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REISSUE PATENT APPLICATION TRANSMITTAL

Address to: Mail Stop Reissue Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450		Attorney Docket No.		
		First Named Inventor	Robert A. Malaney	
		Original Patent Number	8,022,870	
		Original Patent Issue Date (Month/Day/Year)	09/20/2011	
		Express Mail Label No.		
APPLICATION FOR REISSUE OF: (Check applicable box) ☒ Utility Patent ☐ Design Patent ☐ Plant Patent				
APPLICATION ELEMENTS (37 CFR 1.173)			ACCOMPANYING APPLICATION PARTS	
1. ☒ Fee Transmittal Form (PTO/SB/56)			11. ☒ Statement of status and support for all changes to the claims. See 37 CFR 1.173(c).	
2. ☒ Applicant asserts small entity status. See 37 CFR 1.27			12. ☐ Power of Attorney	
3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.			13. ☐ Information Disclosure Statement (IDS) PTOSB/08 or PTO-1449 ☐ Copies of citations attached	
4. ☒ Specification and Claims in double column copy of patent format (amended, if appropriate)			14. ☐ English translation of Reissue Oath/Declaration (if applicable)	
5. ☒ Drawing(s) (proposed amendments, if appropriate)			15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized)	
6. ☒ Reissue Oath/Declaration or Substitute Statement (37 CFR 1.175) (PTO/AIA/05, 06, or 07)			16. ☐ Preliminary Amendment (37 CFR 1.173; MPEP § 1453)	
7. ☒ Application Data Sheet NOTE: Benefit claims under 37 CFR 1.78 and foreign priority claims under 37 CFR 1.55 MUST be set forth in an Application Data Sheet (ADS).			17. ☒ Other: <u>Copy of certificate of correction</u> _____ _____ _____ _____ _____	
8. ☒ Original U.S. Patent currently assigned? ☒ Yes ☐ No (If Yes, check applicable box(es)) ☒ Written Consent of all Assignees (PTO/AIA/53) ☒ 37 CFR 3.73(c) Statement (PTO/AIA/96)				
9. ☐ CD-ROM or CD-R in duplicate, Computer Program (Appendix) or large table ☐ Landscape Table on CD				
10. Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. – c. are required) a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM (2 copies) or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies			☒ This is a continuation reissue or divisional reissue application (i.e., a second or subsequent reissue application for the same issued patent). (Check box if applicable.)	
18. CORRESPONDENCE ADDRESS				
☒ The address associated with Customer Number: <u>132250</u> OR ☐ Correspondence address below				
Name				
Address				
City		State		Zip Code
Country		Telephone		
Email				
Signature	/Robert A. Malaney/		Date	12-13-2016
Name (Print/Type)	Robert A. Malaney		Registration No.	

This collection of information is required by 37 CFR 1.173. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop Reissue, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Robert	Anderson	Malaney		
Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	East Lindfield		Country of Residence ⁱ	AU	
Mailing Address of Inventor:					
Address 1	16 Carlyle Rd				
Address 2	East Lindfield				
City	New South Wales		State/Province		
Postal Code	2070		Country ⁱ	AU	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					
Add					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ An Address is being provided for the correspondence Information of this application.

Customer Number	132250		
Email Address	robert@nariste.com	Add Email	Remove Email

Application Information:

Title of the Invention	SELF MONITORING GPS ON MOBILE DEVICE		
Attorney Docket Number		Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)	2

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number			

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	reissue of	14031992	2013-09-19

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number			
		Application Number			
Title of Invention		SELF MONITORING GPS ON MOBILE DEVICE			
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14031992	reissued of	11661707	2008-02-11	8022870	2011-09-20
Prior Application Status				Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
11661707	a 371 of international	PCT/AU2005/001351	2005-08-31		
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.					Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number		Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)	Remove
2004905024		AU	2004-09-02		
Additional Foreign Priority Data may be generated within this form by selecting the Add button.					Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant

1

Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

Assignee

Legal Representative under 35 U.S.C. 117

Joint Inventor

Person to whom the inventor is obligated to assign.

Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

--	--

Name of the Deceased or Legally Incapacitated Inventor:

--

If the Applicant is an Organization check here.

☐

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Applicant:

Address 1

Address 2

City

State/Province

Country

Postal Code

Phone Number

Fax Number

Email Address

Additional Applicant Data may be generated within this form by selecting the Add button.

Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				Add

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet must be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Robert A. Malaney/		Date (YYYY-MM-DD)	2016-12-13
First Name	Robert	Last Name	Malaney	Registration Number
Additional Signature may be generated within this form by selecting the Add button.				Add

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Robert Anderson Malaney

Application No./Patent No.: 11/661/707 / 8,022,870 Filed/Issue Date: 31 August 2005/ 20 September 2011

Titled: SELF MONITORING GPS ON MOBILE DEVICE

_____, a _____
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is _____. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.
- B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Robert Anderson Malaney To: Nariste Networks Pty Ltd

The document was recorded in the United States Patent and Trademark Office at
Reel 020990, Frame 0609, or for which a copy thereof is attached.

2. From: Nariste Networks Pty Ltd To: Robert Anderson Malaney

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

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☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Robert A. Malaney/

Signature

Robert A. Malaney

Printed or Typed Name

13 Dec 2016

Date

Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

DEED

DEED made 13th December 2016.

BETWEEN: ROBERT ANDERSON MALANEY of 16 Carlyle Road, Lindfield, New South Wales (the "Assignee")

AND: NARISTE NETWORKS PTY LIMITED (ACN 117 199 363) of 16 Carlyle Road, Lindfield, New South Wales (the "Assignor")

RECITALS:

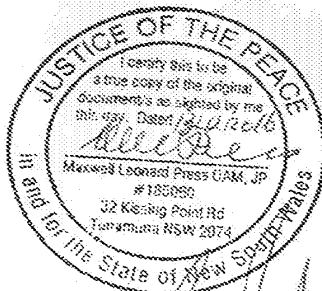
- A. By patent US 8,022,870 ("the patent") the Assignor has obtained a patent in the United States of America for an invention entitled "SELF MONITORING GPS ON MOBILE DEVICE" ("the invention").
- B. The Assignor has agreed to assign to the Assignee all his right, title and interest in and to the patent and the invention, including the right to apply for and obtain patents in any country for the invention, including all reissue and continuation reissue patents derived from the patent US 8,022,870.

THIS DEED WITNESSES AS FOLLOWS:

1. In consideration of the payment of the sum of \$10.00 by the Assignee to the Assignor, the Assignor hereby assigns to the Assignee all his right, title and interest in and to the patent and the invention, including the right to apply for and obtain patents in any country for the invention.
2. The Assignor agrees, at the expense of the Assignee, to do all such further acts and execute all such further documents as may be necessary to transfer to the Assignee the patent and any patent that may be granted as a result of the patent.
3. For the avoidance of doubt, it is agreed that all fees, costs and expenses incurred by the Assignor (whether before or after the date of this Deed) in connection with enabling the Assignee to be registered as the sole owner of any patent that may be granted as a result of the patent, are to be borne and paid by the Assignee or (as the case may be) reimbursed to the Assignor by the Assignee, at the request of the Assignor.

EXECUTED AS A DEED

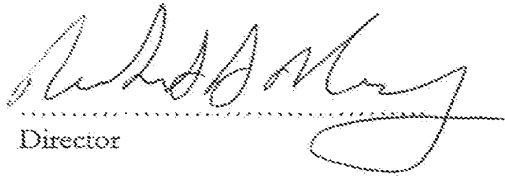
Signed, sealed and delivered by
ROBERT ANDERSON MALANEY
in the presence of

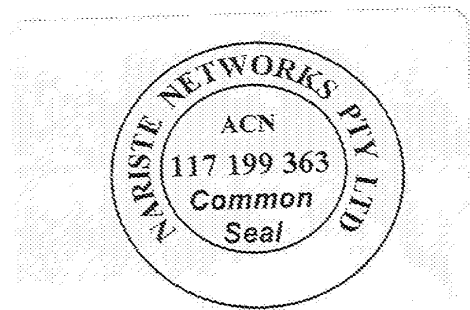


Witness:
Title:

Robert Anderson Malaney

The Common Seal of
NARISTE NETWORKS PTY LIMITED
(ACN 117 199 363)
was affixed in accordance with
its Constitution


Director



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Robert Anderson Malaney

Group Art Unit: Unassigned

Application No.: Unassigned

Examiner: Unassigned

Confirmation No.: Unassigned

For: SELF MONITORING GPS ON MOBILE DEVICE

STATUS OF CLAIMS AND SUPPORT FOR CHANGES OF CLAIMS (37 CFR 1.173c)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Please amend the claims as indicated in the attached claim set. Issued claims 1-36 of the original parent patent 8,022,870 are cancelled without prejudice. Support for the new claims 37-54 listed in this continuation reissue application can be found within the original specification 8,022,870 as noted below. Please also note the following. The application currently being filed is a reissue continuation application, meaning it is a continuation of reissue application 14,031,992 and is also a reissue of U.S. Patent No. 8,022,870. Application 15/364,195 is another pending re-issue of 8,022,870.

Claim 37 - Column 1 lines 12-13; Column 1 lines 18-24; Column 3 line 42; Column 6 lines 33-34; Column 9 line 50; Fig 2 (220).

Claim 38 - Column 1 lines 18-24; Column 2 lines 18-19.

Claim 39 - Column 1 lines 18-24, Column 5 lines 15-16; Column 10 line 66.

Claim 40 - Column 6 lines 33-34; Fig 2 (220).

Claim 41 - Column 2 lines 24-32; Column 7 lines 24-25.

Claim 42 - Column 6 lines 28-36; Column 6 line 10; Column 6 line 41; Column 6 line 44; Column 9 line 25; Fig 2.

Claim 43 - Column 1 lines 12-13; Column 1 lines 18-24; Column 3 line 42; Column 6 lines 33-34; Column 9 line 50; Fig 2 (220); Fig 1; Fig 6.

Claim 44 - Column 1 lines 18-24; Column 2 lines 18-19.

Claim 45 - Column 1 lines 18-24, Column 5 lines 15-16; Column 10 line 66.

Claim 46 - Column 6 lines 33-34; Fig 2 (220).

Claim 47 - Column 2 lines 24-32; Column 7 lines 24-25.

Claim 48 - Column 6 lines 28-36; Column 6 line 10; Column 6 line 41; Column 6 line 44; Column 9 line 25; Fig 2.

Claim 49 - Column 1 lines 12-13; Column 1 lines 18-24; Column 3 line 42; Column 6 lines 33-34; Column 9 line 50; Fig 2 (220); Column 10 lines 27-31; Fig 6.

Claim 50 - Column 1 lines 18-24; Column 2 lines 18-19.

Claim 51 - Column 1 lines 18-24, Column 5 lines 15-16; Column 10 line 66.

Claim 52 - Column 6 lines 33-34; Fig 2 (220).

Claim 53 - Column 2 lines 24-32; Column 7 lines 24-25.

Claim 54 - Column 6 lines 28-36; Column 6 line 10; Column 6 line 41; Column 6 line 44; Column 9 line 25; Fig 2.

16 Carlyle Rd.,
East Lindfield, NSW 2070,
Australia.

Respectfully Submitted,



Robert A. Malaney, Customer Number 132250

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REISSUE APPLICATION FEE TRANSMITTAL FORM							Docket Number (Optional)		
Application as Filed – Part 1									
	(1) Claims in Patent	(2) Claims Filed in Reissue Application	(3) Number Extra	Micro Entity		Small Entity		Undiscounted	
				Rate (\$)	Fee (\$)	Rate (\$)	Fee (\$)	Rate (\$)	Fee (\$)
Total Claims (37 CFR 1.16(ii))	(A)	(B) 18	* 0 =	x =		x =		x =	0
Ind. Claims (37 CFR 1.16(h))	(C)	(D) 3	** 0 =	x =		x =		x =	0
Application Size Fee (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$400 (\$200 for small entity, \$100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
	Filing Fee (37 CFR 1.16(e))				300				
	Search Fee (37 CFR 1.16(n))				140				
	Examination Fee (37 CFR 1.16(r))				1080				
	Total Filing Fee				1520				1520
Application as Amended – Part 2									
	(1) Claims Remaining After Amendment	(2) Highest Number Previously Paid For	(3) Extra Claims Present	Micro Entity		Small Entity		Undiscounted	
				Rate (\$)	Fee (\$)	Rate (\$)	Fee (\$)	Rate (\$)	Fee (\$)
Total Claims (37 CFR 1.16(ii))	***	-	****	=	x =		x =		x =
Ind. Claims (37 CFR 1.16(h))	***	-	****	=	x =		x =		x =
Application Size Fee (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$400 (\$200 for small entity, \$100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
				Total Additional Fee					
* Enter (B) – 20, or enter "0" if (B) is less than 20. ** Enter (D) – minus 3, or enter "0" if (D) is less than 3. *** After any cancellation of claims. **** If the "Highest Number of Total Claims Previously Paid For" is less than 20, enter "20" in this space. ***** If the "Highest Number of Independent Claims Previously Paid For" is less than 3, enter "3" in this space. ☒ Applicant asserts small entity status. See 37 CFR 1.27. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously. ☐ The Director is hereby authorized to charge any additional fees under 37 CFR 1.16 or 1.17 which may be required, or credit any overpayment to Deposit Account No. _____. ☐ A check in the amount of \$ _____ to cover the filing/additional fee is enclosed. ☐ Payment made via EFS-Web. ☐ Payment by credit card. Form PTO-2038 is attached. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. <u>/Robert A. Malanев/</u> 12-12-2016 Signature Date <u>Robert A Malanев</u> Registration Number, if applicable Typed or Printed Name 61294161983 Telephone Number									

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11, 1.14 and 41.6. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Claims 1-36. (Canceled)

37 (new). A method of acquiring a satellite positioning system position on a mobile wireless communication device for a wireless communications network, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system for satellite positioning system capability, said method comprising:

determining when said embedded satellite positioning system module should be powered on, said when said embedded satellite positioning system module should be powered on being dependant on at least one of a position error determined from the wireless communications network and a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

38 (new). The method according to claim 37, wherein said satellite positioning system is a Global Positioning System (GPS).

39 (new). The method according to claim 37, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

40 (new). The method according to claim 37, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

41 (new). The method according to claim 37, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.

42 (new). The method according to claim 37, wherein said determining when said embedded satellite positioning system module should be powered on is also dependent on at least one of; a last satellite position; a last position determined by the satellite positioning system; a last time determined by the satellite positioning system; a previous position.

43 (new). A mobile wireless communication device for a wireless communications network, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system module for satellite positioning system capability, said mobile wireless communication device comprising:

a processor; a memory coupled to said processor; an embedded satellite positioning system module coupled to said processor providing a satellite positioning capability for said mobile wireless communication device; and means for determining when said embedded satellite positioning system module should be powered on, said determining when said embedded satellite positioning system module should be powered on being dependant on at least one of a position error determined from the wireless communications network and a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

44 (new). The mobile device according to claim 43, wherein said satellite positioning system is a Global Positioning System (GPS).

45 (new). The mobile device according to claim 43, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

46 (new). The mobile device according to claim 43, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

47 (new). The mobile device according to claim 43, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.

48 (new). The mobile device according to claim 43, wherein said determining when said embedded satellite positioning system module should be powered on is also dependent on at least one of; a last satellite position; a last position determined by the satellite positioning system; last time determined by the satellite positioning system; a previous position.

49 (new). A computer program product for a mobile wireless communication device for a wireless communication network, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system module for satellite positioning system capability, said computer program product having a non-transitory computer readable medium storing a computer program for acquiring a satellite positioning system position on a said mobile wireless communication device, comprising:
computer program code means for interfacing with the satellite positioning system capability of said mobile wireless communication device; and computer program code means for determining when said embedded satellite positioning system module should be powered on, said determining when said embedded satellite positioning system module should be powered on being dependant on at least one of a position error determined from the wireless communications network and a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

50 (new). The computer program product according to claim 49, wherein said satellite positioning system is a Global Positioning System (GPS).

51 (new). The computer program product according to claim 49, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

52 (new). The computer program product according to claim 49, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

53 (new). The computer program product according to claim 49, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.

54 (new). The computer program product according to claim 49, wherein said determining

when said embedded satellite positioning system module should be powered on is also dependent on at least one of; a last satellite position; a last position determined by the satellite positioning system; a last time determined by the satellite positioning system; and a previous position.

Electronic Acknowledgement Receipt	
EFS ID:	27771055
Application Number:	15376627
International Application Number:	
Confirmation Number:	2064
Title of Invention:	Self Monitoring GPS On Mobile Device
First Named Inventor/Applicant Name:	Robert Anderson Malaney
Customer Number:	132250
Filer:	Robert Anderson Malaney
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	12-DEC-2016
Filing Date:	
Time Stamp:	22:29:06
Application Type:	Reissue (Utility)

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Abstract	abstract.pdf	117562	no	2
			04ca1a1f52d6bad39f7b19623b80acfa1747fc5e		
Warnings:					

Information:					
2	Claims	origClaims.pdf	255693	no	3
			dac54b0d04002ca7cdca328d4e461c9807467be9		
Warnings:					
Information:					
3	Drawings-only black and white line drawings	drawings.pdf	86017	no	6
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Warnings:					
Information:					
4	Specification	specification.pdf	613098	no	5
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Warnings:					
Information:					
5	Miscellaneous Incoming Letter	certOfCorr.pdf	16081	no	1
			80ea80aef7c90691d8c6aef0cfcc9b23e3e023be		
Warnings:					
Information:					
6	Consent of Assignee accompanying the declaration	consentassignee.pdf	905768	no	1
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Warnings:					
Information:					
7	Reissue dec filed in accordance with MPEP 1414	decInventor.pdf	1647422	no	2
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Warnings:					
Information:					
8	Transmittal Reissue Application	Transmittalform.pdf	308692	no	2
			cd6945219646557f5260f9673e9b634ea4cd02df0		
Warnings:					
Information:					

9	Application Data Sheet	ADSaia0016corr.pdf	1793435	no	8
			84eb16e6d516b8bb43b0903ec71463f30d2b816b		
Warnings:					
Information:					
10	Assignee showing of ownership per 37 CFR 3.73	assignmnetcover.pdf	119304	no	3
			a4ae1ca4ae0bccf029bce630d4a126c8f0692599		
Warnings:					
Information:					
11	Assignee showing of ownership per 37 CFR 3.73	deed1.pdf	1146763	no	2
			49b2bd7a4f10d09be876cc6520b30e70b6a0dd717		
Warnings:					
Information:					
12	Transmittal Letter	signedclaimsstatus.pdf	767057	no	1
			bfe114d42be27e4671ce15603b75a73cdfc72fac		
Warnings:					
Information:					
13	Fee Worksheet (SB06)	fee.pdf	254566	no	2
			503c0183ef088afd0244464e4df1677d72d612b4		
Warnings:					
Information:					
14	Claims	FinalclaimsCONT2.pdf	63142	no	4
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Warnings:					
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Total Files Size (in bytes):			8094600		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



US008022870B2

(12) **United States Patent**
Malaney

(10) **Patent No.:** **US 8,022,870 B2**
(45) **Date of Patent:** **Sep. 20, 2011**

(54) **SELF MONITORING GPS ON MOBILE DEVICE**

(75) Inventor: **Robert Anderson Malaney**, East Lindfield (AU)

(73) Assignee: **Nariste Networks Pty Ltd**, New South Wales (AU)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 595 days.

(21) Appl. No.: **11/661,707**

(22) PCT Filed: **Aug. 31, 2005**

(86) PCT No.: **PCT/AU2005/001351**

§ 371 (c)(1),

(2), (4) Date: **Feb. 11, 2008**

(87) PCT Pub. No.: **WO2006/024112**

PCT Pub. Date: **Mar. 9, 2006**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Sep. 2, 2004 (AU) 2004905024

(51) **Int. Cl.**
G01S 19/34 (2010.01)

(52) **U.S. Cl.** **342/357.74**

(58) **Field of Classification**
Search 342/357.01–357.17, 357.2–357.78;
455/343.1–343.6

See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Thomas Tarcza

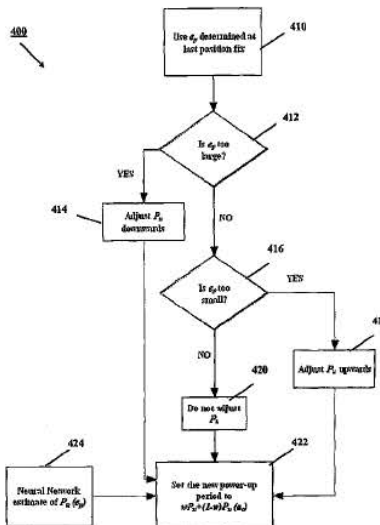
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(57) **ABSTRACT**

A method, a mobile device and a computer program product for acquiring GPS on a mobile device possessing GPS capability are disclosed. The method comprises the step of setting a current value of the period of the power-up phase of the GPS dependent upon adaptive predictions of when the GPS should be powered on to meet specifications on positioning accuracy and GPS acquisition time.

36 Claims, 6 Drawing Sheets



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The computer 650 may comprise a processing unit 666 (e.g., one or more central processing units) 666, memory 670 which may comprise random access memory (RAM), read-only memory (ROM), or a combination of the two, input/output (IO) interfaces 672, a graphics interface 660, and one or more storage devices 662. The storage device(s) 662 may comprise one or more of the following: a floppy disc, a hard disc drive, a magneto-optical disc drive, CD-ROM, DVD, a data card or memory stick, flash RAM device, magnetic tape or any other of a number of non-volatile storage devices well known to those skilled in the art. While the storage device is shown directly connected to the bus in FIG. 6, such a storage device may be connected through any suitable interface, such as a parallel port, serial port, USB interface, a Firewire interface, a wireless interface, a PCMCIA slot, or the like. For the purposes of this description, a storage unit may comprise one or more of the memory 670 and the storage devices 662 (as indicated by a dashed box surrounding these elements in FIG. 6).

Each of the components of the computer 650 is typically connected to one or more of the other devices via one or more buses 680, depicted generally in FIG. 6, that in turn comprise data, address, and control buses. While a single bus 680 is depicted in FIG. 6, it will be well understood by those skilled in the art that a computer or other electronic computing device, such as a PDA, may have several buses including one or more of a processor bus, a memory bus, a graphics card bus, and a peripheral bus. Suitable bridges may be utilized to interface communications between such buses. While a system using a CPU has been described, it will be appreciated by those skilled in the art that other processing units capable of processing data and carrying out operations may be used instead without departing from the scope and spirit of the invention.

The computer system 600 is simply provided for illustrative purposes, and other configurations can be employed without departing from the scope and spirit of the invention. Computers with which the embodiment can be practiced comprise IBM-PC/ATs or compatibles, laptop/notebook computers, one of the Macintosh™ family of PCs, Sun Sparcstation™, a PDA, a workstation or the like. The foregoing are merely examples of the types of devices with which the embodiments of the invention may be practiced. Typically, the processes of the embodiments, described hereinafter, are resident as software or a program recorded on a hard disk drive as the computer readable medium, and read and controlled using the processor. Intermediate storage of the program and intermediate data and any data fetched from the network may be accomplished using the semiconductor memory.

In some instances, the program may be supplied encoded on a CD-ROM or a floppy disk, or alternatively could be read from a network via a modem device connected to the computer, for example. Still further, the software can also be loaded into the computer system from other computer readable medium comprising magnetic tape, a ROM or integrated circuit, a magneto-optical disk, a radio or infra-red transmission channel between the computer and another device, a computer readable card such as a PCMCIA card, and the Internet and Intranets comprising email transmissions and information recorded on websites and the like. The foregoing is merely an example of relevant computer readable mediums. Other computer readable mediums may be practiced without departing from the scope and spirit of the invention.

A small number of embodiments of the invention regarding methods, systems, and computer program products for energy efficient GPS acquisition on a mobile device have

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been described. In the light of the foregoing, it will be apparent to those skilled in the art in the light of this disclosure that various modifications and/or substitutions may be made without departing from the scope and spirit of the invention.

The invention claimed is:

1. A method of acquiring GPS on a mobile wireless communication device for a wireless communications network, said mobile device possessing wireless communications capability for said wireless network and an embedded GPS module for GPS capability, said method comprising:

setting a current value of a period of a power-up phase of said GPS dependent on a current radio position and error of said mobile device in the wireless network determined from the wireless network and adaptive predictions of when said GPS should be powered on to meet specifications on positioning accuracy and GPS acquisition time.

2. The method according to claim 1, wherein the current radio position and error are determined using Cramer-Rao Bounds.

3. The method according to claim 1, wherein the period of the power-up phase is set while retaining the accuracy of a position fix and acquisition times of the position fix within acceptable statistical bounds.

4. The method according to claim 1, wherein said mobile device determines dynamically an optimal period of the power-up phase.

5. The method according to claim 1, wherein said current value of said period of the power-up phase is set using adaptive-filter and machine-learning techniques.

6. The method according to claim 5, wherein said adaptive-filter and machine learning techniques are implemented using said mobile device.

7. The method according to claim further comprising: if at least one of said position error and acquisition times of GPS fail to meet acceptable bounds, reducing said value of said period of the power-up phase; and

if at least one of said position error and acquisition times of GPS meet said acceptable bounds, increasing said value of said period of the power-up phase.

8. The method according to claim 1, wherein said mobile device comprises a power limited device.

9. The method according to claim 1, wherein said embedded GPS module comprises an embedded GPS device.

10. The method according to claim 1, further comprising the step of making adaptive predictions using a neural network.

11. The method according to claim 1, wherein said setting step comprises:

predicting a next position at a next scheduled power-up time using a number of last positions reported of said mobile device in the wireless network determined from the wireless network;

comparing said predicted position at said next power-up time with an actual position of said mobile device in the wireless network determined from the wireless network and determining said position error; and

storing current values of said period of the power-up phase, acquisition time, said position error, and position in a storage unit of said mobile device.

12. A mobile wireless communication device for a wireless communications network, said mobile device possessing wireless communications capability for said wireless network, comprising:

a processor;

a memory coupled to said processor;

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an embedded GPS module coupled to said processor providing a GPS capability for said mobile device; and means for setting a current value of a period of a power-up phase of said GPS dependent on the current radio position and error of said mobile device in the wireless network determined from the wireless network and adaptive predictions of when said GPS should be powered on to meet specifications on positioning accuracy and GPS acquisition time.

13. The mobile device according to claim 12, wherein the current radio position and error are determined using Cramer-Rao Bounds.

14. The mobile device according to claim 12, wherein the period of the power-up phase is set while retaining the accuracy of a position fix and acquisition times of the position fix within acceptable statistical bounds.

15. The mobile device according to claim 12, wherein said mobile device determines dynamically an optimal period of the power-up phase.

16. The mobile device according to claim 12, wherein said current value of said period of the power-up phase is set using adaptive-filter and machine-learning techniques.

17. The mobile device according to claim 16, wherein said adaptive-filter and machine-learning techniques are implemented using said mobile device.

18. The mobile device according to claim 12, further comprising:

means for, if at least one of position error and acquisition times of GPS fail to meet acceptable bounds, reducing said value of said period of the power-up phase; and

means for, if at least one of said position error and acquisition times of GPS meet said acceptable bounds, increasing said value of said period of the power-up phase.

19. The mobile device according to claim 12, wherein said mobile device comprises a power limited device.

20. The mobile device according to claim 19, further comprising a battery for powering said mobile device.

21. The mobile device according to claim 12, further comprising a neural network module for making adaptive predictions.

22. The mobile device according to claim 12, wherein said setting means comprises:

means for predicting a next position at a next scheduled power-up time using a number of last positions reported of said mobile device in the wireless network determined from the wireless network;

means for comparing said predicted position at said next power-up time with an actual position of said mobile device in the wireless network determined from the wireless network and determining said position error; and

means for storing current values of a period of the power-up phase, acquisition time, said position error, and position in a storage unit of said mobile device.

23. A computer program product for a mobile wireless communication device for a wireless communication network, said mobile device possessing wireless communications capability for said wireless network and an embedded GPS module for GPS capability, said computer program product having a computer readable medium storing a computer program for acquiring GPS on said mobile device, comprising:

computer program code means for interfacing with the GPS capability of said mobile device; and

computer program code means for setting a current value of the period of the power-up phase of said GPS dependent

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on a current radio position and error of said mobile device in the wireless network determined from the wireless network and adaptive predictions of when said GPS should be powered on to meet specifications on positioning accuracy and GPS acquisition time.

24. The computer program product according to claim 23, wherein the current radio position and error are determined using Cramer-Rao Bounds.

25. The computer program product according to claim 23, wherein the period of the power-up phase is set while retaining the accuracy of a position fix and acquisition times of the position fix within acceptable statistical bounds.

26. The computer program product according to claim 23, wherein said computer program product determines dynamically an optimal period of the power-up phase.

27. The computer program product according to claim 23, wherein said current value of said period of the power-up phase is set using adaptive-filter and machine-learning techniques.

28. The computer program product according to claim 27, wherein said adaptive-filter and machine-learning techniques are implemented using said mobile device.

29. The computer program product according to claim 23, further comprising:

computer program code means for, if at least one of said position error and acquisition times of GPS fail to meet acceptable bounds, reducing said value of said period of the power-up phase; and

computer program code means for, if at least one of said position error and acquisition times of GPS meet said acceptable bounds, increasing said value of said period of the power-up phase.

30. The computer program product according to claim 23, wherein said mobile device comprises a power limited device.

31. The computer program product according to claim 30, wherein said mobile device comprises a battery for powering said mobile device.

32. The computer program product according to claim 23, further comprising computer program code means for providing a neural network module to make adaptive predictions.

33. The computer program product according to claim 23, wherein said computer program code means for setting comprises:

computer program code means for predicting at a next position a next scheduled power-up time using a number of last positions reported of said mobile device in the wireless network determined from the wireless network; computer program code means for comparing said predicted position at said next power-up time with an actual position of said mobile device in the wireless network determined from the wireless network and determining said position error; and

computer program code means for storing current values of a period of the power-up phase, acquisition time, said position error, and position in a storage unit of said mobile device.

34. A method of acquiring GPS on a mobile device for a wireless network, said mobile device possessing wireless communications capability for said wireless network and GPS capability, said method comprising the steps of:

using a position error of said mobile device in the wireless network determined from the wireless network;

if the position error is too large, adjusting a current value of a period of a power-up phase of said GPS downward;

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if the position error is too small, adjusting the current value of said period of the power-up phase of said GPS upward;

estimating using a neural network a new value of said period of the power-up phase of said GPS dependent upon said position error; and

setting a new value of said period of the power-up phase of said GPS to a weighted value dependent upon an acceptable error bound.

35. A method of acquiring GPS on a mobile device for a wireless network, said mobile device possessing wireless communications capability for said wireless network and GPS capability, said method comprising the steps of:

using an acquisition time at a last position fix of the mobile device in the wireless network determined from the wireless network;

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if the acquisition time is too large, adjusting a current value of a period of a power-up phase of said GPS downward;

if the acquisition time is too small, adjusting the current value of said period of the power-up phase of said GPS upward;

estimating using a neural network a new value of said period of the power-up phase of said GPS dependent upon said acquisition time; and

setting a new value of said period of the power-up phase of said GPS to a weighted value dependent upon an acceptable bound.

36. The method according to claim 34, wherein the position error is the Cramer-Rao Bound on the radio position of the mobile device.

* * * * *

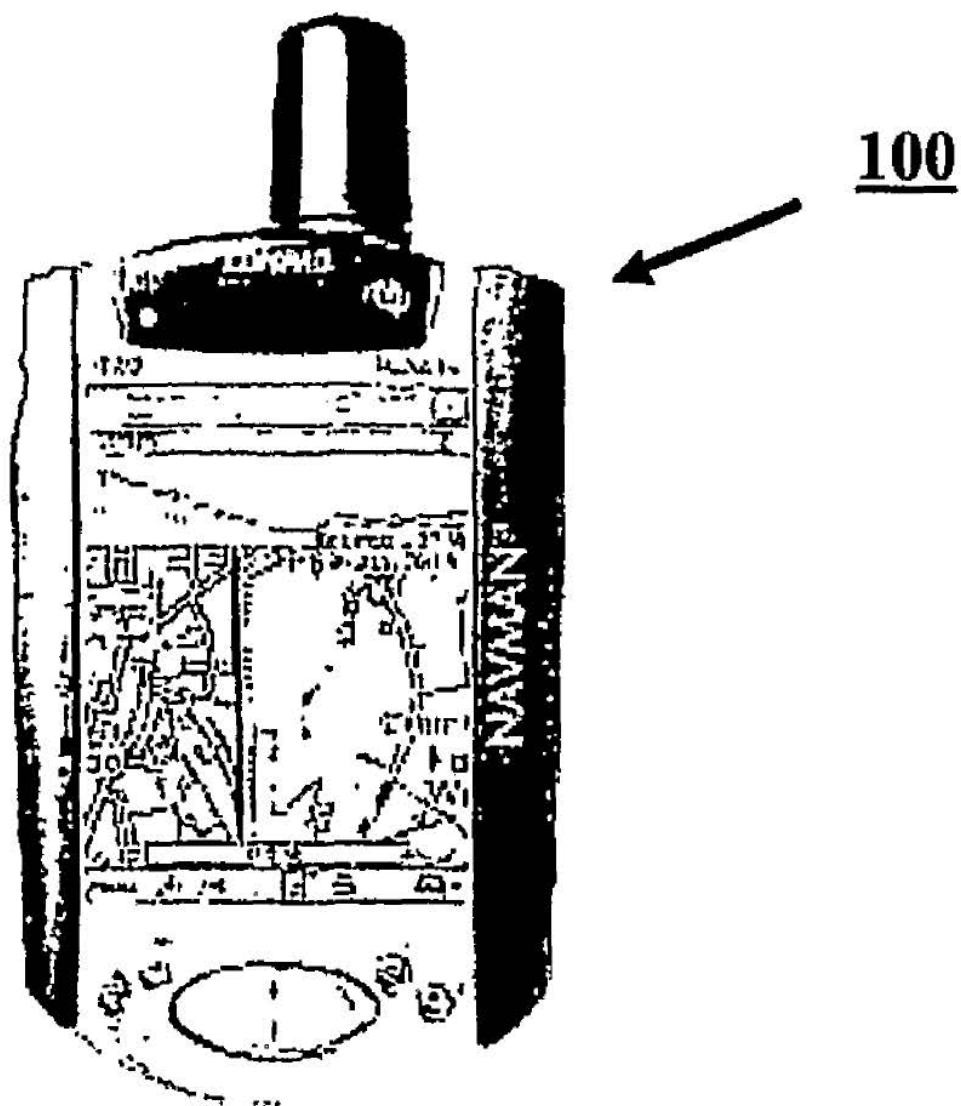


FIG. 1

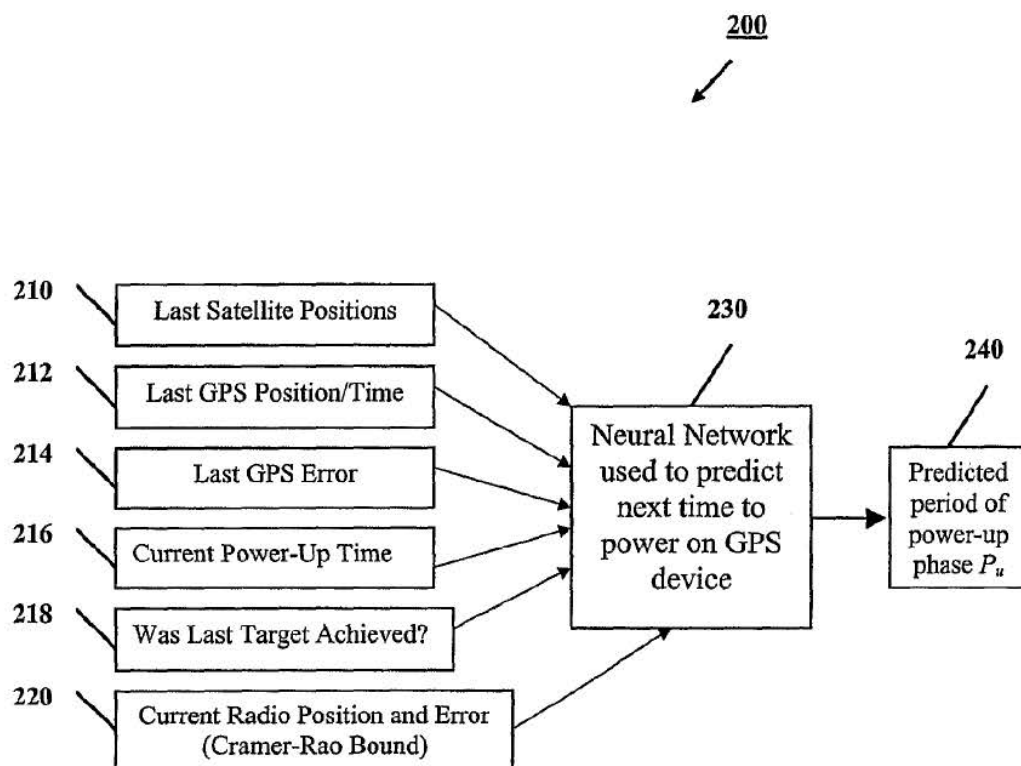


FIG. 2

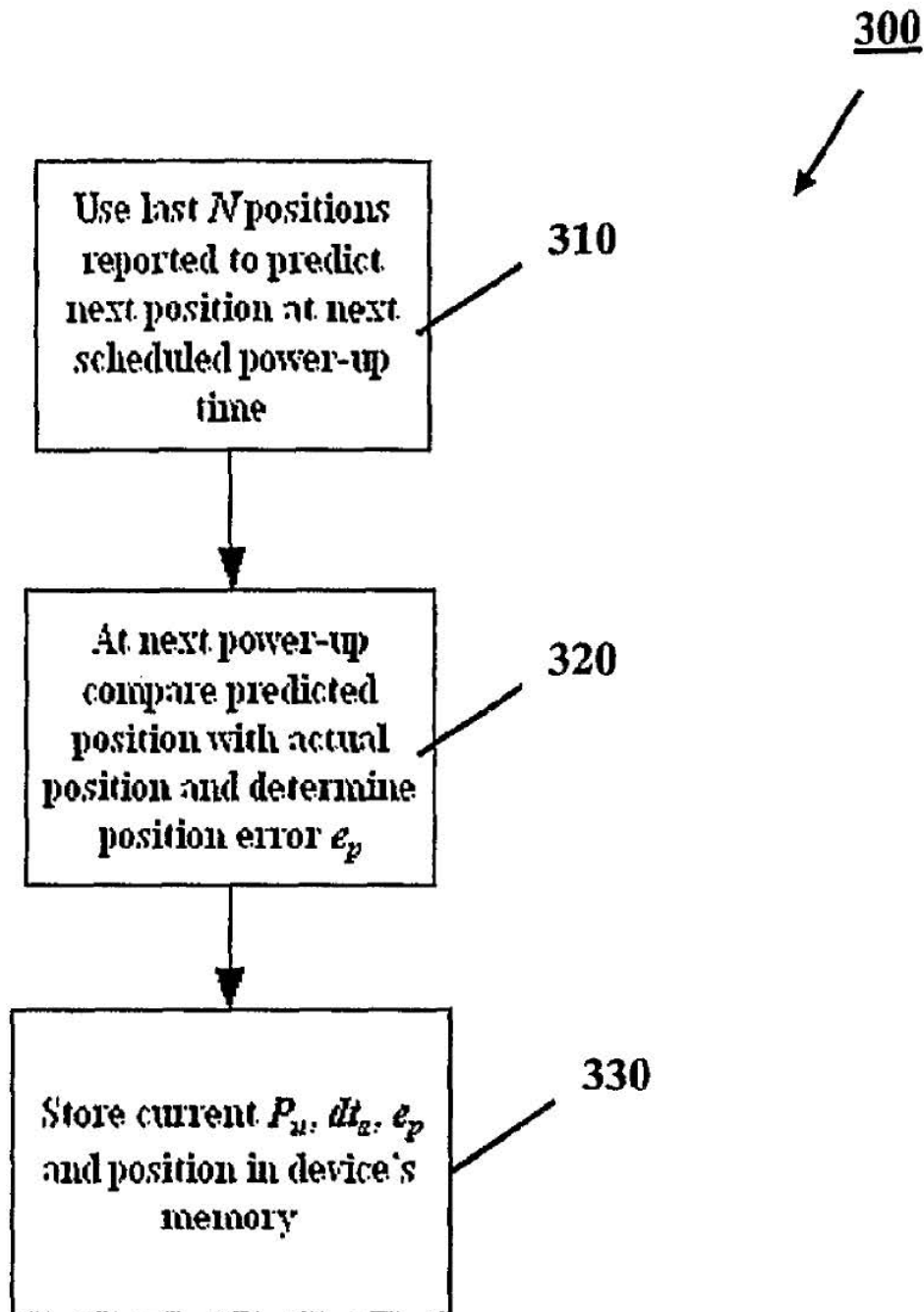


FIG. 3

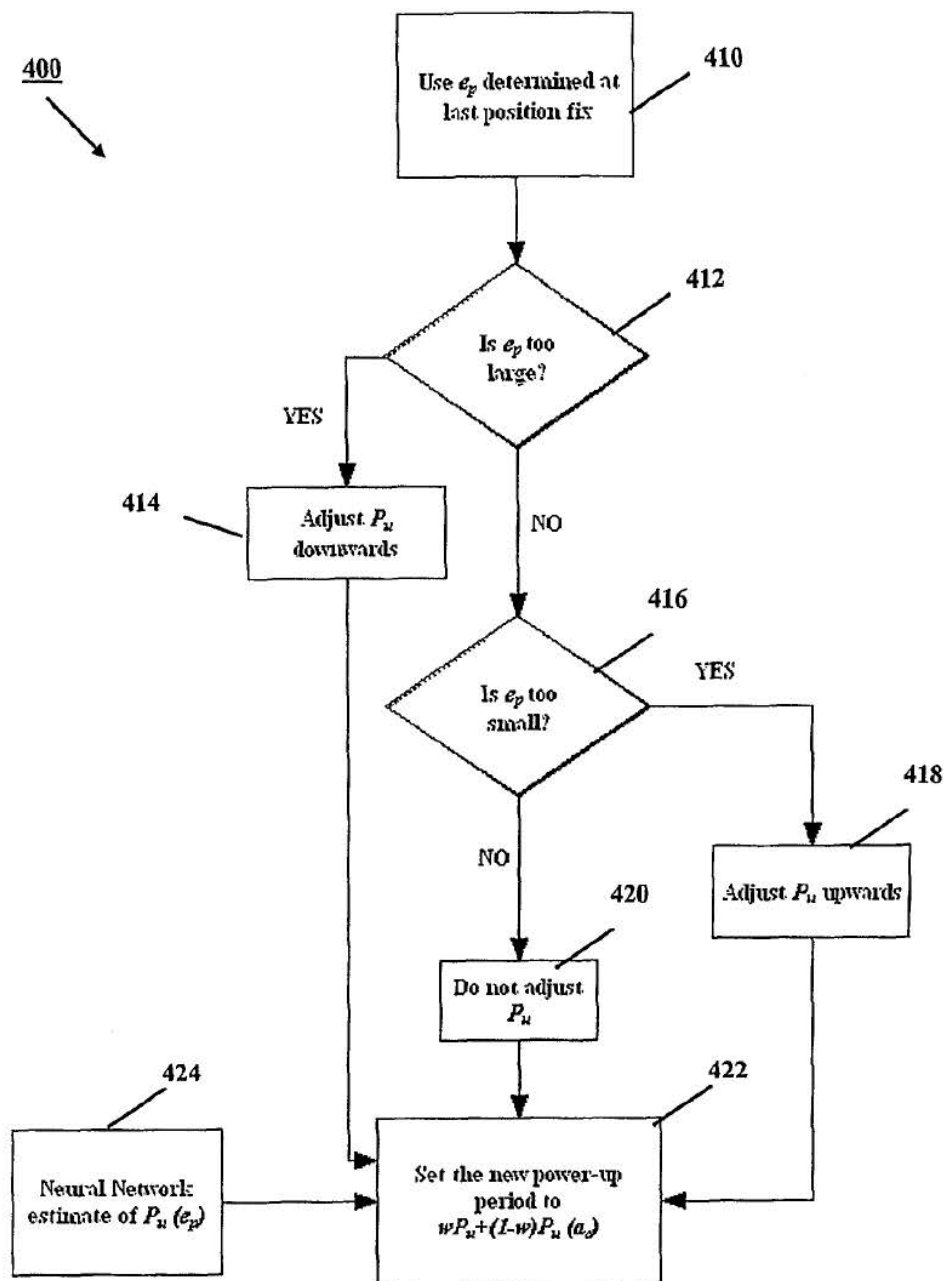


FIG. 4

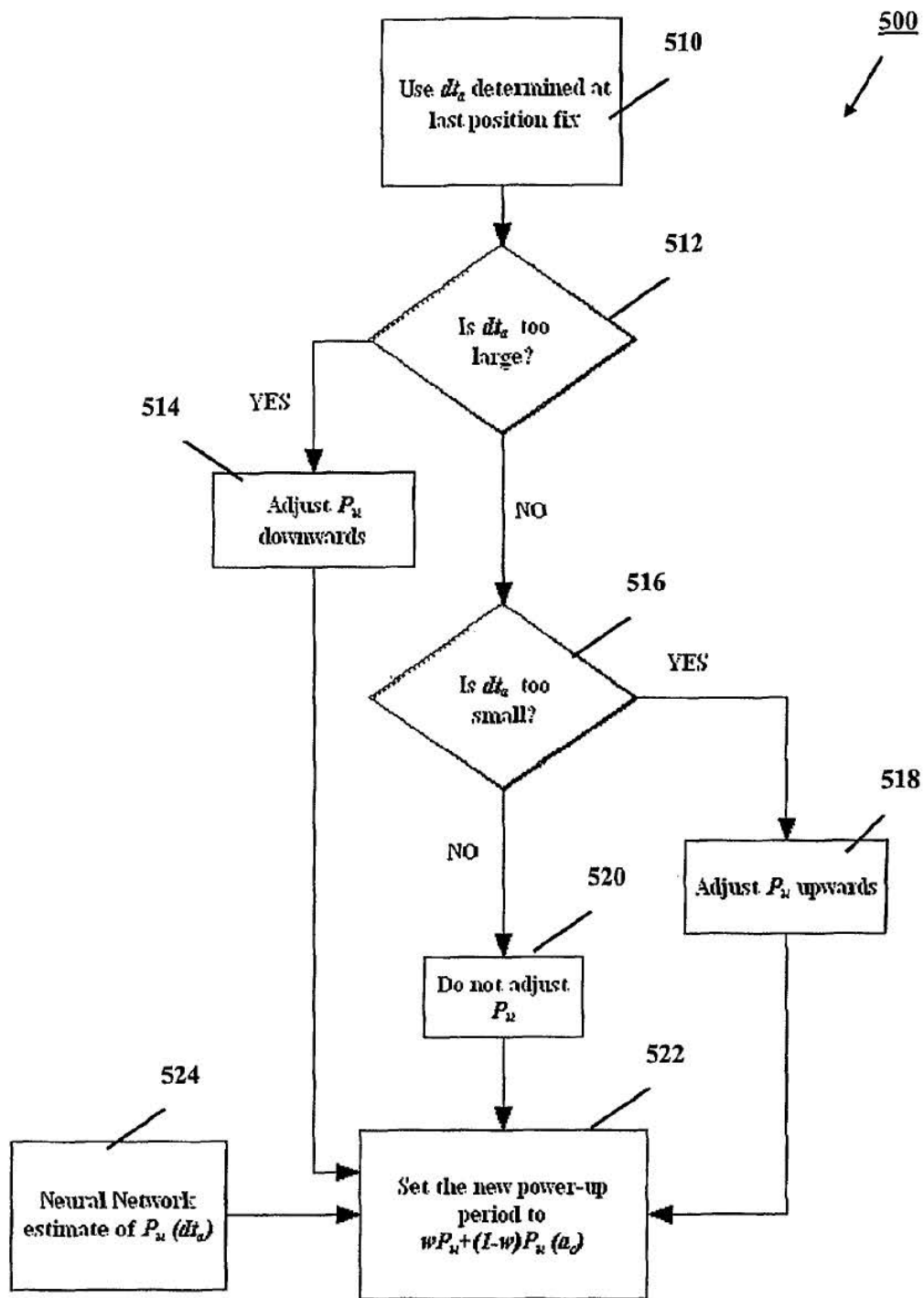


FIG. 5

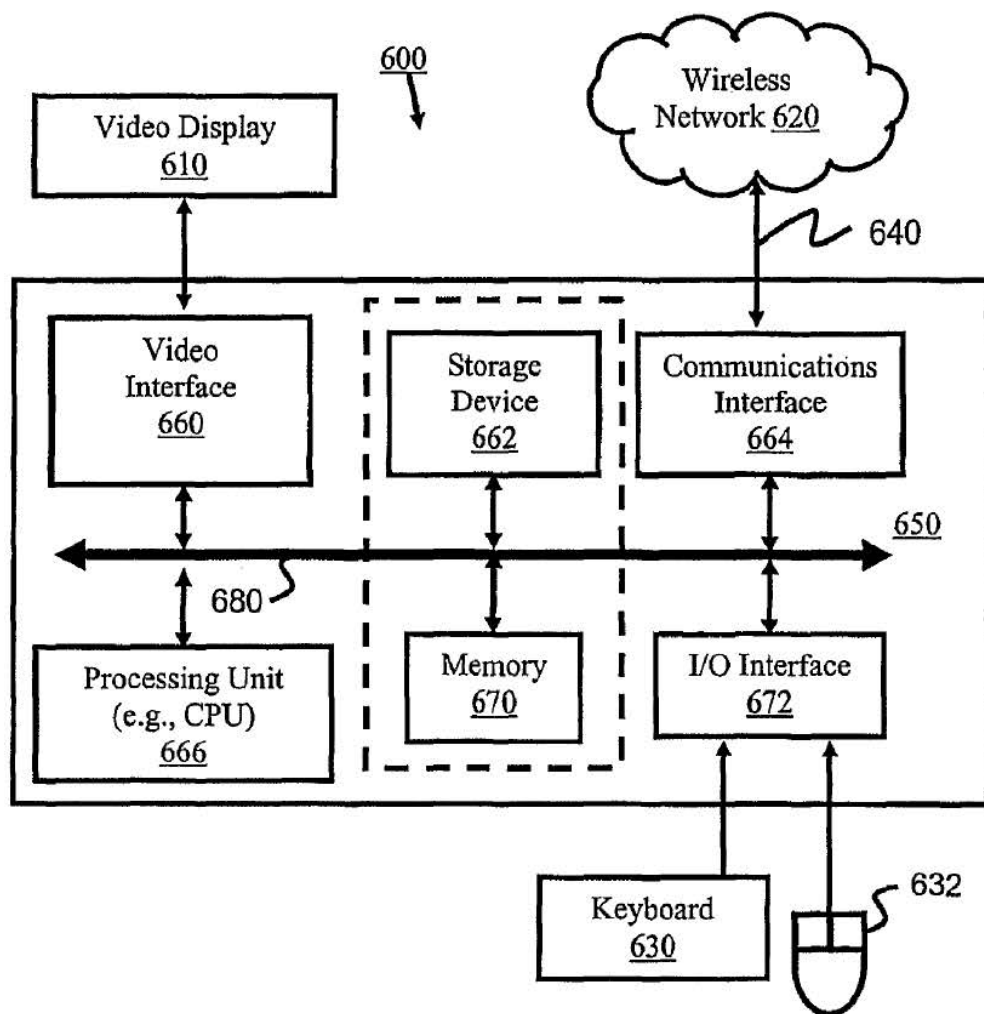


FIG. 6

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SELF MONITORING GPS ON MOBILE DEVICE

FIELD OF THE INVENTION

The present invention relates generally to GPS acquisition and in particular to power conservation for GPS-enabled devices.

BACKGROUND

Techniques for the positioning of mobile devices in a wireless environment are important for a number of applications, such as emergency location services, ad hoc networks, and vehicle tracking.

In the mobile phone industry, competing technologies address the specific issues of Emergency-911 (E-911) position location. Broadly speaking, these technologies fall into two categories: (1) network-based technologies and (2) Global Positioning Systems (GPS) technologies. The network-based technologies use network-based metrics (e.g., time of flight, angle of arrival etc). The GPS technologies use line-of-sight measurements to satellites.

Network-based and GPS technologies each attempt to meet the US Federal Communications Commission (FCC) requirements for E-911 Emergency Location Services. The FCC requirements set specific statistical requirements on the position accuracy on any technology. Currently the FCC's E-911 Phase II Plans dictate that 67% of all attempts for a position location must have an accuracy of less than 50 m, and 95% of calls must have an accuracy of less than 150 m (Federal Communications Commission E-911 <http://www.fcc.gov/911/enhanced/>). Although not mandated, it is generally accepted that acquisition time of a position fix must be in a reasonably short time scale. A positioning technology that can deliver a position fix within a timescale of 30 seconds is generally considered reasonable for E-911 services, since such a small amount of time has negligible impact on the total time taken for the emergency services to reach the emergency scene.

GPS-based techniques are known to provide accurate position measurements. However, such techniques are prone to a lengthy GPS acquisition time (the length of time taken from the time a GPS device is powered on until that device obtains a position fix). A principal reason for this is that the device does not know a priori which GPS satellites are currently in view and must undertake an exhaustive search to find the satellites in view. This is termed a "cold start". Generally speaking in cold start mode, a GPS device can take up to several minutes to find a location fix, which is a time-scale deemed inappropriate for many applications, such as E-911.

One simple approach to overcome this difficulty involves simply keeping the GPS device switched on at all times. After an initial fix, the satellite almanac and ephemeris data are continuously kept up-to-date, and a cold start phase can be avoided. In this mode, the GPS device is said to be in "hot start" mode. A principal disadvantage of always keeping the device in a hot-start mode is the drain on the battery resources of the mobile device. Battery power in a mobile device is a precious resource, and any steps that can be taken to maximize battery life are advantageous. Simply keeping a GPS device powered on at all times to avoid the cold start is generally considered an unacceptable solution. This is particularly the case for an application like E-911, where the GPS location finding capability is likely to be only rarely utilized.

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A potential resolution to the problem of cold starts can be found in the Assisted-GPS (A-GPS) system proposed by Qualcomm; see Qualcomm White Paper, *How A-GPS Works*, 2001 (http://www.snaptrack.com/pdf/How_aGPS_works.pdf). In this system, the network "assists" the mobile device by transferring updated almanacs and ephemeris, collected by base stations, to the mobile device upon receipt of a location request. This speeds up the GPS acquisition of a mobile device relative to the acquisition from a cold start. The system also integrates network positioning information to find optimal position accuracy. However, this approach at attempting to solve the cold start problem comes at the cost of increased complexity in the network system design and incurs additional costs for the required extra infrastructure (i.e. network hardware and communications). This system is also not workable if the mobile device is disconnected from a network, but still requires a GPS position fix.

Another system attempting to address cold start is the use of periodic power-down of the GPS device. In this mode, the device is periodically switched off for a set period. As long as the time switched off remains small, at each onset of the power-up phase, the GPS device effectively commences in hot start mode. This periodic power-down of a GPS device is termed "TricklePower" by GPS chipset manufacturers; see Laipac Technology Inc., *Reference Guideline to TF GPS*, September 2001, (<http://www.laipac.com/datasheets/gps/TF%20GPS%20Series.pdf>). In this mode, a user is allowed to set initially the power-up period, P_u . For example, setting $P_u=30$ minutes means the GPS device powers up every 30 minutes to acquire a position fix. Once the fix is obtained (usually within seconds), the GPS device enters power-down mode.

Simply guessing what value to set P_u at is not optimal. A need clearly exists for an improved GPS acquisition system.

SUMMARY

According to an aspect of the present invention, there is provided a method of acquiring GPS on a mobile device possessing GPS capability. The method comprises the step of setting a current value of the period of the power-up phase of the GPS dependent upon adaptive predictions of when the GPS should be powered on to meet specifications on positioning accuracy and GPS acquisition time.

According to another aspect of the present invention, there is provided a mobile device. The mobile device comprises a processor and memory coupled to the processor; a GPS module coupled to the processor providing a GPS capability for the mobile device; and means for setting a current value of the period of the power-up phase of the GPS module dependent upon adaptive predictions of when the GPS module should be powered on to meet specifications on positioning accuracy and GPS acquisition time.

According to yet another aspect of the present invention, there is provided a computer program product for a mobile device possessing GPS capability. The computer program product having a computer readable medium storing a computer program for acquiring GPS on the mobile device. The computer program product comprises computer program code means for interfacing with the GPS capability of the mobile device and computer program code means for setting a current value of a period of the power-up phase of the GPS module dependent upon adaptive predictions of when the GPS module should be powered on to meet specifications on positioning accuracy and GPS acquisition time.

According to yet another aspect of the present invention, there is provided a method of acquiring GPS on a mobile

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device possessing GPS capability. The method comprises the steps of using a position error between a predicted position and an actual position of the mobile device at a last position fix; if the position error is too large, adjusting a current value of the period of the power-up phase downward; if the position error is too small, adjusting the current value of the period of the power-up phase upward; estimating using a neural network a new value of the period of the power-up phase dependent upon the position error and setting a new value of the period of the power-up phase to a weighted value dependent upon an acceptable error bound.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention are described hereinafter by way of example with reference to the drawings, in which:

FIG. 1 is an image of a GPS-equipped mobile device with which an embodiment of the invention may be practiced;

FIG. 2 is a high-level block diagram of a system for adaptively predicting when a GPS-enable wireless communication device should be powered on in accordance with an embodiment of the invention;

FIG. 3 is a flowchart illustrating a method for determining position errors in accordance with an embodiment of the invention;

FIG. 4 is a flowchart illustrating a method of determining the value of P_u to satisfy position accuracy bounds in accordance with the embodiment of the invention;

FIG. 5 is a flowchart illustrating a method of determining the value of P_u to satisfy GPS acquisition time bounds; and

FIG. 6 is a block diagram of a general-purpose computer system with which embodiments of the invention may be practiced.

DETAILED DESCRIPTION

Methods, apparatuses, and computer program products for energy efficient GPS acquisition on a mobile device are disclosed. The acquisition meets pre-assigned statistical accuracy and acquisition time. In the following description, numerous specific details, including particular wireless networks, positioning systems, network configurations, filtering techniques, and the like are set forth. However, from this disclosure, it will be apparent to those skilled in the art that modifications and/or substitutions may be made without departing from the scope and spirit of the invention. In other circumstances, specific details may be omitted so as not to obscure the invention.

The methods may be implemented in modules. A module, and in particular its functionality, can be implemented in either hardware or software. In the software sense, a module is a process, program, or portion thereof that usually performs a particular function or related functions. Such software may be implemented in C, C++, JAVA, JAVA BEANS, Fortran, or a combination thereof, for example, but may be implemented in any of a number of other programming languages/systems, or combinations thereof. In the hardware sense, a module is a functional hardware unit designed for use with other components or modules. For example, a module may be implemented using discrete electronic components, or it may form at least a portion of an entire electronic circuit such as a Field Programmable Gate Arrays (FPGA), Application Specific Integrated Circuit (ASIC), and the like. A physical implementation may also comprise configuration data for a FPGA, or a layout for an ASIC, for example. Still further, the description of a physical implementation may be in EDIF netlisting language, structural VHDL, structural Verilog, or the like.

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Numerous other possibilities exist. Those skilled in the art will appreciate that the system may also be implemented as a combination of hardware and software modules.

Some portions of the following description are presented in terms of algorithms and representations of operations on data within a computer system or other device capable of performing computations. Such algorithmic descriptions and representations may be used by those skilled in the art to convey the substance of their work to others skilled in the art. An algorithm is a self-consistent sequence of steps leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical, magnetic, or electromagnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated. These signals may be referred to as bits, values, elements, symbols, characters, terms, numbers, or the like.

The above and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied, to such quantities. Unless specifically stated otherwise, and as apparent from the following, discussions utilizing terms such as “receiving”, “calculating”, “predicting”, “comparing”, “determining”, “storing”, “adjusting”, “using”, “estimating”, “setting” or the like, refer to the action and processes of a computer system, or a similar electronic device. Such a system or device manipulates and transforms data represented as physical quantities within the registers and memories of the computer system into other data similarly represented as physical quantities within the computer system registers, memories, or another form of storage, transmission or display devices.

Apparatuses and systems for performing the operations of the methods are also described. Such an apparatus may be specifically constructed for the required purpose. Alternatively, the apparatus may comprise a general-purpose computer (e.g., a notebook PC) or another computing device (e.g., a PDA), which may be selectively activated or reconfigured by a computer program read by the computer. The algorithms presented herein are not inherently related to any particular computer or other apparatus; various general-purpose machines may be used with programs.

The embodiments of the invention also relate to a computer program(s) or software, in which method steps may be put into effect by computer code. The computer program is not intended to be limited to any particular programming language, operating environment, and implementation thereof. A variety of programming languages, operating systems, and coding thereof may be used. Moreover, the computer program is not intended to be limited to any particular control flow. There are many other variants of the computer program, which can use different control flows without departing the scope and spirit of the invention. Furthermore, one or more of the steps of the computer program may be performed in parallel rather than sequentially.

The computer program may be stored on any computer readable medium. The computer readable medium may comprise storage devices, such as magnetic media disks, CD-ROMs, DVDs, flash RAM devices, memory chips, memory cards, magnetic tape, other storage devices and media suitable for interfacing with and being read by a general-purpose computer, and combinations thereof. The computer readable medium may also include a hard-wired medium, such as a local area network or the Internet, or wireless medium, such as an IEEE 802.11 wireless network, BlueTooth, a GSM mobile telephone system, PCS, and GPS. The computer program when loaded and executed on such a general-purpose

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computer effectively results in an apparatus that implements the method steps of the embodiments.

The methods of the embodiments comprise particular control flows. However, different control flows can be practiced without departing from the scope and spirit of the invention.

I. INTRODUCTION

Hereinafter, the next “power-up time” means the time derived by adding the current value of P_u to the time at which a power down occurs. The embodiments of the invention systematically set the period of the power-up phase, P_u , whilst retaining the accuracy of the position fix and the acquisition times of the position fix within acceptable bounds.

Adaptive predictions are made of when a GPS device, embedded in a wireless communication device, should be powered on to meet specifications on positioning accuracy and GPS acquisition time. The embodiments of the invention address the issue of setting the period of the power-up phase, P_u , whilst retaining the accuracy of the position fix and the acquisition times of the position fix within acceptable bounds. Simply setting P_u to some value at the onset of operation may provide the required bounds for some time epoch, but there is no guarantee that this will also be the case in the future. Also, this simple approach provides no sense of an optimized value of P_u . By this, what is meant is the maximum value of P_u allowable whilst still retaining the accuracy of the position fix and the acquisition times of the position fix within acceptable bounds. An example of an inefficient system design would be a GPS system reporting positions every second when an acceptable error bound (accuracy) of 50 meters was required on a device moving at 1 meter per second. The embodiments of the invention allow a GPS device to determine dynamically an optimal P_u in response to such a circumstance.

The methods and apparatuses in accordance with embodiments of the invention address these issues, using adaptive-filter and machine-learning techniques within the mobile device. These techniques allow the mobile device to self monitor the predicted accuracy error and the predicted acquisition times of the GPS device. If these predicted values fail to meet acceptable bounds, the value of P_u is reduced. If the predicted values meet the acceptable bounds, the value of P_u is increased. The embodiments of the invention provide a technology referred to hereinafter as Self Monitored (SM)-GPS. Although applicable to E-911 services, SM-GPS is equally applicable to any mobile GPS device. SM-GPS allows such a device to operate in the most energy efficient way whilst still retaining the position accuracy and acquisition times deemed appropriate by the operator of the GPS device.

The embodiments of the invention assist a mobile device in GPS position acquisition in the most energy efficient way, whilst still retaining the position accuracy and acquisition times deemed appropriate by the operator of the GPS device. In this context, “mobile device” means a power limited (e.g. battery operated) device possessing embedded GPS capability. Examples of such devices are GPS-capable mobile telephones, laptop computers, Personal Digital Assistants (PDAs), and wireless sensor devices, to name a few.

II. DEVICE & SOFTWARE TO SELF-MONITOR POWER OF POWER-UP PHASE

In one embodiment, software is embedded in a mobile device to self-monitor the period of the power-up phase, P_u for the device, and to self-adjust the value of P_u if P_u is inconsistent with maximally conserving the battery power of

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the mobile device. FIG. 1 shows such a GPS-equipped mobile device 100. The GPS-equipped mobile device may be, for example, a Compaq® iPAQ® PDA with a GPS adaptor connected to the PDA. Software embodying a method to self-monitor the period of the power-up phase is used in the PDA to implement this embodiment.

The embodiments of the invention involve the determination of the error between the predicted position of the mobile device and that of the actual position reported by its GPS. Given a past history of N reported positions, prediction techniques can be used to predict the position of the device at some time t later (the next power-up phase). The value N is determined a priori, usually based on experience of testing of a particular adaptive learning algorithm. In an embodiment of the invention, an adaptive filter technique based on neural networks is used for the position prediction. The difference between this predicted position and the actual position measured at time t can be used to formulate the position error. After forming this position error, the values of the position, the position error, and the value of P_u used at the time of the actual position measurement are stored in the mobile device's memory. In addition, acquisition time dt_a may be stored.

FIG. 2 is a block diagram of the system 200 that may be implemented using the PDA of FIG. 1. The system 200 comprises a neural network module 230 that receives various inputs 210-220 to produce a predicted period of the power-up phase P_u 240. The neural network module 230 predicts the next time to power on the GPS device. This module 230 does so dependent upon various inputs including the last satellite positions 210, the last GPS position/time 212, the last GPS error 214, the current power-up time 216, information about whether or not the last target (i.e. were the accuracy requirements satisfied or not) was achieved, and the current radio position and error 220. The latter information 220 may be determined using Cramer-Rao bounds. Further details of the neural network 200 are set forth hereinafter.

A flow chart of a method 300 to determine and store P_u , dt_a , and e_p is depicted in FIG. 3. Processing commences in step 310 in which the last N positions reported are used to predict the next position at the next scheduled power-up time. That is, given the past position history stored in the mobile device, an adaptive algorithm predicts the next position value. A number of techniques are known for predicting the next position of a mobile device based on its past history of positions, such as regression, Kalman filter, particle filter. In step 320, at the next power-up time, the predicted position of the GPS-enabled mobile device is compared with the actual position of the mobile device, and the position error e_p is determined. Thus, given a predicted value of the position, the predicted value is checked against the actual position location reported the next time the GPS device is powered on to form the prediction error e_p . In step 330, the current values of the period of the power-up phase P_u , acquisition time dt_a , and prediction error e_p are stored. This information may be stored in the memory of the wireless device or other suitable storage device. Processing then terminates. The mobile device itself can time how long it took (from the onset of power up) to obtain a GPS fix—this is the acquisition time. If GPS position is unavailable at a particular epoch, nothing is recorded.

The foregoing method uses the stored position error values e_p to determine how best to set the value of P_u given an acceptable error bound a_c . A system can thus be designed that adaptively determines the best functional fit to the function $P_u(e_p)$. In one embodiment, a technique based on neural networks 200 can be used for the determination of $P_u(e_p)$. Given the current best estimate of this function and the acceptable error bound a_c , the value of P_u can be then set using $P_u(a_c)$. In

addition, a weighted contribution of $P_u(a_c)$ can be allowed for to be used in setting the new power-up period. A separate algorithm checks whether the current power-up period is too large or too small, and if so adjusts P_u accordingly. The new power-up period can then be set as $wP_u + (1-w)P_u(a_c)$, where w is a weighting factor in the range 0-1.

FIG. 4 is a flow diagram of a method 400 for adjusting the value of P_u and setting a new power-up period to deliver SM-GPS to mobile devices. Following on from steps described in FIG. 3, the method 400 commences in step 410. In step 410, the stored position error value e_p , determined from the last position fix, is read. In decision step 412, a check is made to determine if the stored position error value e_p is too large. In one embodiment, the term "too large" means that e_p is larger than a_c . Variations on this in terms some fraction or multiple of a_c can also be used. If decision step 412 returns true (Yes), processing continues at step 414. In step 414, the current values of the period of the power-up phase P_u is adjusted down. In one embodiment, the new value may be adjusted to cP_u , where c is set at 0.5. Again, different values of c or different reduction algorithms may be practiced. The new power-up period has a minimum threshold value below which the power-up period cannot be set. This threshold value may be one second—which is the period set in the default TricklePower mode of many GPS chipsets. However, other threshold values may be specified. Processing continues from step 414 at step 422. Otherwise, if decision step 412 returns false (No), processing continues at step 416.

In decision step 416, a check is made to determine if the stored position error values e_p is too small. In one embodiment, the term "too small" means e_p is smaller than $0.5 a_c$. However, variations on this in terms of some other fraction of a_c can also be used. If decision step 416 returns true (Yes), processing continues at step 418. In step 418, the current value of the power-up period P_u is adjusted upwards. That is, the value of P_u is increased to a new value. The new value may be calculated as bP_u , where b is set at 1.5. Once again, different values of b or different increase algorithms may be practiced. The new power-up period has a maximum threshold value above which it cannot be set. This threshold value may be ten minutes, for example, but this can be set by the user a priori. From step 418, processing continues at step 422. If decision step 416 returns false (No), processing continues at step 420.

In step 420, the current value of the power-up period P_u is not changed, that is, it is maintained at the same value. Processing then continues at step 422. In step 422, the new power-up period is set to $wP_u + (1-w)P_u(a_c)$. In step 424, a neural network estimate of $P_u(e_p)$ is provided to step 422. That is, separate from the above steps, a neural network 200 estimate of the function $P_u(e_p)$ is made based on the stored values of P_u and e_p . A weighted average of these two independent values may be used to set the final new power-up period as $wP_u + (1-w)P_u(a_c)$, where a_c is again the acceptable error bound on the position. The value of weighting parameter w is set a priori by the manufacturer or user. In a variant of this process, w can be made time dependent. From step 422, processing terminates.

If position accuracy is the sole criteria dictating the value of P_u , the above process would suffice. However, if the acquisition time is the sole criteria dictating the value of P_u , the process 500 depicted in the flowchart described in FIG. 5 would suffice. This process 500 is similar to that 400 given above, except that the acquisition time dt_a is used to determine the new power-up period. It is the comparison of dt_a with the pre-assigned value for the bound on acquisition time that is used in decision making process. In step 510, the stored

acquisition time dt_a is used to determine the last position fix. In decision step 512, a check is made to determine if the stored acquisition time dt_a is too large. In FIG. 5, a_c is now the acceptable error on acquisition time. The term "too large" means that dt_a is larger than a_c . Variations on this in terms of some fraction or multiple of a_c can also be used. If decision step 512 returns true (Yes), processing continues at step 514. In step 514, the current values of P_u is adjusted down. Thus, if dt_a is too large, the value of P_u is reduced to a new value. The new value may be set to cP_u , where c is set at 0.5. Different values of c or different reduction algorithms may be used. Again, a minimum value of the power-up period is imposed. Processing continues from step 514 at step 522. Otherwise, if decision step 512 returns false (No), processing continues at step 516.

In decision step 516, a check is made to determine if the stored acquisition time dt_a is too small. The term "too small" means that dt_a is smaller than $0.5 a_c$. Variations on this in terms of some other fraction of a_c can also be used. If decision step 516 returns true (Yes); processing continues at step 518. In step 518, the current value of P_u is adjusted upwards. Thus, if dt_a is too small, the value of P_u is increased to a new value. The new value of the power-up period may be set to bP_u , where b is set at 1.5. Different values of b or different increase algorithms may be used. Again a maximum value of the power-up period is imposed. From step 518, processing continues at step 522. If decision step 516 returns false (No), processing continues at step 520.

In step 520, the current value of the power-up period P_u is not changed, that is, it is maintained at the same value. Processing then continues at step 522. In step 522, the new power-up period is set to $wP_u + (1-w)P_u(a_c)$. In step 524, a neural network estimate of $P_u(dt_a)$ is provided to step 522. A weighted average of these two independent values is then used to set the final new power-up period as $wP_u + (1-w)P_u(a_c)$, where a_c is again the acceptable error bound on the acquisition time. The value of w is set a priori by the manufacturer or user. In a variant of this process w can be made time dependent. That is, separate from the above steps, a neural network 200 estimate of the function $P_u(dt_a)$ is made based on the stored values of P and dt_a . From step 522, processing terminates.

In the event that both the position accuracy and the acquisition time are to be considered in dictating the new value of the power-up period, both algorithms shown in FIGS. 4 and 5 may be run simultaneously and independently. The smaller of the two new values of the power-up period reported by the algorithms may be utilized as the final new value.

As used by an E-911 application, the mobile device can automatically power-up the GPS device and determine its current position, if the GPS is available at that particular time. Due the SM-GPS algorithm described hereinbefore, cold start of the GPS device should be avoided. If for some reason the GPS is unavailable (e.g. by non-line of sight effects) when an emergency position request is made, the mobile device can report the GPS position predicted at the last power-up phase. This has the advantage over A-GPS that no added network infrastructure is required, and an estimate of the mobile device's current position is given even if the GPS suddenly became unavailable.

In the context of continuous position requests, such as in a tracking application, the SM-GPS algorithm adaptively alters the power-up period to find the largest value of P_u at that particular epoch that is consistent with the required accuracy and acquisition time bounds. This has an advantage relative to current systems that the user of the device does not have to

estimate and manually enter such a value a priori. This also has the advantage of self-adjusting the value of P_u to changing conditions.

III. NEURAL NETWORKS

The adaptive prediction algorithm used for predicting positions and within the SM-GPS is similar to a Time Delay Neural Network (TDNN). Such networks are neural networks that have a special topology used for position-independent recognition of features within a larger pattern. These types of networks have been successfully used in applications such as speech prediction algorithms and stock predictions. Flexibility in the architectural design of these networks allows them to handle any complex nonlinear behavior as well as more simple linear behavior. A TDNN with just one neuron and a linear transfer function can be trained to operate as an effective linear adaptive filter.

The details of TDNNs, how they operate and the different architectures possible (e.g. learning strategies, transfer functions, number of layers, weights) have been well documented in the literature. For example, see Simon Haykin, *Neural Networks: A comprehensive foundation*, MacMillan, New York, 1994. In one embodiment, the previous positions are used to form the input vectors of the neural network and the output is the predicted position.

Other neural network are constructed to optimally find the functions $P_u(e_p)$ and $P_u(dt_a)$ in FIGS. 4 and 5, respectively. These are referred to as "function discovery" neural networks. Again these networks are adaptive, in the sense that the functional forms $P_u(e_p)$ and $P_u(dt_a)$ do not remain constant in time.

To accommodate various forms of relationships between the input vectors and the output in a neural network, Multi-Layer Perceptron (MLP) models are used. These types of models can be applied to both the TDNN networks and the function discovery neural networks. MLP models typically have an input vector of length r and a hidden layer of s neurons. A matrix of weights $\alpha_{s,r}$ describes the relationship between the input vectors and the layer of neurons. Various transfer function can be deployed such as a log-sigmoid transfer function. In general, the number of hidden layers can be increased to accommodate even more complex systems. In one embodiment, an MLP network that is adopted involves one hidden layer and a number of neurons equal to the size of the input vector. A log-sigmoid transfer function is adopted. For TDNN, the weights associated with the neural network adapt to the newly predicted position and its subsequent measurement of the actual position to minimize future prediction errors. By this mechanism, the network adapts and "learns" the optimal weight $\alpha_{s,r}$ settings relevant to that particular epoch.

For the function discovery neural networks, the weights associated with the neural networks adapt to the newly predicted functional form of the functions ($P_u(e_p)$ and $P_u(dt_a)$) of FIGS. 4 and 5, respectively, based on the incoming new data. This means that the neural networks are constantly re-training themselves.

IV. OTHER EMBODIMENTS & VARIATIONS

The adaptive learning algorithms can be embedded on a signal processing chip in a mobile device. For additional power savings, the neural network calculations may be passed to some external processing unit within the network, if the mobile device is in communication with a larger network, e.g.

a wireless network. The value of the power-up period calculated by the external device may then be passed back to the mobile device.

In the event of a GPS signal being unavailable, the position error and acquisition time are not defined for that time. As this could be an indication that the user is in an area where reception of the GPS satellite signals is poor, one may wish not to decrease the power-up period, or at least to limit the decrease. In this way additional energy sources are not used in a vain attempt at acquiring a GPS signal.

There are many neural network architectures that could be deployed in the algorithms of FIGS. 2, 4 and 5. For example, the predicted position can also be a function of the actual P_u being used (in general shorter values of P_u have smaller errors). A neural network can be invoked in which the past history of P_u is also an input to the neural network. Radial basis function networks could also be deployed in the estimates of the functions $P_u(e_p)$ and $P_u(dt_a)$. A thorough discussion of neural network architectures can be found in standard texts. Again, see for example Simon Haykin, *Neural Networks: A comprehensive foundation*, MacMillan, New York, 1994.

VI. OTHER EMBODIMENTS & VARIATIONS

The methods according to the embodiments of the invention may be practiced using one or more general-purpose computer systems, handheld devices, cellular phone, and other suitable mobile computing devices, in which the processes described with reference to FIGS. 1-5 may be implemented as software, such as an application program executing within the computer system or a handheld device. In particular, instructions in the software that are carried out by the computer effect the steps in the method, at least in part. Software may include one or more computer programs, including application programs, an operating system, procedures, rules, data structures, and data. The instructions may be formed as one or more code modules, each for performing one or more particular tasks. The software may be stored in a computer readable medium, comprising one or more of the storage devices described below, for example. The computer system loads the software from the computer readable medium and then executes the software. FIG. 6 depicts an example of a computer system 600 with which the embodiments of the invention may be practiced. A computer readable medium having such software recorded on the medium is a computer program product. The use of the computer program product in the computer system may effect an advantageous apparatus in accordance with the embodiments of the invention.

FIG. 6 illustrates the computer system 600 in block diagram form, coupled to a wireless network 620. An operator may use the keyboard 630 and/or a pointing device such as the mouse 632 (or touchpad, for example) to provide input to the computer 650. The computer system 600 may have any of a number of output devices, including line printers, laser printers, plotters, and other reproduction devices connected to the computer. The computer system 600 can be connected to one or more other computers via a communication interface 664 using an appropriate communication channel 640. The computer network 620 may comprise a wireless local area network (WLAN), or a 3G network, for example. While not depicted in FIG. 6 to simplify the drawing, it will be readily appreciated by those skilled in the art that the computer system 600 may be equipped with a GPS module, for example, in the manner shown in FIG. 1.

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

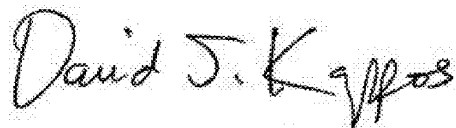
PATENT NO. : 8,022,870 B2
APPLICATION NO. : 11/661707
DATED : September 20, 2011
INVENTOR(S) : Robert Anderson Malaney

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 12, line 35, after "claim" insert -- 1 --

Signed and Sealed this
Third Day of January, 2012

A handwritten signature in black ink that reads "David J. Kappos". The signature is written in a cursive, flowing style with a large initial 'D' and 'K'.

David J. Kappos
Director of the United States Patent and Trademark Office

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REISSUE APPLICATION: CONSENT OF ASSIGNEE; STATEMENT OF NON-ASSIGNMENT		Docket Number (Optional)
This is part of the application for a reissue patent based on the original patent identified below.		
Name of Patentee(s) Robert Anderson Malaney		
Patent Number 8,022,870	Date Patent Issued SEPTEMBER 20, 2011	
Title of Invention SELF MONITORING GPS ON A MOBILE DEVICE		
1. ☒ Filed herein is a statement under 37 CFR 3.73(c). (Form PTO/AIA/96) 2. ☐ Ownership of the patent is in the inventor(s), and no assignment of the patent is in effect. One of boxes 1 or 2 above must be checked. If multiple assignees, complete this form for each assignee. If box 2 is checked, skip the next entry and go directly to "Name of Assignee." The written consent of all assignees and inventors owning an undivided interest in the original patent is included in this application for reissue. The assignee(s) owning an undivided interest in said original patent is/are <u>Robert Anderson Malaney</u> and the assignee(s) consents to the accompanying application for reissue.		
Name of assignee/inventor (if not assigned) Robert Anderson Malaney		
Signature 	Date 13 Dec 2016	
Typed or printed name and title of person signing for assignee (if assigned) Robert A. Malaney		

This collection of information is required by 37 CFR 1.172. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Doc Code: REIS DECL

Document Description: Reissue Declaration Filed In Accordance With MPEP 1414

PTO/AIA/65 (08-12)

Approved for use through 08/31/2013, OMB 0651-0033

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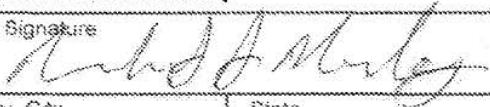
REISSUE APPLICATION DECLARATION BY THE INVENTOR		Docket Number (Optional)
I hereby declare that: Each inventor's residence and mailing address are stated below next to their name. I believe I am the original inventor or an original joint inventor of the subject matter which is described and claimed in patent number <u>5822871</u>, granted <u>05/26/2011</u>, and for which a reissue patent is sought on the invention titled <u>SELF MONITORING GPS ON MOBILE DEVICE</u>. the specification of which ☒ is attached hereto. ☐ was filed on _____ as reissue application number _____. The above-identified application was made or authorized to be made by me. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. I believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below. (Check all boxes that apply.) ☐ by reason of a defective specification or drawing. ☒ by reason of the patentee claiming more or less than he had the right to claim in the patent. ☐ by reason of other errors. At least one error upon which reissue is based is described below. If the reissue is a broadening reissue, a claim that the application seeks to broaden must be identified: Original claim 1 specified a GPS system and not a satellite positioning system. A new claim 37 is added to current application that rectifies that point thus broadening the original scope of the invention. All new claims have a different allowed set of parameters used to make determinations on the controlling of power.		

[Page 1 of 2]

This collection of information is required by 37 CFR 1.175. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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(REISSUE APPLICATION DECLARATION BY THE INVENTOR, page 2)		Docket Number (Optional)	
Note: To appoint a power of attorney, use form PTO/AIA/81. Correspondence Address: Direct all communications about the application to ☒ The address associated with Customer Number: 132250 OR ☐ Firm or Individual Name Address City State Zip Country Telephone Email			
WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.			
Legal name of sole or first inventor (E.g., Given Name (first and middle (if any) and Family Name or Surname)			
Robert Anderson Malaney			
Inventor's Signature		Date (Optional)	
			
Residence: City	State	Country	
East Lindfield	NSW	Australia	
Mailing Address			
16 Carlyle Rd			
City	State	Zip	Country
East Lindfield	NSW	2070	Australia
☐ Additional joint inventors are named on the _____ supplemental sheet(s) PTO/AIA/10 attached hereto.			

[Page 2 of 2]

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/376,627				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	600			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	2160			
TOTAL CLAIMS (37 CFR 1.16(i))	18	minus 20 = *			OR	x 80 =	0.00			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *				x 420 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL		TOTAL	3040			
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
TOTAL ADD'L FEE								OR	TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
TOTAL ADD'L FEE								OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/376,627	12/12/2016	Robert Anderson Malaney	

CONFIRMATION NO. 2064

FORMALITIES LETTER

132250
Robert Malaney
16 Carlyle Rd
East Lindfield, NSW, 2070
AUSTRALIA



Date Mailed: 12/21/2016

NOTICE TO FILE MISSING PARTS OF REISSUE APPLICATION

Filing Date Granted

An application number and filing date have been accorded to this reissue application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
- The application search fee must be submitted.
- The application examination fee must be submitted.
- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.

The surcharge is due for any one of:

- late submission of the basic filing fee, search fee, or examination fee,
- late submission of inventor's oath or declaration,
- filing an application that does not contain at least one claim on filing, or
- submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. No entity status discount is in effect. If applicant is qualified for small entity status, a written assertion of small entity status must be submitted to establish small entity status. (See 37 CFR 1.27). If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- \$ **280** basic filing fee.
- \$ **140** surcharge.
- \$ **600** search fee.
- \$ **2160** examination fee.
- \$ **(0)** previous unapplied payment amount.
- \$ **3180** TOTAL FEE BALANCE DUE.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
15/376,627	12/12/2016		0.00		18	3

CONFIRMATION NO. 2064

FILING RECEIPT



000000008028303

132250
Robert Malaney
16 Carlyle Rd
East Lindfield, NSW, 2070
AUSTRALIA

Date Mailed: 12/21/2016

Receipt is acknowledged of this reissue patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Robert Anderson Malaney, East Lindfield, AUSTRALIA;

Applicant(s)

Robert Anderson Malaney, East Lindfield, AUSTRALIA;

Assignment For Published Patent Application

Robert Anderson Malaney

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a REI of 14/031,992 09/19/2013 PAT RE46237
which is a REI of 11/661,707 02/11/2008 PAT 8022870
which is a 371 of PCT/AU2005/001351 08/31/2005

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)
AUSTRALIA 2004905024 09/02/2004 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

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page 1 of 3

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/376,627**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No
Title

SELF MONITORING GPS ON MOBILE DEVICE

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/376,627	12/12/2016	Robert Anderson Malaney	

CONFIRMATION NO. 2064

FORMALITIES LETTER



132250
Robert Malaney
16 Carlyle Rd
East Lindfield, NSW, 2070
AUSTRALIA

Date Mailed: 12/21/2016

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- The application examination fee must be submitted.
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/meday/

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Robert Anderson Malaney

Group Art Unit: 3662

Application No.: 15/376,627

Examiner:

Filed: 12-12-2016

Confirmation No.: 2064

For: SELF MONITORING GPS ON MOBILE DEVICE

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R 1.56 the examiner attention is directed to the documents listed on the attached Form. With the exception of the Japanese examiner report and Japanese patents cited in that report, all other (non-US) documents were listed in the parent reissue application 14,031,992 and/or the parent patent application 11,661,707 (patent 8,022,870). Thus only copies of the above mentioned Japanese documents are filed in this application.

Respectfully Submitted,

/Robert A. Malaney/
Robert A. Malaney
Customer Number 132250

8 Feb 2017,
16 Carlyle Rd.,
East Lindfield,
NSW 2070,
Australia.

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

Approved for use through 07/31/2012. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15376627
	Filing Date	2016-12-12
	First Named Inventor	Robert Anderson MALANEY
	Art Unit	3662
	Examiner Name	
	Attorney Docket Number	

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	6590525	B2	2003-07-08	Yule, et al.	
	2	6298229	B1	2001-10-02	Tomlinson, Jr., et al.	
	3	5864315	A	1999-01-26	Welles, et al.	
	4	5592173	A	1997-01-07	Lau, et al.	
	5	6584331	B2	2003-06-24	Ranta	
	6	6141570	A	2000-10-31	O'Neill, Jr., et al.	
	7	6191587	B1	2001-02-20	Fox	
	8	6556832	B1	2003-04-29	Soliman	

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number		15376627
Filing Date		2016-12-12
First Named Inventor	Robert Anderson MALANEY	
Art Unit	3662	
Examiner Name		
Attorney Docket Number		

9	6765958	B1	2004-07-20	Dowling	
10	6703971	B2	2004-03-09	Pande, et al.	
11	6903684	B1	2005-06-07	Simic, et al.	
12	7440762	B2	2008-10-21	Maloney, et al.	
13	7969351	B2	2011-06-28	Pande, et al.	
14	7619559	B2	2009-11-17	DiEsposti	
15	6151353	A	2000-11-21	Harrison, et al.	
16	6389291	B1	2002-05-14	Pande, et al.	
17	6429808	B1	2002-08-06	King, et al.	
18	6701153	B1	2004-03-02	Chang, et al.	
19	6121921	A	2000-09-19	Ishigaki	

**INFORMATION DISCLOSURE
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Application Number	15376627
Filing Date	2016-12-12
First Named Inventor	Robert Anderson MALANEY
Art Unit	3662
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20	7256731	B2	2007-08-14	Siegel, et al.
21	8515667	B2	2013-08-20	Haatainen

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	1	20030083814	A1	2003-05-01	Gronemeyer	
	2	20030107514	A1	2003-06-12	Syrjarinne, et al.	
	3	20020091956	A1	2002-07-11	Potter, et al.	
	4	20050162306	A1	2005-07-28	Babitch, et al.	
	5	20040225439	A1	2004-11-11	Gronemeyer	
	6	20110102258	A1	2011-05-05	Underbrink, et al.	
	7	20020154058	A1	2002-10-24	Pande, et al.	

**INFORMATION DISCLOSURE
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Application Number	15376627
Filing Date	2016-12-12
First Named Inventor	Robert Anderson MALANEY
Art Unit	3662
Examiner Name	
Attorney Docket Number	

8	20030004640	A1	2003-01-02	Vayanos
9	20140188638	A1	2014-07-03	Jones, et al.

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	1	2002088769	WO	A1	2002-11-07	Lee at al.		
	2	2394134	GB	A	2004-04-14	Haddrell		
	3	2004048473	JP	A	2004-02-12	Nakagawa at al		
	4	2001242235	JP	A	2001-09-07	Hasegawa		
	5	2001215268	JP	A	2001-08-10	Hasegawa et al.		
	6	2003207351	JP	A	2003-07-25	Murakamai		
	7	H08327718	JP	A	1996-12-13	Takechi et al		

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15376627
	Filing Date	2016-12-12
	First Named Inventor	Robert Anderson MALANEY
	Art Unit	3662
	Examiner Name	
	Attorney Docket Number	

	8	H1038993	JP	A	1998-02-13	Kumai		
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NON-PATENT LITERATURE DOCUMENTS

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	"How A-GPS Works" (2001) SnapTrack, A QUALCOMM Company, White Paper (http://www.snaptrack.com/pdf/How_aGPS_works.pdf)	
	2	"TricklePower" in REFERENCE GUIDELINE TO TF GPS ENGINE BOARD by Laipac Technology, Inc. (2001) (http://www.laipac.com/datasheets/gps/TF%20GPS%20Series.pdf)	
	3	Haykin, S. "Neural Networks: A Comprehensive Foundation - 2110 Edition", Prentice Hall, Upper Saddle River, New Jersey, pp. 641-645	
	4	Conner, S., et al. "Building a Wireless World with Mesh Networking Technology" in: Technology@Intel, (November 2003), pp. 1-6	
	5	Ahmavaara, K., et al. "Integration of Wireless LAN and 3G Wireless: Interworking Architecture Between 3GPP and WLAN Systems" in: IEEE Communication Magazine, (November 2003), pp. 74-81	
	6	Karygiannis, T., et al. "Wireless Network Security: 802.11, Bluetooth and Handheld Devices" in: National Institute of Standards and Technology, Technology Administration U.S. Department of Commerce, (November 2002), pp. ES-1 - G-3	
	7	Koshima, H., et al. "Finding A Mentally Impaired Relative, A Lost Child, or a Criminal in a Sprawling Metropolitan Area would be Simple if the Person Were Equipped With A Personal Locator Device: Personal Locator Services Emerge" in: IEEE Spectrum, (February 2000), pp. 41-48	
	8	OET Bulletin No. 17 "Guidelines for Testing and Verifying the Accuracy of Wireless E911 Location Systems" Federal Communications Commission USA, (April 2000), pp. 1-12	

**INFORMATION DISCLOSURE
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Application Number	15376627
Filing Date	2016-12-12
First Named Inventor	Robert Anderson MALANEY
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9	Bahl, P., et al. "RADAR: An In-Building RF-based User Location and Tracking System" Microsoft Research
10	Ladd, A., et al. "Robotics-Based Location Sensing Using Wireless Ethernet" MOB/COM 02, (September 2002), Atlanta Georgia, USA
11	Patwari, N., et al. "Relative Location Estimation in Wireless Sensor Networks" IEEE Transactions on Signal Processing, Vol. 15, (2003), pp. 2137-2148
12	Capkun, S., et al. "OPS-free Positioning in Mobile Ad-Hoc Networks" IEEE, Proceedings of the 34th Hawaii International Conference on Systems Sciences, (2001), pp. 1-10
13	Krumm, J., et al., "Probabilistic Inferencing for Location" 2003 Workshop on Location-Aware Computing (Part of UbiComp 2003), Seattle, WA, USA, (2003)
14	Newbury Networks Debuts First Location-Enabled Networks Solution for 802.11B WLANS", Release Detail Newbury Networks [online], [retrieved on 11/02/2007]. Retrieved from the internet, <URL: http://www.newburynetworks.com/pr_021102/news_events-news_archiverelease_details.... >
15	Denning, D., et al. "Location-based Authentication: Grounding Cyberspace for Better Security" Computer Fraud & Security [online], [retrieved on 11/01/2007]. Retrieved from the internet, URL: http://www.cs.georgetown.edu/~denning/infosec/Grounding.txt >
16	Denning, D., et al. "Using OPS to Enhance Data Security" OPS World - Geo-Encryption (April 2003) [online], [retrieved on 11/01/2007]. Retrieved from the internet, <URL: http://www.gpsworld.com/gpsworld/content/printContentPopup.jsp?id=57975 >
17	Epstein, K., "How Geo-Encryption Makes Copyright Protection Global" CIOINSIGHT - Global Encryption by Satellite [online], [retrieved on 11/01/2007] Retrieved from the internet, <URL: http://www.coinsight.com/print_article2/0,1217,a=24831,00.asp >
18	van Diggelen, F., et al. "Indoor OPS Technology" Presented at CTIA Wireless-Agenda, Dallas (May 2001), pp. 1-10
19	Rappaport, T., "Principles and Practice" in: Wireless Communications, Prentice Hall Communications Engineering and Emerging Technology Series, pp. 123-133

**INFORMATION DISCLOSURE
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(Not for submission under 37 CFR 1.99)

Application Number	15376627
Filing Date	2016-12-12
First Named Inventor	Robert Anderson MALANEY
Art Unit	3662
Examiner Name	
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20	Battiti, R., et al. "Statistical Learning Theory for Location Fingerprinting in Wireless LANs" Technical Report DIT-02-0086, Universita di Trento (October 2002), pp. 1-12
21	Royer, E., et al. "A Review of Current Routing Protocols for Ad Hoc Mobile Wireless Networks" in IEEE Personal Communications (April 1999), pp. 46-55
22	Ziv, J., et al. "Some Lower Bounds on Signal Parameter Estimation" in: IEEE Transactions on Information Theory, Vol. 15, (May 1969), pp. 386-391
23	Caffery, J., et al. "Wireless Location in CDMA Cellular Radio Systems" Kluwer Academic Publishers, Boston, pp. 1-11
24	Caffery, J., et al. "Overview of Radiolocation in CDMA Cellular Systems" Georgia Institute of Technology School of Electrical and Computer Engineering, Atlanta, GA, pp. 1-32
25	a second Office Action dated May 24, 2010 in respect of Chinese corresponding Application No. 200580036782.3 and an English-language version thereof
26	a third Office Action dated January 19, 2011 in respect of Chinese corresponding Application No. 200580036782.3 and an English-language version thereof
27	Chinese First Office Action, 20 November, 2009 - State Intellectual Property Office of P.R.C. and English translation re corresponding Application No. 205800367823 with English version
28	European Communication, 28 May, 2010- European Patent Office re corresponding EP application No. 05777708.8 (in English)
29	International Search Report dated 14 October 2005 re counterpart PCT/AU2005/01351
30	International Preliminary Report on Patentability dated 18 July 2006 re counterpart PCT/AU2005/001351

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	Art Unit	3662	
	Examiner Name		
	Attorney Docket Number		

31	Japanese Notification of Reasons for Refusal dated 28th February 2012 for Japanese Patent Application No. 2007-528529 and an English version thereof
----	--

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15376627
	Filing Date	2016-12-12
	First Named Inventor	Robert Anderson MALANEY
	Art Unit	3662
	Examiner Name	
	Attorney Docket Number	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Robert A. Malaney/	Date (YYYY-MM-DD)	2017-02-08
Name/Print	Robert A. Malaney	Registration Number	

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Electronic Patent Application Fee Transmittal				
Application Number:	15376627			
Filing Date:	12-Dec-2016			
Title of Invention:	SELF MONITORING GPS ON MOBILE DEVICE			
First Named Inventor/Applicant Name:	Robert Anderson Malaney			
Filer:	Robert Anderson Malaney			
Attorney Docket Number:				
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY REISSUE BASIC	2014	1	140	140
DESIGN AND UTILITY REISSUE BASIC	2114	1	300	300
DESIGN AND UTILITY REISSUE BASIC	2314	1	1080	1080
Pages:				
Claims:				
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	70	70
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1590

Electronic Acknowledgement Receipt	
EFS ID:	28305633
Application Number:	15376627
International Application Number:	
Confirmation Number:	2064
Title of Invention:	SELF MONITORING GPS ON MOBILE DEVICE
First Named Inventor/Applicant Name:	Robert Anderson Malaney
Customer Number:	132250
Filer:	Robert Anderson Malaney
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	08-FEB-2017
Filing Date:	12-DEC-2016
Time Stamp:	18:50:49
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Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1590
RAM confirmation Number	020917INTEFSW18535600
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assertion of entitlement to small entity status	enitystaus.pdf	97530	no	1
			d8c7126d129cc3ed1190ef1f640ed94f227f371b		
Warnings:					
Information:					
2	Applicant Response to Pre-Exam Formalities Notice	notice15376627.pdf	69671	no	2
			0d1831feafceadc763acd0bb8adc5c9df67a3bbd		
Warnings:					
Information:					
3	Transmittal Letter	cover3IDS.pdf	113281	no	1
			dbeddc34ccc45348759c60be717d3303e30e6618		
Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Form (SB08)	NewIDS2.pdf	616526	no	10
			7dc53d242eea91563ffb87f92d6d8b954accfabafab		
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	36536	no	2
			dbbfcd02f13d52ad15d3d9bc4c26233165429669		
Warnings:					
Information:					
Total Files Size (in bytes):			933544		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Robert Anderson Malaney

Group Art Unit: 3662

Application No.: 15/376,627

Examiner: Unassigned

Confirmation No.: 2064

For: SELF MONITORING GPS ON MOBILE DEVICE

Small Entity Status

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I hereby state that the applicant on the above application is a small entity.

Respectfully Submitted,

/Robert A. Malaney/

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最終頁に続く

(54) 【発明の名称】 全地球測位システムの受信装置

(57) 【要約】

【課題】本発明は、全地球測位システムの受信装置で消費電力を低減しつつ一段と正確な現在位置を通知できるようにする。

【解決手段】本発明は、移動体の位置を検出するGPS受信装置11において、GPS衛星から送信される衛星信号を間欠受信して復調処理するGPS受信回路3及びGPS復調回路4と、移動体の移動速度に応じてGPS受信回路3及びGPS復調回路4における間欠受信の間欠受信間隔を制御する間欠受信制御回路12とを設けることにより、移動体の移動速度に応じた最適な間欠受信間隔で衛星信号を間欠受信して復調処理することができるので、間欠受信を行ったときの測位誤差を一定の精度に保持したまま、消費電力を増加させることなく一段と正確な現在位置をユーザに対して通知することができる。

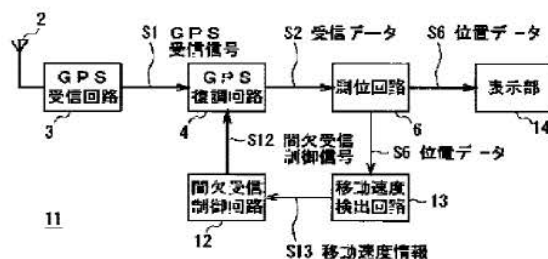


図1 第1の実施の形態におけるGPS受信装置

【特許請求の範囲】

【請求項1】移動体の位置を検出する全地球測位システムの受信装置において、
上記全地球測位システムの衛星から送信される衛星信号を間欠受信して復調処理する受信手段と、
上記移動体の移動速度に応じて上記受信手段における上記間欠受信の間欠受信間隔を制御する制御手段とを具えることを特徴とする全地球測位システムの受信装置。

【請求項2】上記受信装置は、
上記受信手段による復調結果に基づいて上記移動体の上記移動速度を検出する速度検出手段を具えることを特徴とする請求項1に記載の全地球測位システムの受信装置。

【請求項3】上記受信装置は、
所定の通信システムの基地局から上記移動体の上記位置を示す位置情報を受信する位置情報受信手段と、
上記位置情報受信手段によって受信した上記位置情報に基づいて上記移動体の上記移動速度を検出する速度検出手段を具えることを特徴とする請求項1に記載の全地球測位システムの受信装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は全地球測位システムの受信装置に関し、例えば移動体の位置測定を行うGPS(Global Positioning System)の受信装置に適用して好適なものである。

【0002】

【従来の技術】従来、GPSにおいては地球上を周回する複数のGPS衛星からそれぞれ送信される衛星信号をGPS受信装置によって受信し、当該受信した衛星信号を解析することにより、当該GPS受信装置と各GPS衛星との距離をそれぞれ取得し、これらを基にGPS受信装置を搭載した移動体の現在位置を算出するようになされている。

【0003】このGPS衛星から送信される衛星信号は、各GPS衛星毎に異なる種類の符号系列でなるPN(Pseudo noise)コードすなわち疑似雑音符号によってスペクトラム拡散された信号である。

【0004】従ってGPS受信装置は、複数種類のGPS衛星毎にそれぞれ応じた局部PNコードを発生し得るようになされており、発生した局部PNコードの位相を衛星信号のPNコードの位相に合わせることににより同期獲得し、その衛星信号に対してトラッキングをかけることにより同期補足した後、スペクトラム逆拡散処理を施すことにより各GPS衛星からの航法メッセージ(測位計算のための軌道情報等)をそれぞれ復調し、当該航法メッセージに基づいて現在位置を算出するようになされている。

【0005】實際上、図4に示すようにGPS受信装置1は、GPSアンテナ2及びGPS受信回路3を介して

各GPS衛星から受信したGPS受信信号S1をそれぞれGPS復調回路4に送出する。

【0006】GPS復調回路4は、間欠受信制御回路5から供給される間欠受信制御信号S3に基づく間欠受信タイミングで各GPS衛星からのGPS受信信号S1を受信し、局部PNコードを用いて同期獲得した後にスペクトラム逆拡散処理を施すことにより復調処理を施し、その結果得られる各GPS衛星毎の受信データS2をそれぞれ測位回路6に送出する。

【0007】測位回路6は、間欠受信タイミング毎に得られる各GPS衛星毎の受信データS2に基づいてGPS受信装置1と各GPS衛星との距離をそれぞれ取得し、これらを基に移動体の現在位置を測位するようになされている。

【0008】

【発明が解決しようとする課題】ところどころかかる構成のGPS受信装置1においては、消費電力を極力低減させるために、間欠受信制御信号S3に基づく間欠受信タイミングでのみGPS受信信号S1を間欠的に受信して復調処理し、その結果得られる測位位置を所定のマーク等によって表示部の地図上に重ねて表示するようになされている。

【0009】すなわちGPS受信装置1は、例えば図5に示すように、GPS受信信号S1を間欠受信する受信間隔が長く設定される程、待ち受け時間が長くなって消費電力を低減することができる。

【0010】しかしながらGPS受信装置1は、図6に示すように、移動体が一定速度で移動中にGPS受信信号S1の受信間隔が長くなると、消費電力を低減することはできるが、受信間隔の長さ按比例して移動中の移動体の現在位置と測位位置との誤差が大きくなって、正確な現在位置をユーザに対して通知し得なくなるという問題があった。

【0011】本発明は以上の点を考慮してなされたもので、消費電力を低減しつつ一段と正確な現在位置を通知し得る全地球測位システムの受信装置を提案しようとするものである。

【0012】

【課題を解決するための手段】かかる課題を解決するため本発明においては、移動体の位置を検出する全地球測位システムの受信装置において、全地球測位システムの衛星から送信される衛星信号を間欠受信して復調処理する受信手段と、移動体の移動速度に応じて受信手段における間欠受信の間欠受信間隔を制御する制御手段とを設けることにより、移動体の移動速度に応じた最適な間欠受信間隔で衛星信号を間欠受信して復調処理することができるので、間欠受信を行ったときの測位誤差を一定の精度に保持したまま、消費電力を増加させることなく一段と正確な現在位置をユーザに対して通知することができる。

【0013】

【発明の実施の形態】以下図面について、本発明の一実施の形態を詳述する。

【0014】(1) 第1の実施の形態

図4との対応部分に同一符号を付して示す図1において、11は全体として第1の実施の形態における全地球測位システムの受信装置としてのGPS受信装置を示し、当該GPS受信装置11が移動体として例えば自動車に搭載されており、図示しないバッテリーから供給される電力に基づいて各回路が動作する。

【0015】この場合、GPS受信装置11は、まずGPSアンテナ2及びGPS受信回路3を介して各GPS衛星から受信したGPS受信信号S1をそれぞれGPS復調回路4に送出する。

【0016】GPS復調回路4は、間欠受信制御回路12から供給される間欠受信制御信号S12に基づく間欠受信タイミングで各GPS衛星からのGPS受信信号S1をそれぞれ受信し、局部PNコードを用いて同期獲得した後にスペクトラム逆拡散処理を施すことにより復調処理を施し、その結果得られる各GPS衛星毎の受信データS2をそれぞれ測位回路6に送出する。

【0017】測位回路6は、間欠受信タイミング毎に得られる各GPS衛星毎の受信データS2に基づいてGPS受信装置1と各GPS衛星との距離をそれぞれ取得し、これらを基に測位した結果（以下、これを測位位置と呼ぶ）の位置データS6を算出し、これを移動速度検出回路13に送出する。

【0018】同時に測位回路6は、位置データS6を液晶ディスプレイでなる表示部14に送出する。表示部14は、位置データS6に対応した地図上の地点に所定のマークを表示することにより、ユーザに対して測位位置を現在位置として通知するようになされている。

【0019】移動速度検出回路13は、測位回路6から間欠受信タイミング毎に順次供給される2つの位置データS6に対応した2地点の距離間隔と、間欠受信タイミングの時間間隔とに基づいて移動体の移動速度を算出し、その結果得られる移動速度情報S13を間欠受信制御回路12に送出する。

【0020】間欠受信制御回路12は、CPU(Central Processing Unit)でなり、移動速度検出回路13から供給される移動体の移動速度情報S13に基づいてGPS復調回路4における間欠受信間隔を制御するようになされている。

【0021】すなわち間欠受信制御回路12は、図2に示すように移動速度情報S13に基づいて移動体の移動速度が高くなるに連れて、GPS復調回路4における間欠受信間隔を短くし、移動体の移動速度が低くなるに連れて、GPS復調回路4における間欠受信間隔を長くするように制御する。

【0022】この場合、間欠受信制御回路12は間欠受

信制御テーブル（図示せず）を内部メモリに格納しており、当該間欠受信制御テーブルを基に移動体の移動速度に応じて間欠受信間隔を制御する。

【0023】因みに移動速度と間欠受信間隔との関係は、現在位置と測位位置との誤差を一定に保持する際の精度に依存しており、現在位置と測位位置との誤差を少なくする場合には、移動速度に係わらず間欠受信間隔がより短くなるような間欠受信制御テーブルに基づいて間欠受信間隔を制御すれば良い。

【0024】以上の構成において、GPS受信装置11は移動速度検出回路13から供給される移動速度情報S13に基づいて移動体の移動速度が例えば時速100[Km]程度の高速移動時には、間欠受信制御テーブルに従ってGPS復調回路4における間欠受信間隔を短くし、移動体の移動速度が例えば時速5[Km]程度の歩行速度で低速移動時には、間欠受信制御テーブルに従ってGPS復調回路4における間欠受信間隔を長くするように制御する。

【0025】このようにGPS受信装置11は、移動体の移動速度に応じてGPS受信信号S1を最適な間欠受信間隔で間欠受信して復調処理するように制御することにより、移動速度が可変しながら移動する移動体に搭載された状態で、GPS受信信号S1を間欠受信したときでも、移動体の現在位置と測位位置との誤差を一定範囲内に保持したまま測位することができる。

【0026】またGPS受信装置11は、低速移動時にはGPS復調回路4における間欠受信間隔を長くすることにより、移動体の現在位置と測位位置との誤差を一定に保持しつつ消費電力を無駄に浪費することを防止してバッテリーの寿命を一段と延ばすことができる。

【0027】以上の構成によれば、GPS受信装置11は移動体の移動速度に応じてGPS受信信号S1の間欠受信間隔を最適に制御することにより、移動体の移動速度が可変する場合に間欠受信を行ったときでも、常時一定の誤差範囲内で移動体の現在位置をユーザに通知することができる。

【0028】(2) 第2の実施の形態

図1との対応部分に同一符号を付して示す図3において、21は全体として第2の実施の形態におけるGPS受信装置を示し、移動体として例えば携帯電話機に搭載されており、新たにCDMA送受信部20が組み合わされた構成となっている。

【0029】この場合GPS受信装置21は、CDMA送受信部20においてCDMAセルラーシステムの基地局（図示せず）からCDMAアンテナ22及びCDMA送受信回路23を介して受信したCDMA受信信号S23をCDMA復調回路24に送出する。

【0030】CDMA復調回路24は、CDMA制御回路25から供給されるCDMA復調制御信号S26に基づいてCDMA受信信号S23に対して同期獲得した後

に復調処理を施し、その復調結果である受信データS24をCDMA制御回路25に送出する。

【0031】一方CDMA制御回路25は、送信すべきデータや音声等の送信データS27をCDMA変調回路26に対して送出すると共に、当該CDMA変調回路26におけるスペクトラム拡散処理を制御するCDMA変調制御信号S28をCDMA変調回路26に対して送出する。

【0032】CDMA変調回路26は、CDMA変調制御信号S28に従って送信データS27を変調処理し、これをスペクトラム拡散処理されたCDMA送信信号S29としてCDMA送受信回路23を介してCDMAアンテナ22からCDMAセルラーシステムの基地局へ送信する。

【0033】ところでCDMA制御回路25は、CDMA復調回路24から供給された受信データS24を解析することにより、CDMAセルラーシステムの基地局によって測位された携帯電話機の現在位置を認識し、これをCDMA位置データS25として移動速度検出回路13に供給する。

【0034】移動速度検出回路13は、CDMA送受信部20のCDMA制御回路25から供給されるCDMA位置データS25に基づいて携帯電話機の移動速度を算出し、その結果得られる移動速度情報S13を間欠受信制御回路12に送出する。

【0035】間欠受信制御回路12は、この場合も図2に示すように、移動速度情報S13に基づいて移動体の移動速度が高くなるに連れて、GPS復調回路4における間欠受信間隔を短くし、移動体の移動速度が低くなるに連れて、GPS復調回路4における間欠受信間隔を長くするように制御する。

【0036】なお、測位回路6によって測位された位置データS6は、移動速度検出回路13で移動速度情報S13を算出するために用いられるのではなく、位置データS6に対応した地点を表示部14の地図上に表示するためにのみ用いられるようになされている。

【0037】以上の構成においてGPS受信装置21は、CDMA送受信部20から供給されたCDMA位置データS25に基づいて携帯電話機の移動速度を算出し、当該移動速度に応じてGPS復調回路4における間欠受信間隔を制御することにより、移動速度が可変しながら移動する携帯電話機に搭載された状態で、GPS受信信号S1を間欠受信したときでも携帯電話機の現在位置と測位位置との誤差を一定範囲内に保持したまま測位することができる。

【0038】以上の構成によれば、GPS受信装置21は携帯電話機の移動速度に応じてGPS受信信号S1の間欠受信間隔を最適に制御することにより、携帯電話機の移動速度が可変する場合に間欠受信を行ったときでも、常時一定の誤差範囲内で携帯電話機の現在位置をユ

ーザに通知することができる。

【0039】(3)他の実施の形態

なお上述の第1及び第2の実施の形態においては、移動体の移動速度情報S13を移動速度検出回路13で算出し、これを間欠受信制御回路12に送出するようにした場合について述べたが、本発明はこれに限らず、例えば自動車の車速パルスに基づいて算出した移動速度情報S13を間欠受信制御回路12に送出するようにしても良い。

【0040】また上述の第1及び第2の実施の形態においては、移動体の移動速度情報S13を移動速度検出回路13で算出し、これを間欠受信制御回路12に送出するようにした場合について述べたが、本発明はこれに限らず、例えばGPS復調回路4の内部に周波数誤差検出回路(図示せず)を設け、当該周波数誤差検出回路により求めたドップラー周波数を基に移動速度情報S13を算出し、これを間欠受信制御回路12に送出するようにしても良い。

【0041】さらに上述の第1及び第2の実施の形態においては、GPSアンテナ2及びGPS受信回路3で受信したGPS受信信号S1を間欠受信制御回路12の制御に基づいてGPS復調回路4で間欠受信して復調処理するようにした場合について述べたが、本発明はこれに限らず、間欠受信制御回路12の制御に基づいてGPS受信回路3でGPS受信信号S1を間欠受信するようにしても良い。

【0042】さらに上述の第1及び第2の実施の形態においては、間欠受信制御回路12が内部メモリに格納した間欠受信制御テーブルを基に移動速度に応じて間欠受信間隔を制御するようにした場合について述べたが、本発明はこれに限らず、移動移動速度に応じて間欠受信間隔をフレキシブルに変更するようにしても良い。

【0043】さらに上述の第1及び第2の実施の形態においては、全地球測位システムの受信装置としてのGPS受信装置11及び21が、受信手段としてのGPSアンテナ2、GPS受信回路3及びGPS復調回路4によってGPS衛星から送信される衛星信号を間欠受信して復調処理し、制御手段としての間欠受信制御回路12によって移動体の移動速度に応じて間欠受信間隔を制御するようにした場合について述べたが、本発明はこれに限らず、他の種々の受信手段及び制御手段によって間欠受信間隔を制御するようにしても良い。

【0044】

【発明の効果】上述のように本発明によれば、移動体の位置を検出する全地球測位システムの受信装置において、全地球測位システムの衛星から送信される衛星信号を間欠受信して復調処理する受信手段と、移動体の移動速度に応じて受信手段における間欠受信の間欠受信間隔を制御する制御手段とを設けることにより、移動体の移動速度に応じた最適な間欠受信間隔で衛星信号を間欠受

信して復調処理することができるので、間欠受信を行ったときの測位誤差を一定の精度に保持したまま、消費電力を増加させることなく一段と正確な現在位置をユーザに対して通知することができる。

【図面の簡単な説明】

【図1】第1の実施の形態におけるGPS受信装置の構成を示すブロック図である。

【図2】移動速度と受信間隔との関係を示す特性曲線図である。

【図3】第2の実施の形態におけるGPS受信装置の構成を示すブロック図である。

【図4】従来のGPS受信装置の構成を示すブロック図である。

【図5】従来の受信間隔と消費電力との関係を示す特性曲線図である。

【図6】従来の定速移動時における受信間隔と測位誤差との関係を示す特性曲線図である。

【符号の説明】

1、11、21……GPS受信装置、2、12……GPSアンテナ、3……GPS受信回路、4……GPS復調回路、5、12……間欠受信制御回路、6……測位回路、13……移動速度検出回路、20……CDMA送受信部、23……CDMA送受信回路、24……CDMA復調回路、25……CDMA制御回路、26……CDMA変調回路。

【図1】

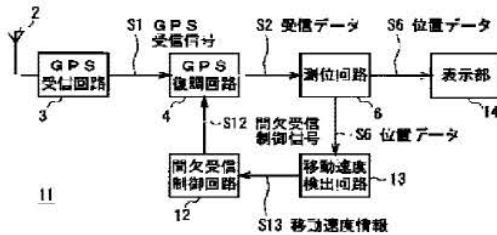


図1 第1の実施の形態におけるGPS受信装置

【図4】

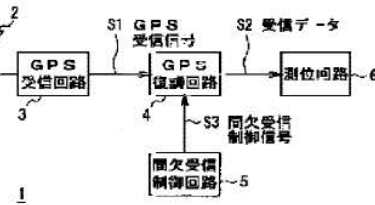


図4 従来のGPS受信装置

【図2】

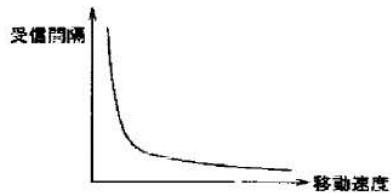


図2 移動速度と受信間隔との関係

【図5】

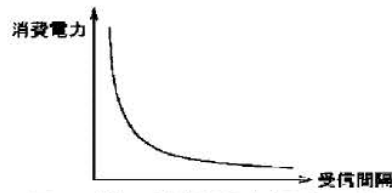


図5 従来の受信間隔と消費電力との関係

【図6】

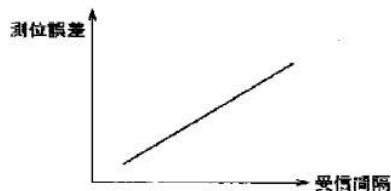


図6 従来の定速移動時における受信間隔と測位誤差との関係

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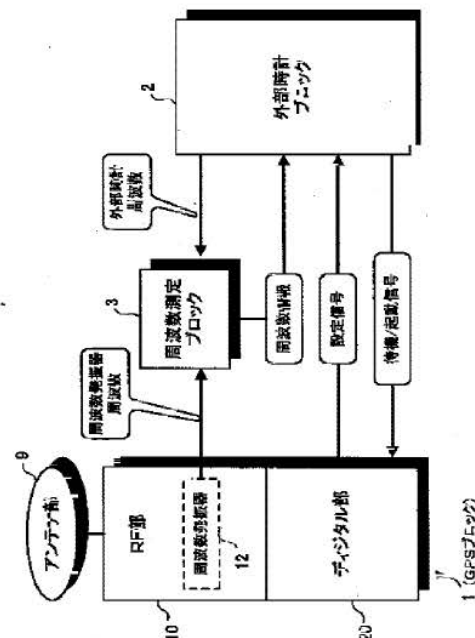
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(54) 【発明の名称】 GPS受信機、およびGPS測位方法

(57) 【要約】

【課題】 GPS衛星からの定期的な時間情報を待つことなく、GPSの測位時間を安定して早くし、最適なGPSの間欠受信間隔を選択することによって、測位時間を短縮した場合にも、消費電力を大幅に減らしたGPS受信機を提供する。

【解決手段】 GPS衛星から発信される信号に基づいて測位を行い航法メッセージを更新すると共に、待機と起動を繰り返すGPSブロック1と、高精度な周波数情報と時刻情報とを保持すると共に、保持された周波数情報と時刻情報とに基づいて待機状態にあるGPSブロック1に対して起動信号を出力する外部時計ブロック2と、この外部時計ブロック2で保持している周波数情報を基準に、GPSブロック1が有する周波数発振器12とのずれである周波数オフセットを測定し、測定されたオフセットの周波数情報を外部時計ブロック2に対して出力する周波数測定ブロック3とを備える。



【特許請求の範囲】

【請求項1】 GPS衛星から発信される信号に基づいて測位を行い航法メッセージを更新すると共に、待機と起動を繰り返すGPSブロックと、高精度な周波数情報と時刻情報とを保持すると共に、保持された当該周波数情報と当該時刻情報とに基づいて待機状態にある前記GPSブロックに対して起動信号を出力する外部時計ブロックと、を備えたことを特徴とするGPS受信機。

【請求項2】 前記外部時計ブロックで保持している前記周波数情報を基準に、前記GPSブロックが有する周波数発振器とのずれである周波数オフセットを測定し、測定された当該周波数オフセットを当該外部時計ブロックに対して出力する周波数測定ブロックと、を更に備えたことを特徴とする請求項1記載のGPS受信機。

【請求項3】 前記外部時計ブロックは、前記周波数測定ブロックから出力された前記周波数オフセットに基づいて前記GPSブロックの待機と起動を制御することを特徴とする請求項2記載のGPS受信機。

【請求項4】 周波数発振器を備え、GPS衛星から発信される信号に基づいて測位を行う測位実行手段と、電波時計放送局からの搬送波を受信する電波時計受信手段と、前記電波時計受信手段によって受信された前記搬送波の有する周波数に基づいて前記測位実行手段が有する前記周波数発振器の誤差を測定する周波数測定手段と、を備えたことを特徴とするGPS受信機。

【請求項5】 前記周波数測定手段は、測定された前記周波数発振器の誤差を前記電波時計受信手段に対して出力し、前記電波時計受信手段は、前記周波数測定手段によって出力された前記周波数発振器の誤差に基づいて前記測位実行手段の起動/待機を制御することを特徴とする請求項4記載のGPS受信機。

【請求項6】 複数のGPS衛星から階層化された航法メッセージを受信し、受信された前記航法メッセージをメモリに保持し、高精度な周波数と時刻情報とを常時動作状態にある外部時計に保持し、前記外部時計に保持された前記周波数と前記時刻情報とを用いて求めた所定時間内に起動と待機を繰り返すことでGPS衛星から測位を行い、前記メモリに保持されている前記航法メッセージを更新することを特徴とするGPS測位方法。

【請求項7】 前記外部時計が保持する前記周波数または前記時刻情報の正確さに基づいて起動と待機の時間間隔を変更することを特徴とする請求項6記載のGPS測位方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、カーナビゲーション等の移動体におけるナビゲーションシステムに係り、特にGPS(Global Positioning System: 全球測位システム)の測位時間を短縮したGPS受信機等に関する。

【0002】

【従来の技術】GPSシステムは、上空を軌道するGPS衛星を利用して車や航空機、船舶などの移動体が、地球上の位置や速度をリアルタイムで求めることができるように開発された位置測定システムであり、近時、この移動体による測位以外に、地球上のある地点間の距離や方向を測定するスタティック測量の分野等にも広く利用されている。このようなGPSシステムを利用する場合、GPS衛星から発信される電波を受信するためのGPS受信機が用いられている。

【0003】図9(a)、(b)は、一般的に用いられるGPSシステムの概略構成と、従来のGPS測位動作を示した説明図である。図9(a)に示すように、GPS衛星200からは、スペクトラム拡散された1.57542GHzの信号が発信される。この発信された信号は、その距離に応じた伝播時間後にGPS受信機210のアンテナ部211にて受信される。このアンテナ部211にて受信された信号は、RF部212によって所定の中間周波数にダウンコンバートされ、信号同期復調部213に入る。その後、この信号同期復調部213にて信号の逆拡散が行われ、データが復調される。復調されたデータは、信号処理部214にて測位計算に用いられる。このようにして、GPS衛星200から発信された信号がGPS受信機210にて受信され、測位計算が行われる。

【0004】図9(b)は、GPS受信機210にて行われている従来のGPS測位動作を示している。まず、電源がオン(ON)されると周波数サーチがなされる。この周波数サーチは、GPS受信機210内部の周波数発振器215から作られる、誤差を持った低精度な周波数を、GPS衛星200が発信している高精度な信号周波数に同期させるために行われる。ここで、ある程度の相関が検出されると、PLL(Phase Lock Loop)を行って位相を合わせ込み、GPS衛星200からの信号と内部の信号とを完全に位相同期させる。そして、ビット境界のエッジが検出され、データが取り込めるようになると、時間情報の確認が行われる。即ち、階層化された航法メッセージ内のサブフレームにおける2ワード目に格納され、6秒周期で1週間までの信号時刻を表すTOW(Time Of Week)が取り込まれる。このTOWが取り込まれると測位計算に移る。測位計算が終了すると、測位データが出力され、最終的に現在位置が計算される。

【0005】

【発明が解決しようとする課題】このように、GPSの測位方法では、GPS衛星200からの信号を捕捉する

ための周波数発振器215が必要であり、GPS衛星200が発信している高精度な信号周波数に同期させるためには、この周波数発振器215が高精度であることが要求される。しかしながら、この周波数発振器215は、一般的に温度や経年変化により発振周波数が変動してしまう。この変動のために周波数発振器215を用いてGPS衛星200からの信号を簡単に捕捉することができず、上述のように、周波数サーチという仕組みを別途、設ける必要があった。通常、この周波数サーチには時間がかかるため、最終的に現在位置が計算されるまでにかなりの時間を要していた。

【0006】また、従来のGPSの測位方法では、GPS衛星200からの信号捕捉後、信号に含まれる絶対時間情報を全て取得するまでに、最も短時間なホットスタート時で且つ最も良い条件でも6秒は必要であり、通常では十数秒の時間がかかっていた。そして、その取得した絶対時間情報を用いて測位計算を行なうため、現在位置が計算されるまでにかなりの時間を要していた。更に、従来のGPS測位方法において、ある一定時間以上経過した後に、再度、測位を行う場合には、航法メッセージを新たに取り込むための時間が必要となり、現在位置が計算されるまでに多くの時間がかかっていた。

【0007】以上のような理由でGPSの測位に時間がかかる場合、例えば、カーナビゲーションシステムでは、電源投入後、直ぐに現在位置を知ることができないため、目的地への道を素早く知ることができなかったり、自立航法の誤差のために現在位置が不確定になって、正しい位置に戻る時間が長くなることが問題となっていた。また、最近の携帯情報端末などにGPS受信機を内蔵または接続するような機器においては、現在位置を素早く知ることができないことから、主に徒歩での用途を想定すると、機器を持ったまま動けずにその場で測位するまで待つことが必要となり、非常に不便であった。

【0008】一方で、常時、電源をオンした状態において測位を行うことも考えられるが、その場合には消費電力が大幅に増加してしまう。例えばカーナビゲーションシステムや携帯型ナビゲーションシステム等のように、消費電力が特に限られている場合には、常に電源をオンしておくことは好ましくない。また、GPS受信機に対して所定の待機/起動を繰り返してGPSの間欠受信を行うように構成した場合であっても、周波数と時刻の精度を維持するためには、間欠受信間隔を短くして頻繁に測位をする必要があり、消費電力が大きくなっていた。

【0009】本発明は、このような技術的課題を解決するためになされたものであって、その目的とするところは、GPS衛星からの定期的な時間情報を待つことなく、GPSの測位時間を安定して早くすることにある。また他の目的は、最適なGPSの間欠受信間隔を選択することによって、測位時間を短縮した場合にも、消費電

力を大幅に減らしたGPS受信機を提供することにある。

【0010】

【課題を解決するための手段】かかる目的のもと、本発明が適用されたGPS受信機は、GPS衛星から発信される信号に基づいて測位を行い航法メッセージを更新すると共に、待機と起動を繰り返すGPSブロックと、高精度な周波数情報と時刻情報とを保持すると共に、保持された周波数情報と時刻情報とに基づいて待機状態にあるGPSブロックに対して起動信号を出力する外部時計ブロックとを備えたことを特徴としている。

【0011】ここで、この外部時計ブロックで保持している周波数情報を基準に、GPSブロックが有する周波数発振器とのずれである周波数オフセットを測定し、測定されたこの周波数オフセットを外部時計ブロックに対して出力する周波数測定ブロックとを更に備えたことを特徴とすることができる。更に、この外部時計ブロックは、常時、起動された状態とし、この周波数測定ブロックから出力された周波数オフセットに基づいてGPSブロックの待機と起動を制御することを特徴とすれば、周波数発振器のずれ量に基づいて最適なGPS間欠受信間隔を得ることができ、性能の向上と消費電力の更なる削減が可能となる点で好ましい。

【0012】本発明を他の観点から捉えると、本発明が適用されたGPS受信機は、周波数発振器を備え、GPS衛星から発信される信号に基づいて測位を行う測位実行手段と、電波時計放送局からの搬送波を受信する電波時計受信手段と、この電波時計受信手段によって受信された搬送波の有する周波数に基づいて測位実行手段が有する前記周波数発振器の誤差を測定する周波数測定手段とを備えたことを特徴としている。また、この周波数測定手段は、測定された周波数発振器の誤差を電波時計受信手段に対して出力し、この電波時計受信手段は、周波数測定手段によって出力された周波数発振器の誤差に基づいて測位実行手段の起動/待機を制御することを特徴としている。このように構成することで、例えば、GPS受信機の間欠受信間隔を、航法メッセージの有効時間まで延ばすことが可能となり、この間欠受信間隔を更に延長して消費電力を更に削減することができる点で優れている。

【0013】一方、上記目的を達成するために、本発明が適用されたGPS測位方法は、複数のGPS衛星から階層化された航法メッセージを受信し、受信されたこの航法メッセージをメモリに保持し、高精度な周波数と時刻情報とを常時動作状態にある外部時計に保持し、この外部時計に保持された周波数と時刻情報とを用いて求めた所定時間内に起動と待機を繰り返すことでGPS衛星から測位を行い、メモリに保持されている航法メッセージを更新することを特徴としている。ここで、外部時計が保持する周波数または時刻情報の正確さに基づいて起

動と待機の時間間隔を変更することを特徴とすれば、外部時計の状況によらずに、例えば確実に高精度な周波数と時刻情報、そして航法メッセージを保持することが可能となる。尚、外部時計が保持する周波数または時刻情報の正確さは、例えば外部時計が電波時計放送局からの搬送波を受信できるように構成すれば、GPS受信機内に高精度のリアルタイムクロック(RTC)を持たなくても、間欠受信間隔を最大限、長くすることが可能となり、平均消費電力を更に低く抑えることができる点で好ましい。

【0014】

【発明の実施の形態】◎ 実施の形態1

以下、添付図面に示す実施の形態に基づいてこの発明を詳細に説明する。図1は、本実施の形態におけるGPS受信機の概略構成を示す説明図である。図1に示すように、本実施の形態におけるGPS受信機は、大きくGPSブロック1と外部時計ブロック2、および周波数測定ブロック3から構成される。このGPSブロック1は、高度約2万km上のGPS衛星から発信された1575.42MHzの電波を受信するGPSアンテナ部9、このGPSアンテナ部9から受信した電波を周波数発振器12の周波数を利用して中間周波数に下げたためのRF部10、そして、RF部10によって中間周波数に下げられた電波を復調し、必要なデータを抜き出して現在位置を計算するためのデジタル(Digital)部20から構成されている。

【0015】一方、外部時計ブロック2は、後述するように、所定の信号を所定の周期で送信することのできる時計、または時計機能を内蔵したマイコンから構成されている。GPSブロック1から外部時計ブロック2には、次に起動するまでの時間間隔を指示する設定信号が送られる。外部時計ブロック2は、この信号を受信すると、起動信号を送る周期を設定する。また、外部時計ブロック2からGPSブロック1には起動/待機信号が送られる。この起動/待機信号の受信により、GPSブロック1は起動又は待機できるように構成されている。

【0016】また、本実施の形態では、周波数測定ブロック3を備えており、外部時計ブロック2で保持している高精度な周波数を基準にGPSブロック1の周波数発振器12の周波数、もしくは外部時計ブロック2の周波数からのずれ量である周波数オフセットを測定し、外部時計ブロック2にそれらの値を送るよう構成されている。

【0017】図2は、GPSブロック1、外部時計ブロック2および周波数測定ブロック3の構成を更に詳述したブロック図である。GPSアンテナ部9から受信した信号は、GPSブロック1のRF部10におけるアンプ11にて増幅される。一方、RF部10の内部には周波数発振器(TCXO)12を備え、N倍された後にミキサ14でアンプ11にて増幅された信号と混合され、中間

周波数信号に変換される。この中間周波数信号は、アンプ15にて増幅され、AD変換器(ADC)16によってデジタル変換されてデジタル部20に入力される。

【0018】デジタル部20は、GPSブロック1を制御するCPU21の他に、中間周波数信号を復調する復調器22、クロックを生成するリアルタイムクロック(RTC)23を備えている。また、RAM24を備え、GPS衛星の高度な周波数と内蔵の周波数発振器との差をオフセットとして格納したり、取得された航法メッセージを保持できるように構成されている。ROM25には各種制御情報等が格納されている。

【0019】一方、外部時計ブロック2には、この外部時計ブロック2を制御するCPU31と、水晶発振子(XTAL)33に接続され時計機能を有するリアルタイムクロック(RTC)32を備えている。また、制御情報を格納するROM34の他、時刻情報等を格納するRAM35を備えている。また、GPSブロック1と外部時計ブロック2等に電力を供給する電源30を備えており、この電源30は、CPU21によってGPSブロック1に対する電源のオン/オフがコントロールされ、GPSブロック1の待機/起動を繰り返す、いわゆる間欠受信(スリープ受信)を可能としている。

【0020】更に、周波数測定ブロック3は、内部にカウンタ41を備えている。このカウンタ41は、外部時計ブロック2からの基準周波数信号で得られる正確なクロックで動作させ、このクロックで作られる所定の時間に、GPSブロック1のRF部10からの被測定周波数信号をカウントし、そのカウント値を周波数測定データ(周波数情報)として外部時計ブロック2に出力できるように構成されている。

【0021】図3は、各ブロック動作と通信内容を説明するための図である。GPSブロック1からは、まず、次に起動するまでの時間間隔を指示する設定信号が外部時計ブロック2に送信され、その送信を受けた外部時計ブロック2はGPSブロック1に対して待機信号を送出する。その後、RTC32におけるタイマーを起動させ、タイマーのチェックによって所定時間の経過が判断された後に、外部時計ブロック2からGPSブロック1に対して起動信号が送信される。また、このときに、外部時計ブロック2が高精度な周波数と時刻情報を保持している場合には、周波数と時刻情報もGPSブロック1に対して送信される。

【0022】図4は、GPSブロック1における処理の流れを示すフローチャートである。電源がオンされた状態にあるGPSブロック1は、まず初回の測位を実行する(ステップ101)。この測位が行われると、RAM24に格納されている航法メッセージを更新する(ステップ102)。その後、GPSブロック1は外部時計ブロック2に対して、設定信号を送信する(ステップ103)。このときに送信される設定信号には、航法メッセ

ージの有効時間(通常約2時間以内)、GPS受信機で保持している時計の誤差がある一定の値で収まる時間、またはGPS受信機で保持している周波数発振器12の誤差がある一定の値で収まる時間が含まれている。その後、外部時計ブロック2から待機信号を待つ(ステップ104)。待機信号が受信されなければ、測位を繰り返す。待機信号が受信されると、電源を切って待機状態に入る(ステップ105)。

【0023】その後、設定信号で設定された時間のうち、外部時計ブロック2の状態により選択された時間が経過すると、外部時計ブロック2からの起動信号が受信される(ステップ106)。そして、GPSブロック1を起動させるが(ステップ107)、起動信号が受信されない間は待機状態を継続する。このとき、外部時計ブロック2が高精度な周波数と時刻情報を保持している場合には、周波数と時刻情報も受信する。そして、再び測位を行い(ステップ101)、航法メッセージを更新すると(ステップ102)、同様にして待機状態に入る(ステップ103～ステップ105)。外部時計ブロック2が高精度な周波数と時刻情報とを保持していない場合には、GPSブロック1にはそれらの情報が送信されずに、GPSブロック1は内部で保持している周波数と時刻情報を用いて測位を行う。このようにして、本実施の形態におけるGPSブロック1は、外部時計ブロック2の状況に応じて、外部時計ブロック2からの周波数と時刻情報を用いて測位を行う場合と、内部に保持している周波数と時刻情報を用いて測位を行う場合に分かれて間欠測位を実行している。

【0024】図5は、外部時計ブロック2における第1の処理の流れを示すフローチャートである。本実施の形態における外部時計ブロック2は、常に動作し続け、高精度な周波数と時刻情報を保持している。この外部時計ブロック2は、まず、GPSブロック1から送信される設定信号を待つ(ステップ111)。設定信号が受信されると、GPSブロック1から送られる正確な時刻に基づいてRTC32における設定時間を更新し(ステップ112)、タイマーを起動させる(ステップ113)。そして、GPSブロック1に対して待機信号を送信する(ステップ114)。その後、外部時計ブロック2は動作を続け、タイマーが終了したか否かを判断する(ステップ115)。そして、タイマー時間が経過した後、即ちGPSブロック1から設定された時間間隔が過ぎると、起動信号をGPSブロック1に対して送信する(ステップ116)。起動信号を受信したGPSブロック1は、前述のように待機状態を解いて起動する。このとき、周波数測定ブロック3にて測定された周波数または周波数オフセットと、保持している時刻情報も併せてGPSブロック1に送信する(ステップ117)。このようにしてGPSブロック1は、所定の間隔で起動/待機を繰り返す、周波数のオフセット、時刻、航法メッセージを更新

し続けることで、高精度の周波数基準、時刻情報、最新の航法メッセージを保持することができるのである。

【0025】図6は、外部時計ブロック2における第2の処理の流れを示すフローチャートである。ここでは、周波数と時刻精度がある程度正確か否かによって処理が異なる場合を説明する。外部時計ブロック2は、GPSブロック1から送信される設定信号を待つ(ステップ121)。設定信号が受信されると、保持している、または得ることのできる周波数と時刻情報の正確さを調べる(ステップ122)。周波数と時刻精度がある程度正確な場合には、タイマー1の設定時間を更新する(ステップ123)。そしてタイマー1を起動し(ステップ124)、待機信号をGPSブロック1に送信する(ステップ125)。待機信号を返信後、設定信号で更新されたタイマー1の時間が経過すると(ステップ126)、GPSブロック1に起動信号を送信する(ステップ127)。このとき、保持している周波数と時刻情報もGPSブロック1に送信される(ステップ128)。

【0026】一方、ステップ122で、保持している、または得ることのできる周波数と時刻情報が不正確な場合には、タイマー2の設定時間を更新する(ステップ129)。そして、タイマー2を起動し(ステップ130)、待機信号をGPSブロック1に送信する(ステップ131)。待機信号を返信後、設定信号で更新されたタイマー2の時間が経過すると(ステップ132)、GPSブロック1に起動信号を送信する(ステップ133)。このようにして、保持しているまたは得ることのできる周波数と時刻情報の正確さによって、GPSブロック1へ送信する待機信号と起動信号の間隔を変え、起動信号送信時にGPSブロック1へ送信する内容も変えることが可能となる。

【0027】尚、周波数測定ブロック3は、外部時計ブロック2で保持している高精度な周波数を基準に、GPSブロック1における周波数発振器12の周波数、若しくは外部時計ブロック2の周波数からのずれである周波数オフセットを測定し、外部時計ブロック2に対してそれらの値を送っている。

【0028】以上説明したように、本実施の形態によれば、外部時計ブロック2が常に動作し、GPSブロック1は、常に高精度な周波数と時刻情報、そして航法メッセージを保持することが可能となる。このような情報をGPS受信機が保持している場合には、GPSの測位にかかる時間を大幅に短縮することができる。また、外部時計ブロック2が常に動作し、その保持しているまたは得ることのできる周波数と時刻情報との正確さにより、GPSブロック1の間欠受信の間隔を変えるように構成すれば、GPSブロック1は、外部時計ブロック2の状況によらずに、確実に高精度な周波数と時刻情報、そして航法メッセージを保持することが可能となる。また、外部時計ブロック2が、正確な周波数と時刻精度を保持

または得ることができる場合には、航法メッセージの有効時間まで延ばすことができる。そのために、GPSブロック1における間欠受信間隔を長くすることが可能となり、消費電力の削減が可能となる。

【0029】図7は、本実施の形態における測位動作を示した説明図である。通常のGPS受信機では、図9(b)に示すように、電源が入れられるとまず周波数サーチを行っている。この周波数サーチとは、前述のように、GPS受信機210内の周波数発振器215にて作られた周波数を用いて、GPS衛星200からの信号と周波数の同期を取ることである。通常、GPS受信機210内の周波数発振器215の精度が温度や経年変化で劣化し、正確な周波数からずれる場合がある。このような場合には、GPS衛星200からの信号に同期を取ることが出来ないため、GPS受信機210内の周波数発振器215の周波数を段階的にずらし、正確なGPS衛星200からの信号に同期をかけるのである。そして、この周波数サーチにより相関がある程度検出された時点でPLLを使った位相合わせに入る。そして、位相を合わせることができると、各GPS衛星200からの距離であるレンジデータが取得され、データの復調も可能になる。この復調データを取得できる状態で、データ内の時刻情報が取得できるまで待ち、データが取得できると測位計算を行い、位置データを出力している。従って、温度や経年変化による周波数ずれが起きない高精度の周波数を得ることができれば、図6に示したような周波数サーチを行う必要がなくなってくるが、同時に高精度の時刻情報を得ることができれば、時間情報の確認を行う必要がなくなってくるのである。すなわち、図7に示したように、本実施の形態によれば、GPS測位に必要な動作の一部が必要でなくなり、即座にPLLを用いた位相合わせに入ることができ、また、即座に測位動作に移行することができる。その結果、その動作に必要であった時間が不要となり、測位時間が大幅に短縮できるわけである。

【0030】また、測位を開始する時点で航法メッセージを保持していない場合、もしくは時間経過のために航法メッセージが有効で無くなってしまった場合には、GPSの測位動作に航法メッセージを取得する時間がさらに必要になってしまう。本実施の形態のように、GPSが所定の周期で起動し航法メッセージを常に最新に更新することで、航法メッセージの取得を行わずに測位が行えるため、測位時間を大幅に短くすることができる。

【0031】◎ 実施の形態2

実施の形態1では、周波数測定ブロック3を設け、外部時計ブロック2の保持する、または得られる周波数、時刻情報の正確さによってGPS間欠受信間隔を変えるように構成した。実施の形態2では、外部時計ブロック2の代わりに、外部時計に電波時計を利用した電波時計ブロックを用いてGPS間欠受信間隔を変えるものであ

る。尚、実施の形態1と同様の構成については、同様の符号を用いて説明し、ここではその詳細な説明を省略する。

【0032】図8は、実施の形態2におけるGPS受信機の概略構成を示す説明図である。実施の形態2では、前述したGPSブロック1および周波数測定ブロック3に、電波時計ブロック4を備えたものである。この電波時計ブロック4は、郵政省通信総合研究所が運営している標準電波である40KHzの搬送波を受信するGPSアンテナ部5と、GPSアンテナ部5により受信された搬送波を増幅して検波する信号復調部6と、信号復調部6によって検波された波形から時刻情報を読み取るディジタル部7とを備えている。

【0033】本実施の形態における電波時計ブロック4は、常に電源が入っており、電波時計放送局からの信号を受信して高精度の時間情報と高精度な周波数基準を、常時保持し続けている。電波時計ブロック4は、40KHzの搬送波であって信号復調部6によって増幅された検波前の周波数を周波数測定ブロック3に出力し、周波数測定ブロック3は、前述のカウンタ41を用いてGPSブロック1における周波数発振器12の誤差を検出する。この周波数発振器12の誤差を周波数情報として受信した電波時計ブロック4は、この周波数情報に基づいて待機時間を適宜、設定し、GPSブロック1の待機/起動を制御して間欠受信を行う。GPSブロック1は、この制御によって定期的に起動し、GPS衛星の位置情報である測位計算に必要なエフェメリスデータを更新する。このエフェメリスデータの取得が終わるとスリープ(待機)に入る。この起動/待機を繰り返すことで、常に最新のエフェメリスデータを保持し続けることが可能となる。測位を行うためには、GPSブロック1に電源が入った瞬間に、電波時計ブロック4から時刻情報と周波数情報(誤差)をもらう。これらの情報を用いてGPS受信機は、図7に示した高速測位を行うことができるようになる。

【0034】ここで、本実施の形態を採用した場合、常に高速測位を実現するために必要なスリープ受信(間欠受信)間隔、平均消費電力について考察する。まず、GPSブロック1の消費電力を W_{gps} 、待機時間を T_k 、起動時間を T_{on} とすると、平均消費電力 W_{avg} は、 $W_{avg} = (W_{gps} \times T_{on}) / T_k$ で計算できる。本実施の形態では、スリープ受信はエフェメリスデータの取得にしか用いないため、エフェメリスデータの必要更新周期がそのままスリープ受信の間隔になると考えることができる。通常、エフェメリスデータの寿命は2時間程度とされているので、更新時間も最大で2時間(7200秒)と考える。また、起動時間(エフェメリスデータ取得の時間) T_{on} を1分(60秒)、GPSブロック1の消費電力を W_{gps} を580mWとすると、スリープ受信に必要な平均消費電力 W_{avg} は、

$W_{avg} = (580 \text{ mW} \times 60 \text{ s}) / 7200 \text{ s} = 4.8$
(mW)

となる。電波時計ブロック4の消費電力を15mWとすると、トータルの消費電力は、 $4.8 + 15 = 19.8$ (mW) となり、消費電力を大きく削減することが可能となる。

【0035】また、本実施の形態によれば、GPS受信機の内部に高精度のリアルタイムクロック(RTC)を持たなくても、GPS受信機のスリープ受信間隔を最大限、長くすることができ、このことから平均消費電力を低く抑えることが可能となる。また、電波時計ブロック4からの高精度な周波数基準を利用することができることから、GPS受信機内の周波数発振器が大きな誤差を持ったとしても、確実な高速測位を実現することができる。

【0036】

【発明の効果】以上、詳述したように、本発明によれば、GPSの測位時間を飛躍的に早くすることができ、また、GPS衛星からの定期的な時間情報を待つ必要もなくなることから、測位までの時間が安定して早くなる。また、外部時計の状況によって、最適なGPSの間欠受信間隔を選択することができるので、消費電力の削減が可能となる。

【図面の簡単な説明】

【図1】 本実施の形態におけるGPS受信機の概略構成を示す説明図である。

【図2】 GPSブロック1、外部時計ブロック2および周波数測定ブロック3の構成を更に詳述したブロック

図である。

【図3】 各ブロック動作と通信内容を説明するための図である。

【図4】 GPSブロック1における処理の流れを示すフローチャートである。

【図5】 外部時計ブロック2における第1の処理の流れを示すフローチャートである。

【図6】 外部時計ブロック2における第2の処理の流れを示すフローチャートである。

【図7】 本実施の形態における測位動作を示した説明図である。

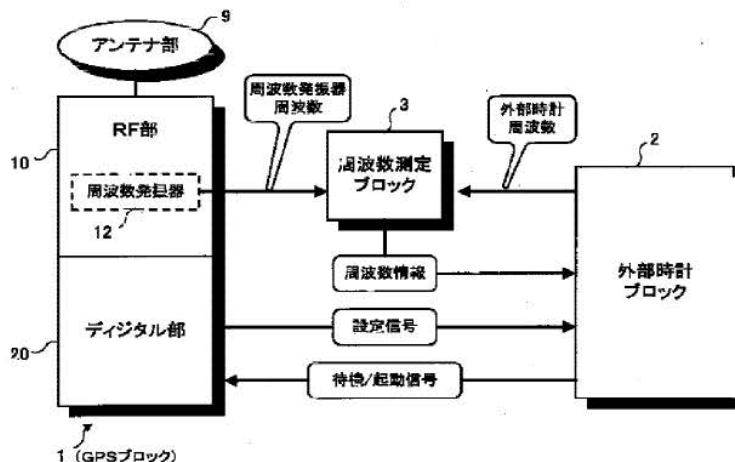
【図8】 実施の形態2におけるGPS受信機の概略構成を示す説明図である。

【図9】 (a)、(b)は、一般的に用いられるGPSシステムの概略構成と、従来のGPS測位動作を示した説明図である。

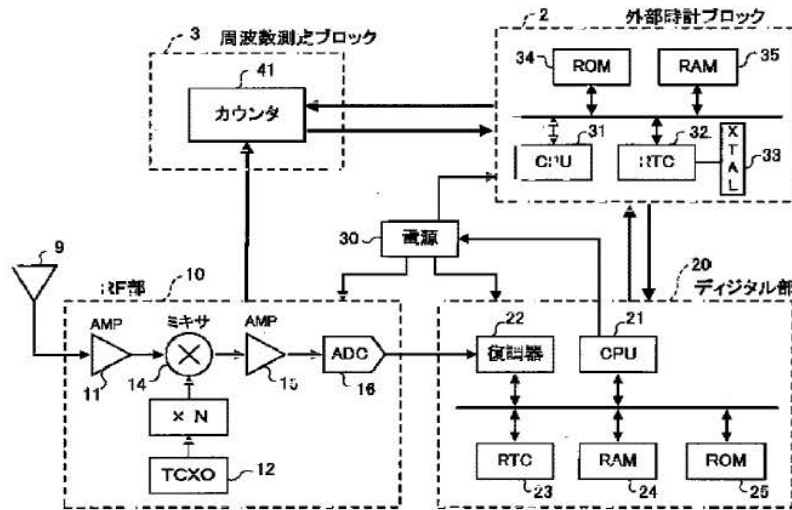
【符号の説明】

1…GPSブロック、2…外部時計ブロック、3…周波数測定ブロック、4…電波時計ブロック、5…GPSアンテナ部、6…信号復調部、7…デジタル部、9…GPSアンテナ部、10…RF部、11…アンプ、12…周波数発振器(TCXO)、14…ミキサ、15…アンプ、16…AD変換器(ADC)、20…デジタル(Digital)部、21…CPU、22…復調器、23…リアルタイムクロック(RTC)、24…RAM、25…ROM、30…電源、31…CPU、32…リアルタイムクロック(RTC)、33…水晶発振子(XTAL)、34…ROM、35…RAM、41…カウンタ

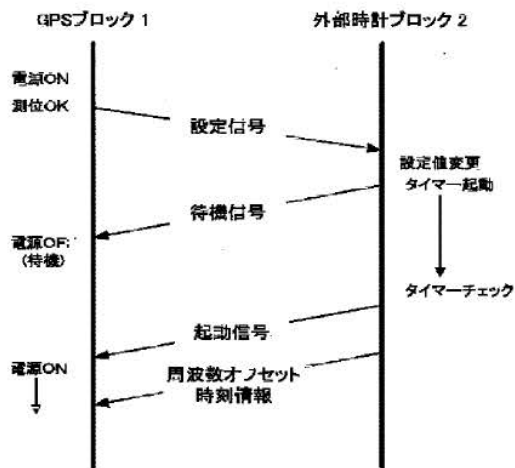
【図1】



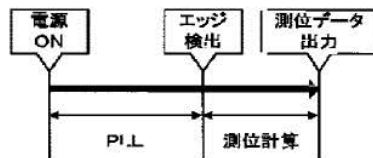
【図2】



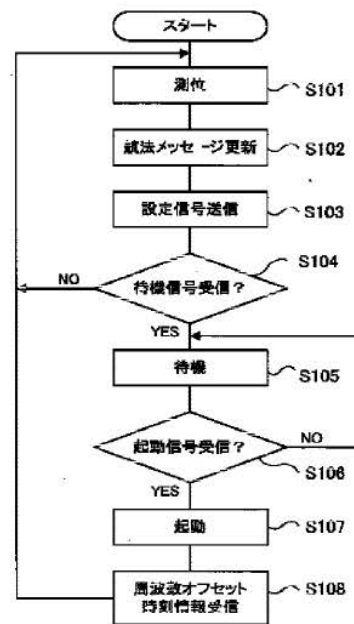
【図3】



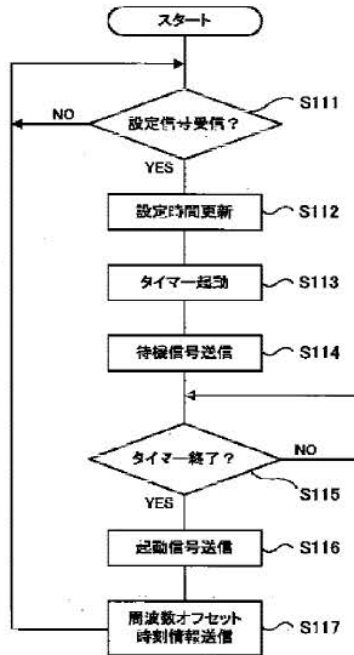
【図7】



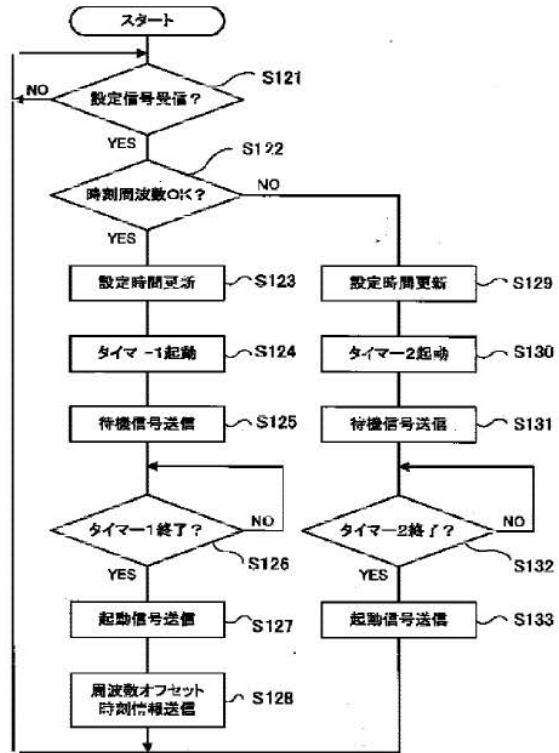
【図4】



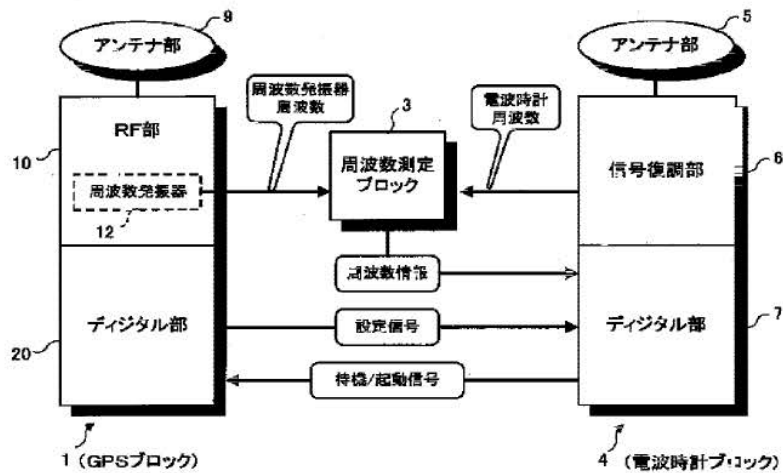
【図5】



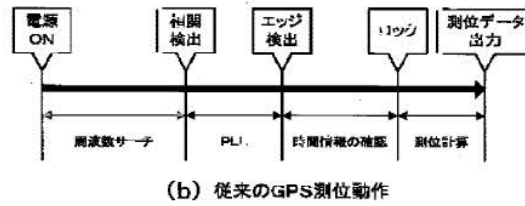
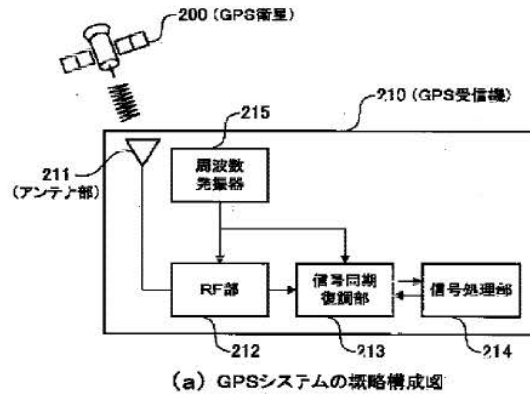
【図6】



【図8】



【図9】



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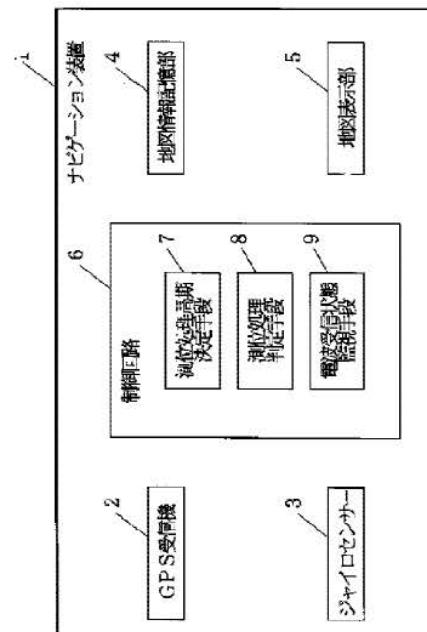
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(54) 【発明の名称】 ナビゲーション装置

(57) 【要約】

【課題】 走行状況に応じてGPS受信機における測位動作を制御することができるナビゲーション装置を提供することを目的とする。

【解決手段】 GPS衛星からの電波を受信してナビゲーション装置1の現在位置を測位するGPS受信機2と、装置の速度・進行方向の検出をして位置測位の補助を行うジャイロセンサー3と、地図情報を記憶する地図情報記憶部4と、全体を制御する制御回路6とを有するナビゲーション装置1であって、制御回路6は、地図情報に基づいて分岐の少ない道路を走行しているか否かを判定する測位処理判定手段8と、GPS受信機2による位置測位を適時に開始させ停止させる測位処理周期決定手段7とを有する。



【特許請求の範囲】

【請求項1】GPS衛星からの電波を受信して装置の現在位置を測位するGPS受信機と、装置の速度・進行方向を検出して位置測位の補助を行うジャイロセンサーと、地図情報を記憶する地図情報記憶部と、全体を制御する制御回路とを有するナビゲーション装置であって、前記制御回路は、前記地図情報に基づいて分岐の少ない道路を走行しているか否かを判定する測位処理判定手段と、前記GPS受信機による位置測位を適時に開始させ停止させる測位処理周期決定手段とを有することを特徴とするナビゲーション装置。

【請求項2】前記測位処理判定手段は、前記地図情報に基づいて装置の現在位置から次の道路分岐点までの距離を計測し、前記測位処理周期決定手段は、前記計測した距離に応じて前記GPS受信機における現在位置の測位周期を決定することを特徴とする請求項1に記載のナビゲーション装置。

【請求項3】前記測位処理周期決定手段は、前記地図情報に基づいて装置の現在位置から次の道路分岐点までの距離が長いと前記測位処理判定手段が判定した場合、前記GPS受信機における測位動作の周期を長く、装置の現在位置から次の道路分岐点までの距離が短いと前記測位処理判定手段が判定した場合、前記GPS受信機における測位動作の周期を短くするか又は通常の周期にすることを特徴とする請求項1に記載のナビゲーション装置。

【請求項4】前記測位処理判定手段は、トンネルに進入しトンネルを通過したか否かを判定し、前記測位処理周期決定手段は、トンネルを通過した後は前記GPS受信機における測位動作の周期を通常の周期にすることを特徴とする請求項1乃至3のいずれか1に記載のナビゲーション装置。

【請求項5】前記測位処理判定手段は、走行している道路分岐の少ない道路において曲線道路が続くか否かを判定し、前記測位処理周期決定手段は、曲線道路が続くと前記測位処理判定手段が判定した場合、前記GPS受信機における測位動作の周期を通常の周期にすることを特徴とする請求項1乃至4のいずれか1に記載のナビゲーション装置。

【請求項6】GPS衛星からの電波のGPS受信機における受信状態を監視する電波受信状態監視手段を備え、前記測位処理周期決定手段は、前記受信状態に応じて前記GPS受信機における測位動作の周期を変化させることを特徴とする請求項1乃至5のいずれか1に記載のナビゲーション装置。

【請求項7】前記測位処理判定手段は、前記地図情報に基づいて装置の現在位置が地図の道路上に正しくプロットされているか否かを判定し、地図の道路上に正しくプロットされていないと前記測位処理判定手段が判定した場合、前記測位処理周期決定手段は、前記GPS受信機

における測位動作の周期を通常の周期にすることを特徴とする請求項1乃至6のいずれか1に記載のナビゲーション装置。

【請求項8】前記測位処理周期決定手段は、前記ジャイロセンサーで検出した速度の変化に応じて測位動作の周期を変化させることを特徴とする請求項1乃至7のいずれか1に記載のナビゲーション装置。

【請求項9】前記測位処理周期決定手段は、前記ジャイロセンサーで検出した速度が一旦停止を示した場合は測位動作を中断し、前記速度が移動し始めたことを示した場合は測位動作の周期を通常の周期に戻し、所定距離を走行した後に測位動作の周期を変化させることを特徴とする請求項1乃至8のいずれか1に記載のナビゲーション装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、GPS衛星からの電波を受信して装置の現在位置を測位するGPS受信機と、装置の速度・進行方向を検出して位置測位の補助を行うジャイロセンサーと、地図情報を記憶する地図情報記憶部と、全体を制御する制御回路とを有するナビゲーション装置に関するものである。

【0002】

【従来の技術】図2は、従来のナビゲーション装置1Aを示すブロック図である。

【0003】図2に示すように、ナビゲーション装置1Aは、GPS衛星からの電波を受信して利用者の現在位置を測位するGPS受信機2と、装置の速度・進行方向を検出して位置測位の補助を行うジャイロセンサー3と、地図情報を記憶する地図情報記憶部4と、地図情報記憶部4の地図情報を参照して、利用者の現在位置（つまり装置の現在位置）を地図上に表示する液晶ディスプレイ等の地図表示部5と、ナビゲーション装置1Aの全体を制御する制御回路6とを有する。

【0004】このように構成されたナビゲーション装置1Aにおいては、GPS受信機2は或る一定の周期にて位置測位の動作を繰り返し、利用者の位置を測位し、制御回路6は、GPS受信機2における測位結果を地図上にプロットし、利用者の現在位置を地図表示部5に表示させる。

【0005】ところで、高速道路のような分岐の少ない道路においては、最初の位置のみ測位できれば、ジャイロセンサー3による装置の速度・進行方向の検出を行うことにより現在位置の測位は可能となる。

【0006】

【発明が解決しようとする課題】しかし、従来のナビゲーション装置では、ジャイロセンサー3による装置の速度・進行方向の検出を行って現在位置を測位することが可能であるにもかかわらず、移動状況・道路状況・環境状況等の走行状況に関係無くGPS受信機2による位置

測位を頻繁に繰り返しているため、不必要な位置測位まで行ってしまう、消費電力を浪費するという問題点を有していた。

【0007】このナビゲーション装置では、走行状況に応じてGPS受信機における測位動作の周期を変更することができることが要求されている。

【0008】本発明は、走行状況に応じてGPS受信機における測位動作を制御することができるナビゲーション装置を提供することを目的とする。

【0009】

【課題を解決するための手段】上記課題を解決するために本発明のナビゲーション装置は、GPS衛星からの電波を受信して装置の現在位置を測位するGPS受信機と、装置の速度・進行方向の検出をして位置測位の補助を行うジャイロセンサーと、地図情報を記憶する地図情報記憶部と、全体を制御する制御回路とを有するナビゲーション装置であって、制御回路は、地図情報に基づいて分岐の少ない道路を走行しているか否かを判定する測位処理判定手段と、GPS受信機による位置測位を適時に開始させ停止させる測位処理周期決定手段とを有する構成を備えている。

【0010】これにより、走行状況に応じてGPS受信機における測位動作を制御することができるナビゲーション装置が得られる。

【0011】

【発明の実施の形態】本発明の請求項1に記載のナビゲーション装置は、GPS衛星からの電波を受信して装置の現在位置を測位するGPS受信機と、装置の速度・進行方向の検出をして位置測位の補助を行うジャイロセンサーと、地図情報を記憶する地図情報記憶部と、全体を制御する制御回路とを有するナビゲーション装置であって、制御回路は、地図情報に基づいて分岐の少ない道路を走行しているか否かを判定する測位処理判定手段と、GPS受信機による位置測位を適時に開始させ停止させる測位処理周期決定手段とを有することとしたものである。

【0012】この構成により、必要に応じてGPS受信機での位置測位の動作を停止させ、ジャイロセンサーでの測位を行わせることができるので、GPS受信機を適時に停止させている分だけ電力消費を低減して省電力化を図ることができるという作用を有する。

【0013】請求項2に記載のナビゲーション装置は、請求項1に記載のナビゲーション装置において、測位処理判定手段は、地図情報に基づいて装置の現在位置から次の道路分岐点までの距離を計測し、測位処理周期決定手段は、計測した距離に応じてGPS受信機における現在位置の測位周期を決定することとしたものである。

【0014】この構成により、計測した距離に応じてGPS受信機における装置の現在位置の測位周期を変更することができるので、たとえば装置の現在位置から次の

道路分岐点までの距離が長いと、GPS受信機における測位動作の周期を長くすることができ、測位動作の周期が長くなった分だけ電力消費を低減して省電力化を図ることができるという作用を有する。

【0015】請求項3に記載のナビゲーション装置は、測位処理周期決定手段は、地図情報に基づいて装置の現在位置から次の道路分岐点までの距離が長いと測位処理判定手段が判定した場合、GPS受信機における測位動作の周期を長く、装置の現在位置から次の道路分岐点までの距離が短いと測位処理判定手段が判定した場合、GPS受信機における測位動作の周期を短くするか又は通常の周期にすることとしたものである。

【0016】この構成により、装置の現在位置から次の道路分岐点までの距離の長短に応じてGPS受信機における測位動作の周期を長く又は短くすることができるので、電力消費を確実に低減することができると共に、位置測位の精度も維持することができるという作用を有する。

【0017】請求項4に記載のナビゲーション装置は、請求項1乃至3のいずれか1に記載のナビゲーション装置において、測位処理判定手段は、トンネルに進入しトンネルを通過したか否かを判定し、測位処理周期決定手段は、トンネルを通過した後はGPS受信機における測位動作の周期を通常の周期にすることとしたものである。

【0018】この構成により、長時間のトンネル通過のためにジャイロセンサーが劣化することによる位置測位の精度の劣化を防止することができるという作用を有する。

【0019】請求項5に記載のナビゲーション装置は、請求項1乃至4のいずれか1に記載のナビゲーション装置において、測位処理判定手段は、走行している道路分岐の少ない道路において曲線道路が続くか否かを判定し、測位処理周期決定手段は、曲線道路が続くと測位処理判定手段が判定した場合、GPS受信機における測位動作の周期を通常の周期にすることとしたものである。

【0020】この構成により、長時間の曲線道路通過のためにジャイロセンサーが劣化することによる位置測位の精度の劣化を防止することができるという作用を有する。

【0021】請求項6に記載のナビゲーション装置は、請求項1乃至5のいずれか1に記載のナビゲーション装置において、GPS衛星からの電波のGPS受信機における受信状態を監視する電波受信状態監視手段を備え、測位処理周期決定手段は、受信状態に応じてGPS受信機における測位動作の周期を変化させることとしたものである。

【0022】この構成により、GPS受信状態が悪化して位置測位の精度が劣化した場合でも、受信状態復帰直後のGPS受信機における測位動作の周期を短くして位

置測位の劣化を防止することができるという作用を有する。

【0023】請求項7に記載のナビゲーション装置は、請求項1乃至6のいずれか1に記載のナビゲーション装置において、測位処理判定手段は、地図情報に基づいて装置の現在位置が地図の道路上に正しくプロットされているか否かを判定し、地図の道路上に正しくプロットされていないと測位処理判定手段が判定した場合、測位処理周期決定手段は、GPS受信機における測位動作の周期を通常の周期にすることとしたものである。

【0024】この構成により、古い地図情報を使用したときにその地図情報に存在しない分岐した道路を走行すると、車両の位置が正しく表示されず、次の道路分岐までの距離が正確に計測されず、ジャイロセンサーによる位置測位では精度が悪化する場合があるが、そのような場合には、GPS受信機における測位動作の周期を通常の周期として位置測位の精度を維持することができるという作用を有する。

【0025】請求項8に記載のナビゲーション装置は、請求項1乃至7のいずれか1に記載のナビゲーション装置において、測位処理周期決定手段は、ジャイロセンサーで検出した速度の変化に応じて測位動作の周期を変化させることとしたものである。

【0026】この構成により、速度が遅くなると移動する距離も短くなるため、その分だけGPS受信機における測位動作の周期を低減することができ、電力消費を低減することができるという作用を有する。

【0027】請求項9に記載のナビゲーション装置は、請求項1乃至8のいずれか1に記載のナビゲーション装置において、測位処理周期決定手段は、ジャイロセンサーで検出した速度が一旦停止を示した場合は測位動作を中断し、速度が移動し始めたことを示した場合は測位動作の周期を通常の周期に戻し、所定距離を走行した後に測位動作の周期を変化させることとしたものである。

【0028】この構成により、測位動作の中断後の測位精度の劣化を回避することができ、また所定距離移動後は通常の電力消費低減の動作に移行することができるという作用を有する。

【0029】以下、本発明の実施の形態について、図1を用いて説明する。

【0030】(実施の形態1) 図1は、本発明の実施の形態1によるナビゲーション装置を示すブロック図である。

【0031】図1に示すように、ナビゲーション装置1は、GPS衛星からの電波を受信して利用者の現在位置を測位するGPS受信機2と、装置の速度・進行方向を検出して位置測位の補助を行うジャイロセンサー3と、地図情報を記憶する地図情報記憶部4と、地図情報記憶部4の地図情報を参照して、利用者の現在位置(つまり装置の現在位置)を地図上に表示する液晶ディスプレイ

等の地図表示部5と、ナビゲーション装置1の全体を制御する制御回路6とを有し、制御回路6は、GPS受信機2における位置測位の周期の決定を行う測位処理周期決定手段7と、その周期の変更を行うか否かを判定する測位処理判定手段8と、GPS受信機2における受信状態を監視する電波受信状態監視手段9とを有する。

【0032】このように構成されたナビゲーション装置1について、その概略動作を説明する。

【0033】図1において、通常はGPS受信機2において或る一定の周期(所定の周期)で測位動作を行い、ジャイロセンサー3では、GPS受信機2の測位精度を補うために、装置の速度・進行方向の検出を行う。GPS受信機2やジャイロセンサー3において測位・検出した現在位置や進行方向および地図情報記憶部4の地図情報を参照して、高速道路のような分岐の少ない道路を走行していることを認識すると、最初の位置のみ測位できればGPS受信機2による測位動作を頻繁に行わなくても、ジャイロセンサー3による装置の速度・進行方向の検出により位置の測位が可能になるため、GPS受信機2による測位動作の周期を長く、つまり測位動作の頻度を減らすことが可能になる。GPS受信機2の測位動作の頻度を減らすことが可能になると、装置の消費電力の低減を図ることができる。

【0034】次に、GPS受信機2の測位動作の各種制御方法について説明する。

【0035】まず、第1の方法について説明する。

【0036】測位処理判定手段8は、地図情報記憶部4の地図情報を参照して、装置の現在位置から次の道路分岐点までの距離を計測する。その距離に応じて測位処理周期決定手段7は、GPS受信機2の測位動作の周期を決定する。例えば、分岐点までの距離が基準となる或る一定の距離を越えた場合、測位処理周期決定手段7は測位動作の周期を長く設定する。つまり、GPS受信機2による位置測位の頻度を通常の状態より少なくする。また、測位処理判定手段8において計測された装置の現在位置から次の分岐点までの距離の長さに応じて、GPS受信機2における測位動作の周期を決定する。その距離が長い場合は測位動作の周期を長く、分岐点までの距離が短いまたは分岐に近づいてくるにつれて、測位動作の周期を短くまたは通常の測位動作の周期の状態にする。

【0037】このように、必要に応じてGPS受信機2の測位動作を減らすことが可能になり、装置の消費電力の低減を図ることができる。

【0038】次に、第2の方法について説明する。

【0039】分岐が少ない道路を走行中、測位処理判定手段8において、地図情報を参照して、トンネルに進入・通過したことが認識された場合、測位処理周期決定手段7は、測位動作の周期が通常の状態より長く設定されていた場合でも、強制的に測位動作の周期を通常の状態に戻す。これは、トンネル通過後は、測位された現在位

置の位置精度が劣化しているおそれがあり（GPS受信機2を使わずジャイロセンサー3のみで現在位置測位を行うと、誤差が積算され、結果的に測位精度が劣化するおそれがある）、精度を維持する目的でGPS受信機2における測位動作の周期を通常の状態に戻す。

【0040】第3の方法について説明する。

【0041】分岐の少ない道路を走行中にカーブ等の曲線の道路が続く場合、GPS受信機2による位置測位の頻度を減らしていると、測位された位置の精度が劣化する可能性がある（劣化の原因は第2の方法の場合と同様である）。位置測位の精度の劣化を防止するために、ジャイロセンサー3からの加速度情報や地図情報に基づき曲線道路を走行していることを認識したとき、測位位置の精度を維持するために、強制的にGPS受信機2における測位動作の周期を通常の間隔状態にする。

【0042】第4の方法について説明する。

【0043】GPS受信機2においてGPS衛星からの電波の受信状態を監視し、その結果を電波受信状態監視手段9に通知する。電波受信状態監視手段9は、分岐の少ない道路を走行中に、GPS衛星からの電波の受信状態が悪化したか否かを判定する。この電波受信状態監視手段9において、GPS衛星からの電波の受信状態が悪化したと判定され、その後電波の受信状態が復帰した際、復帰直後にGPS受信機2における測位動作の周期が長い場合は、測位された位置の精度が劣化する可能性があり、測位精度を維持するためにも、測位動作の周期を短く、または通常の状態に戻す必要がある。そのためにも、測位処理周期決定手段7は、電波受信状態監視手段9で監視している電波の受信状態に応じて、測位動作の周期を変化させる。

【0044】第5の方法について説明する。

【0045】ナビゲーション装置1において、使用している地図情報が古い場合、その地図情報に存在しない分岐した道路を走行すると、装置の現在位置が地図上に正しくプロットされない可能性がある。特に測位動作の周期が長く設定されていた場合は、測位位置の精度が悪化する可能性がある。そのため、正しくプロットされていないと測位処理判定手段8において判定された場合（例えば、突然別の道路へプロットされたり、地図上の道路にプロットされていないとき）は、測位処理周期決定手段7は、測位動作の周期を強制的に通常周期の状態に戻す。これにより測位精度が維持される。

【0046】第6の方法について説明する。

【0047】分岐の少ない道路を走行中に、GPS受信機2またはジャイロセンサー3において、装置の利用者の移動速度（車両の移動速度）を検出する。その速度に応じて、測位処理周期決定手段7は測位動作の周期を変化させる。例えば、速度が遅くなると、移動する距離も短くなるため、その際の測位動作の頻度を減らすことが可能になり、装置の消費電力の低減を図ることができる。

また、分岐の少ない道路を走行中に、GPS受信機2またはジャイロセンサー3において、装置の利用者（つまり車両）が一旦停止したことを検出した場合は、測位処理周期決定手段7は、測位動作を中断し、再度利用者が移動し始めたことを検出した場合に、一度測位動作の周期を通常周期の状態に戻し、或る一定の距離を走行後、測位動作の周期を必要に応じて変化させる。

【0048】以上のように本実施の形態によれば、制御回路6は、地図情報に基づいて分岐の少ない道路を走行しているか否かを判定する測位処理判定手段8と、GPS受信機2による位置測位を適時に開始させ停止させる測位処理周期決定手段7とを有することにより、必要に応じてGPS受信機2での位置測位の動作を停止させ、ジャイロセンサー3での測位を行わせることができるので、GPS受信機2を適時に停止させている分だけ電力消費を低減して省電力化を図ることができる。

【0049】また、測位処理判定手段8は、地図情報に基づいてナビゲーション装置1の現在位置から次の道路分岐点までの距離を計測し、測位処理周期決定手段7は、計測した距離に応じてGPS受信機2における現在の位置の測位周期を決定することにより、計測した距離に応じてGPS受信機2におけるナビゲーション装置1の現在位置の測位周期を変更することができるので、たとえばナビゲーション装置1の現在位置から次の道路分岐点までの距離が長いと、GPS受信機2における測位動作の周期を長くすることができ、測位動作の周期が長くなった分だけ電力消費を低減して省電力化を図ることができる。

【0050】さらに、測位処理周期決定手段7は、地図情報に基づいてナビゲーション装置1の現在位置から次の道路分岐点までの距離が長いと測位処理判定手段8が判定した場合、GPS受信機2における測位動作の周期を長く、ナビゲーション装置1の現在位置から次の道路分岐点までの距離が短いと測位処理判定手段8が判定した場合、GPS受信機2における測位動作の周期を短くするか又は通常周期にすることにより、ナビゲーション装置1の現在位置から次の道路分岐点までの距離の長短に応じてGPS受信機2における測位動作の周期を長く又は短くすることができるので、電力消費を確実に低減することができると共に、位置測位の精度も維持することができる。

【0051】さらに、測位処理判定手段8は、トンネルに進入しトンネルを通過したか否かを判定し、測位処理周期決定手段7は、トンネルを通過した後はGPS受信機2における測位動作の周期を通常周期にすることにより、長時間のトンネル通過のためにジャイロセンサー3が劣化することによる位置測位の精度の劣化を防止することができる。

【0052】さらに、測位処理判定手段8は、走行している道路分岐の少ない道路において曲線道路が続くか否

かを判定し、測位処理周期決定手段7は、曲線道路が続くと測位処理判定手段8が判定した場合、GPS受信機2における測位動作の周期を通常の周期にすることにより、長時間の曲線道路通過のためにジャイロセンサー3が劣化することによる位置測位の精度の劣化を防止することができる。

【0053】さらに、GPS衛星からの電波のGPS受信機2における受信状態を監視する電波受信状態監視手段9を備え、測位処理周期決定手段7は、受信状態に応じてGPS受信機2における測位動作の周期を変化させることにより、GPS受信状態が悪化して位置測位の精度が劣化した場合でも、受信状態復帰直後のGPS受信機2における測位動作の周期を短くして位置測位の劣化を防止することができる。

【0054】さらに、測位処理判定手段8は、地図情報に基づいてナビゲーション装置1の現在位置が地図の道路上に正しくプロットされているか否かを判定し、地図の道路上に正しくプロットされていないと測位処理判定手段8が判定した場合、測位処理周期決定手段7は、GPS受信機2における測位動作の周期を通常の周期にすることにより、古い地図情報を使用したときにその地図情報に存在しない分岐した道路を走行すると、車両の位置が正しく表示されず、次の道路分岐までの距離が正確に計測されず、ジャイロセンサーによる位置測位では精度が悪化する場合があるが、そのような場合には、GPS受信機2における測位動作の周期を通常の周期として位置測位の精度を維持することができる。

【0055】さらに、測位処理周期決定手段7は、ジャイロセンサー3で検出した速度の変化に応じて測位動作の周期を変化させることにより、速度が遅くなると移動する距離も短くなるため、その分だけGPS受信機2における測位動作の周期を低減することができ、電力消費を低減することができる。

【0056】さらに、測位処理周期決定手段7は、ジャイロセンサー3で検出した速度が一旦停止を示した場合に測位動作を中断し、速度が移動し始めたことを示した場合は測位動作の周期を通常の周期に戻し、所定距離を走行した後に測位動作の周期を変化させることにより、測位動作の中断後の測位精度の劣化を回避することができ、また所定距離移動後は通常の電力消費低減の動作に移行することができる。

【0057】

【発明の効果】以上説明したように本発明の請求項1に記載のナビゲーション装置によれば、GPS衛星からの電波を受信して装置の現在位置を測位するGPS受信機と、装置の速度・進行方向の検出をして位置測位の補助を行うジャイロセンサーと、地図情報を記憶する地図情報記憶部と、全体を制御する制御回路とを有するナビゲーション装置であって、制御回路は、地図情報に基づいて分岐の少ない道路を走行しているか否かを判定する測

位処理判定手段と、GPS受信機による位置測位を適時に開始させ停止させる測位処理周期決定手段とを有することにより、必要に応じてGPS受信機での位置測位の動作を停止させ、ジャイロセンサーでの測位を行わせることができるので、GPS受信機を適時に停止させている分だけ電力消費を低減して省電力化を図ることができるという有利な効果が得られる。

【0058】請求項2に記載のナビゲーション装置は、請求項1に記載のナビゲーション装置において、測位処理判定手段は、地図情報に基づいて装置の現在位置から次の道路分岐点までの距離を計測し、測位処理周期決定手段は、計測した距離に応じてGPS受信機における現在位置の測位周期を決定することにより、計測した距離に応じてGPS受信機における装置の現在位置の測位周期を変更することができるので、たとえば装置の現在位置から次の道路分岐点までの距離が長いと、GPS受信機における測位動作の周期を長くすることができ、測位動作の周期が長くなった分だけ電力消費を低減して省電力化を図ることができるという有利な効果が得られる。

【0059】請求項3に記載のナビゲーション装置は、測位処理周期決定手段は、地図情報に基づいて装置の現在位置から次の道路分岐点までの距離が長いと測位処理判定手段が判定した場合、GPS受信機における測位動作の周期を長く、装置の現在位置から次の道路分岐点までの距離が短いと測位処理判定手段が判定した場合、GPS受信機における測位動作の周期を短くするか又は通常の周期にすることにより、装置の現在位置から次の道路分岐点までの距離の長短に応じてGPS受信機における測位動作の周期を長く又は短くすることができるので、電力消費を確実に低減することができると共に、位置測位の精度も維持することができるという有利な効果が得られる。

【0060】請求項4に記載のナビゲーション装置は、請求項1乃至3のいずれか1に記載のナビゲーション装置において、測位処理判定手段は、トンネルに進入しトンネルを通過したか否かを判定し、測位処理周期決定手段は、トンネルを通過した後はGPS受信機における測位動作の周期を通常の周期にすることにより、長時間のトンネル通過のためにジャイロセンサーが劣化することによる位置測位の精度の劣化を防止することができるという有利な効果が得られる。

【0061】請求項5に記載のナビゲーション装置は、請求項1乃至4のいずれか1に記載のナビゲーション装置において、測位処理判定手段は、走行している道路分岐の少ない道路において曲線道路が続くか否かを判定し、測位処理周期決定手段は、曲線道路が続くと測位処理判定手段が判定した場合、GPS受信機における測位動作の周期を通常の周期にすることにより、長時間の曲線道路通過のためにジャイロセンサーが劣化することによる位置測位の精度の劣化を防止することができるとい

う有利な効果が得られる。

【0062】請求項6に記載のナビゲーション装置は、請求項1乃至5のいずれか1に記載のナビゲーション装置において、GPS衛星からの電波のGPS受信機における受信状態を監視する電波受信状態監視手段を備え、測位処理周期決定手段は、受信状態に応じてGPS受信機における測位動作の周期を変化させることにより、GPS受信状態が悪化して位置測位の精度が劣化した場合でも、受信状態復帰直後のGPS受信機における測位動作の周期を短くして位置測位の劣化を防止することができるという有利な効果が得られる。

【0063】請求項7に記載のナビゲーション装置は、請求項1乃至6のいずれか1に記載のナビゲーション装置において、測位処理判定手段は、地図情報に基づいて装置の現在位置が地図の道路上に正しくプロットされているか否かを判定し、地図の道路上に正しくプロットされていないと測位処理判定手段が判定した場合、測位処理周期決定手段は、GPS受信機における測位動作の周期を通常の周期にすることにより、古い地図情報を使用したときにその地図情報に存在しない分岐した道路を走行すると、車両の位置が正しく表示されず、次の道路分岐までの距離が正確に計測されず、ジャイロセンサーによる位置測位では精度が悪化する場合があるが、そのような場合には、GPS受信機における測位動作の周期を通常の周期として位置測位の精度を維持することができるという有利な効果が得られる。

【0064】請求項8に記載のナビゲーション装置は、請求項1乃至7のいずれか1に記載のナビゲーション装置において、測位処理周期決定手段は、ジャイロセンサ

ーで検出した速度の変化に応じて測位動作の周期を変化させることにより、速度が遅くなると移動する距離も短くなるため、その分だけGPS受信機における測位動作の周期を低減することができ、電力消費を低減することができるという有利な効果が得られる。

【0065】請求項9に記載のナビゲーション装置は、請求項1乃至8のいずれか1に記載のナビゲーション装置において、測位処理周期決定手段は、ジャイロセンサーで検出した速度が一旦停止を示した場合は測位動作を中断し、速度が移動し始めたことを示した場合は測位動作の周期を通常の周期に戻し、所定距離を走行した後に測位動作の周期を変化させることにより、測位動作の中断後の測位精度の劣化を回避することができ、また所定距離移動後は通常の電力消費低減の動作に移行することができるという有利な効果が得られる。

【図面の簡単な説明】

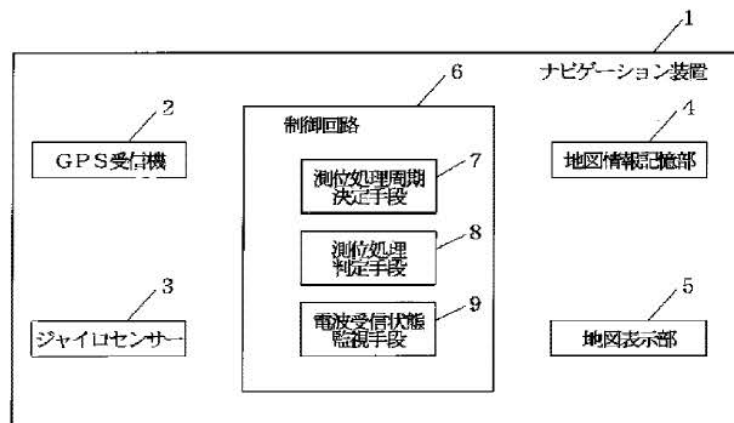
【図1】本発明の実施の形態1によるナビゲーション装置を示すブロック図

【図2】従来のナビゲーション装置を示すブロック図

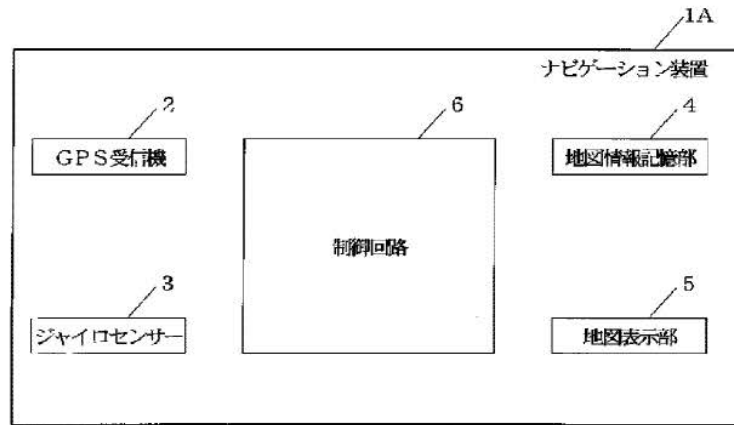
【符号の説明】

- 1 ナビゲーション装置
- 2 GPS受信機
- 3 ジャイロセンサー
- 4 地図情報記憶部
- 5 地図表示部
- 6 制御回路
- 7 測位処理周期決定手段
- 8 測位処理判定手段
- 9 電波受信状態監視手段

【図1】



【図2】



フロントページの続き

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最終頁に続く

(54) 【発明の名称】 移動体位置通報装置

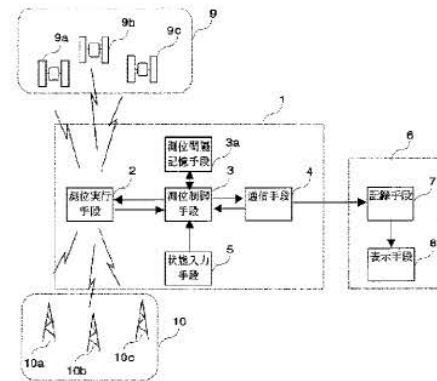
(57) 【要約】

【課題】被測位対象である移動体の位置を知らせる測位サービスを提供する際に総消費電力を低減することができ移動体位置通報装置の提供。

【解決手段】所定の測位間隔で測位を実行させる測位制御手段3と、現在位置を測定する測位実行手段2と、現在位置を外部に通報する通信手段4と、被測位対象の状態に関する情報を入力する状態入力手段5と、これら状態入力手段5、測位実行手段2、通信手段4からの情報に基づき設定した所定の測位間隔を記憶する測位間隔記憶手段3aとを備えた。これにより、被測位対象の作業状態や測位精度、通信状況に応じて上記の測位間隔を設定し無駄な測位動作を低減できる。

【選択図】

図1



1: 移動体位置通報装置
2: 測位センタ
3: GPS
3a: 測位間隔記憶手段
4: 測位制御手段
5: 状態入力手段
6: 測位センタ
7: 測位実行手段
8: 表示手段
9a~9c: GPS衛星
10: 携帯電話・PHSシステム
10a~10c: 基地局

【特許請求の範囲】

【請求項1】

所定の測位間隔で測位を実行させる測位制御手段と、この測位制御手段の制御によりGPSの電波と通信基地局の電波およびそれらの組み合わせで現在位置を測定する測位実行手段と、この測位実行手段で測定した現在位置を外部に通報する通信手段と、被測位対象の状態に関する情報を入力する状態入力手段とを具備した移動体位置通報装置において、前記状態入力手段より入力される前記被測位対象の状態に関する情報と、前記測位実行手段より得られる測位精度情報と、前記通信手段より得られる通信可否情報との内の少なくとも1つの情報に基づいて設定した前記所定の測位間隔を記憶する測位間隔記憶手段を備えたことを特徴とする移動体位置通報装置。

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【請求項2】

前記測位制御手段は、前記被測位対象の状態に関する情報に基づいて前記被測位対象が特定の位置区域に滞留中であると判断するとともに、これに伴い前記所定の測位間隔を、前記被測位対象が移動するときの測位間隔より長く設定し、また前記測位精度情報に基づいて測位精度が低下したと判断するとともに、これに伴い前記所定の測位間隔を、前記被測位対象が移動するときの測位間隔より長く設定し、また前記通信可否情報に基づいて通信圏外にあると判断するとともに、これに伴い前記所定の測位間隔を、前記被測位対象が移動するときの測位間隔より長く設定することを特徴とする移動体位置通報装置。

【請求項3】

前記測位制御手段は、前記被測位対象の状態に関する情報に基づいて前記被測位対象が移動中であると判断するとともに、これに伴い前記測位間隔を、前記被測位対象が滞留中の測位間隔より短く設定することを特徴とする移動体位置通報装置。

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【発明の詳細な説明】

【0001】

【発明の属する技術分野】

本発明は、被測位対象である移動体の位置を通報する移動体位置通報装置に係り、特に、サービスマンや警備員などの業務を行う際に本装置を携行し、各人物の位置を通知して位置に関する情報を提供するサービスに用いたり、各人物の位置関係を把握して迅速な人員の派遣や配備を実施する位置情報を利用した業務支援システムに用いるのに好適な移動体位置通報装置に関する。

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【0002】

【従来の技術】

近年、人工衛星や携帯電話の基地局やPHSの基地局からの電波を受信し、複数の電波の到達所要時間や強度を使用して、被測位対象の位置（緯度、経度）を測定し、被測位対象の位置を特定して利用する測位技術が、カーナビゲーションやパスロケータなどの交通システムや、営業マン支援や老人の探索などのマンロケーションシステム、貴重品や現金輸送車の追跡などのセキュリティシステムにおいて実用化されてきている。

【0003】

例えば、人工衛星からの電波を受信し位置を測定する技術として、GPS（すなわちGlobal Positioning System）が挙げられる。このGPSは人工衛星を利用した全世界的な電波測位システムで、24個の衛星が6つの軌道面にそれぞれ4個ずつ配置されており、原理的には各衛星からの電波を受信し、その到達時間から衛星と受信地点との距離を算出し、最終的に受信点の三次元測位（すなわち緯度、経度、高度）を求めることができるものである。

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【0004】

また、携帯電話の基地局やPHSの基地局からの電波を受信し位置を測定する技術として、現在携帯電話が通信を行っている携帯電話の基地局の位置を利用して位置を測定する技術と、携帯電話や被測位対象機器において複数の基地局の電波を受信し、前記複数の基地局からの電波の強度や、電波の到達所要時間を使用して、携帯電話や被測位対象機器の位置を測定する技術がある。

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【0005】

さらに、最近の携帯電話や携帯端末においては、前記のGPSによる測位技術のみを用いた測位サービスと、前記の携帯電話の基地局やPHSの基地局からの電波を受信して位置を測定する測位サービス、および前記の両方の測位技術を同時に使用する測位サービスが提供されている。GPSによる測位技術のみを用いた測位サービスとしては、株式会社NTTドコモが提供している歩行者ナビゲーションサービス「どこNavい」等があり、携帯電話の基地局、PHSの基地局からの電波を利用する測位サービスとしては、株式会社NTTドコモの「iエリア」や「いまどきサービス」、JーPhone株式会社の「JーSkンステーション」等があり、前記の両方の測位技術を同時に使用する測位サービスとして、KDDI株式会社の「GPSOne」が提供されている。また、これらの測位サービスを利用してナビゲーションや位置探索を行う例として、特開2000-249565号公報や特開9-58957号公報に記載されているような応用方法が提案されている。

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【0006】

【発明が解決しようとする課題】

ところで、上記した従来技術では、測位サービスを提供する際に、携帯の際の利便性や携帯電話の通信・通話機能との連携による機能向上を目的として、携帯電話に測位機能を実現する機器を内蔵し、携帯電話の通話・通信機能部分と電源を共有して動作させる方式の製品が現れてきている。しかしながら、この方式においては、通常の携帯電話の機器の消費電力に加えて、測位機能を実行する機器の消費電力が加わるため、携帯電話の利用可能な時間が短くなってしまうという状況が発生し、携帯電話の小型化に伴うバッテリー等の小型化を進めるためには総消費電力を低減するための改良が必要になってきている。

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【0007】

本発明は、上記のような従来技術における実情に鑑みてなされたもので、その目的は、被測位対象である移動体の位置を知らせる測位サービスを提供する際に総消費電力を低減することのできる移動体位置通報装置を提供することにある。

【0008】

【課題を解決するための手段】

上記目的を達成するため本発明の請求項1に係る発明は、所定の測位間隔で測位を実行させる測位制御手段と、この測位制御手段の制御によりGPSの電波と通信基地局の電波およびそれらの組み合わせで現在位置を測定する測位実行手段と、この測位実行手段で測定した現在位置を外部に通報する通信手段と、被測位対象の状態に関する情報を入力する状態入力手段とを具備した移動体位置通報装置において、前記状態入力手段より入力される前記被測位対象の状態に関する情報と、前記測位実行手段より得られる測位精度情報と、前記通信手段より得られる通信可否情報との内の少なくとも1つの情報に基づいて設定した前記所定の測位間隔を記憶する測位間隔記憶手段を備えた構成にしてある。

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【0009】

このように構成した請求項1に係る発明では、状態入力手段より被測位対象の状態に関する情報を入力するとともに、測位実行手段より測位精度情報を入力して、通信手段より通信可否情報を入力し、これらの内の少なくとも1つの情報に基づいて、測位制御手段により測位間隔を設定して測位間隔記憶手段に記憶する。次いで、測位制御手段の制御により前記の測位間隔をおりて測位実行手段で現在位置を測定するとともに、通信手段により現在位置を外部に通報する。

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【0010】

このように構成した本発明では、被測位対象が移動しない場合や、測位精度の悪化、通信状態の悪化などが生じた場合に、測位間隔を比較的長く設定することにより測位実行手段で現在位置を測定する頻度を少なくして無駄な測位動作を省くことができ、これによって、被測位対象である移動体の位置を知らせる測位サービスを提供する際に総消費電力を低減することができる。

【0011】

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【発明の実施の形態】

以下、本発明の移動体位置通報装置の実施の形態を図に基づいて説明する。

【0012】

図1は本発明の一実施形態に係る移動体位置通報装置を示すブロック図、図2は本実施形態の処理手順を示すフローチャート、図3は本実施形態の動作を説明するタイムチャート、図4は本実施形態に設けられる状態入力手段の一例を示す図である。

【0013】

図1に示す本実施形態の移動体位置通報装置1は、GPS9や携帯電話・PHSシステム10を利用して被測位対象である移動体の位置を測位し、測位センタ6に報告を行う機能を有しており、この移動体位置通報装置1は、被測位対象である例えばサービスマンや警備員などにより携行され、これらのサービスマンや警備員等は業務を開始した時点で移動体位置通報装置1の電源を投入した後、業務中は常に携行して客先での作業開始時および終了時に、移動体位置通報装置1を操作して作業種別と作業状態を入力して報告するようになっている。

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【0014】

また移動体位置通報装置1は、測位実行手段2と、測位制御手段3と、測位間隔記憶手段3aと、通信手段4と、状態入力手段5と、図示しない通話機能、および各部に電源を供給するバッテリー（図示せず）とで構成されている。

【0015】

測位実行手段2は、GPS9の各GPS衛星9a～9cからの電波や、携帯電話・PHSシステム10の基地局10a～10cからの電波を受信し、移動体位置通報装置1を携行するサービスマンや警備員などの位置（緯度、経度）と測位日時および測位の精度を提供するものである。この機能を満たすものとしては、例としてKDDI株式会社の「GPS One」が挙げられる。この「GPS One」は、測位完了時に、前記の移動体の位置と測位日時とともに、測位精度として、予想される測位誤差と、測位方式（例えば、GPS電波のみでの測位、GPS電波と基地局電波を併用、基地局電波のみを使用した三角測量、基地局電波強度を利用等）を提供する機能を持つため、本実施形態として好適である。

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【0016】

測位制御手段3は、測位実行手段2の測位実行制御と測位結果の読み出し、通信手段4の通信実行制御を行うとともに、通信実行状態の読み出して評価を行うものである。この評価の方法としては、予想される測位誤差を所定の値で判定する方法と、測位方式によって評価する方法、およびこの両方を利用する方法とが挙げられる。上述した予想される測位誤差を所定の値として、GPSの公称精度である10m、あるいは、建物内と判断する距離、例えば50mが考えられる。また、測位方式によって評価する方法としては、比較的測位精度が高いGPS測位とGPSと基地局の電波を併用した測位を測位精度良好と判断し、測位精度が低い基地局の電波のみによる測位や基地局の電波の強度による測位を測位精度不良と判断する方法がある。ただし、GPSのみの測位でも、GPS衛星9a～9cの天空上での配置や受信状況によっては大きな測定誤差が発生する場合があるため、両方の方法を併用することが望ましい。

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【0017】

測位間隔記憶手段3aは、移動体位置通報装置1にて測位を実施する間隔を記憶するものであり、電源投入中は所定の測位間隔を保持し続ける機能を持つ。例えば、移動体位置通報装置1を携行するサービスマン等の移動中の測位間隔を5分として設定し、一方、作業中、測位精度低下時、および通信不良時（携帯電話やPHSの電波が届かない地下等にいるとき）は、それぞれ通常の屋外における移動時と同じ測位間隔での測位は不必要であるため、測位間隔を移動中の設定よりも長い時間、例えば15分として設定するようになっている。

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【0018】

通信手段4は、携帯電話・PHSシステム10や公衆無線LANシステム（図示せず）などを経由して測位センタ6と通信を行い、測位結果や移動体の状態を伝送する機能を持つ

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。また、この通信手段４からは、通信可否情報として現在の基地局からの電波の強度や、基地局との通信が可能かどうかの情報を読み出すことが可能である。

【００１９】

状態入力手段５は、移動体位置通報装置１を携帯するサービスマン等が、例えば携帯電話により作業の状況を入力するものであり、この状態入力手段５では、サービスマン等が作業の状況を入力した際に、図４に示す入力画面５０が表示される。この入力画面５０には、現在の作業の種別を入力する作業種別入力項目５１、作業先の情報（お客様ＮＯ等）を入力するお客様番号入力項目５２、作業中や移動中の状態を入力する作業状態入力項目５３、移動体位置通報装置１を持つ個人を特定する為の情報を入力する個人情報入力項目５４、および報告を指示する報告ボタン５５が含まれている。作業状態入力項目５３により作業中や移動中の状態を入力した場合、移動体位置通報装置１の電源が投入され、動作を開始した直後は移動中の状態に設定されている。また、報告ボタン５５を押下することにより、上記の電源投入後に実行される実行動作とは非同期に、測位・報告動作が１回のみ実行される。

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【００２０】

測位センタ６は、移動体位置通報装置１を携帯するサービスマン等の位置情報の提供や管理を行う機能を持ち、この測位センタ６は、測位結果や作業状態の情報を記録する記録手段７と、この記録手段７の情報を使用して、例えば地図上へのサービスマン等の位置の表示を行う等の機能を持つ表示手段８とで構成されている。

【００２１】

この実施形態の移動体位置通報装置１にあっては、図２に示す処理手順にしたがって被測位対象であるサービスマン等の位置を通報するようになっている。すなわち、まず手順Ｓ１として、移動体位置通報装置１の電源を投入すると、測位制御手段３は状態入力手段５より現在の作業状態を読み出し、例えば、入力画面５０の作業状態入力項目５３に「作業中」や「移動中」の状態を表示する。そこで、手順Ｓ２として、サービスマン等が「移動中」の欄を選択して入力すると、現在の作業状態が作業中で無い（すなわち移動中）と判定し、手順Ｓ３として測位間隔記憶手段３αに対して、移動中の通常の測位間隔（５分）を設定する。

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【００２２】

一方、上記の手順Ｓ２で、サービスマン等が「作業中」の欄を選択して入力すると、手順Ｓ４として、サービスマン等が所定の建物や地区内で作業を行っているため以降頻繁な測位は不必要であると判断し、測位間隔記憶手段３αに対して例えば１５分の測位間隔を設定する。

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【００２３】

次に手順Ｓ５として、測位制御手段３は測位実行手段２に対して測位動作を行うように指示し、測位実行手段２は、例えばＧＰＳや携帯電話・ＰＨＳシステム１０を利用して測位動作を行う。ここで、前記の測位技術である「ＧＰＳＯｎｅ」を使用して測位を行った場合、測位結果として、位置（緯度、経度）、測位日時とともに、測位精度として、予想される測位誤差と、測位方式が測位結果として得られる。

次に手順Ｓ６として、測位制御手段３は手順Ｓ５で得た測位結果より測位精度の評価を行い、この測位精度が良好でないと判断された場合、手順Ｓ７として、通常の屋外における移動時と同じ測位間隔での測位は不必要であるため、測位間隔を当初の設定よりも長い時間、例えば１５分に設定する。

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【００２４】

次に手順Ｓ８として、測位制御手段３は手順Ｓ２で得た現在の作業状態と手順Ｓ５で得た測位結果を通信に好適な状態に編集し、通信手段４に対して測位センタ６に向けて送信するように指示を行う。ここで、通信手段４より通信が不可能であった場合、手順Ｓ９として、携帯電話やＰＨＳの電波が届かない地下等にいると判別し、手順Ｓ１０として、通常の屋外における移動時と同じ測位間隔での測位は不必要であるため、測位間隔を当初の設定よりも長い時間、例えば１５分に設定する。

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【0025】

上記の手順S1～S10の処理を行った後、手順S11として、フローチャートの動作の開始状況（電源投入による開始、または報告ボタン55による開始）を判別し、電源投入による起動であったと判別した場合、手順S12として測位制御手段3は、手順S1～S10にて設定された測位間隔（5分または15分）を測位間隔記憶手段3aより読み出し、設定された測位間隔時間の間、待機した後に、再度手順S1に戻って手順S1～S10の処理を繰り返す。また、前記の手順S11にて報告ボタン55による起動であったと判別した場合、1回のみ測位・通信動作を実行して一連の処理を終了する。よって、測位間隔記憶手段3aには、報告ボタン55による起動時の状況に応じた測位間隔が設定されている。

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【0026】

さらに、前記の図2のフローチャートによる測位動作の例を図3のタイムチャートを使用して説明する。すなわち、サービスマン等が就業開始後、移動体位置通報装置1の電源を投入し、期間71に屋外を作業先まで移動していく場合、移動体位置通報装置1は手順S1～S3、S5、S6、S8、S9、S11、S12を繰返し実行しており、測位間隔記憶手段3aに5分が設定されるため、5分間隔で測位を行い位置を報告するので、測位センタ6では移動中のサービスマン等の位置を詳細に追跡することが可能となる。

【0027】

次に、サービスマン等が移動中、期間72に地下鉄や地下街に入り移動する状況である場合、移動体位置通報装置1は手順S1～S3、S5～S9、S11、S12（測位精度が悪化した、または測位不可能であった場合）、または手順S1～S3、S5、S6、S8～S12（測位は実施できたが、測位センタ6との通信が不可能であった場合）を実施し、この結果、屋外移動時よりも長い間隔（15分）で測位を行うこととなる。

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【0028】

次に、サービスマン等が期間73に地下街や地下鉄より屋外に出て移動している場合、地下街や地下鉄より屋外に出た後の最初の動作により、期間71と同様に測位間隔記憶手段3aに5分が設定され、この5分間隔で測位を行い位置を報告するので、測位センタ6では移動中のサービスマン等の位置を再度詳細に追跡することが可能となる。

【0029】

次に、サービスマン等が作業先に到着した際には、状態入力手段5より、現在の作業状態を入力画面50の作業状態入力項目53にて「作業中」として入力し、報告ボタン55を押下して業務報告を行う。この操作により、移動体位置通報装置1は手順S1、S2、S4～S6、S8、S9、S11の処理を1回実行し、測位間隔記憶手段3aに15分が設定される。よって、以降の期間74にフローチャートの自動実行にて測位間隔記憶手段3aに15分と設定されているため、15分間隔で測位を行い位置を報告することとなる。

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【0030】

このようにして作業が完了し、次の現場に向かう際に、サービスマン等は状態入力手段5より現在の作業状態を入力画面50の作業状態入力項目53にて「移動中」として入力し、報告ボタン55を押下して業務報告を行う。この操作により、移動体位置通報装置1は手順S1～S3、S5、S6、S8、S9、S11の処理を1回実行し、測位間隔記憶手段3aに5分が設定される。よって、以降の期間75にフローチャートの自動実行にて、測位間隔記憶手段3aに5分と設定されているため、5分間隔で測位を行い位置を報告することとなる。

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【0031】

以降同様に、屋内移動中の期間76に測位精度が悪化したり、通信不能となった場合、測位間隔が15分となり、屋外移動時の期間77に測位間隔が5分に戻る。その後、作業中の期間78に、報告ボタン55の操作により測位間隔が15分となり、作業終了後の屋外移動中の期間79で測位間隔が5分に戻る。

【0032】

このように構成した本実施形態では、移動体位置通報装置1を携行するサービスマンや警

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備員等の作業状況、測位実行時の精度および通信状況に応じて、測位の時間間隔を自動的に設定し、状況に応じた最適な測位間隔で測位および業務状況の報告を行うことが可能となる。この動作により、従来の構成の移動体位置通報装置における測位動作と比較して、移動体位置通報装置 1 は、測位対象が移動しない場合や、測位精度の悪化、通信状態の悪化などにおける無駄な測位動作を大幅に省くことが可能となる。

【0033】

なお、本実施形態では、移動中の測位間隔を 5 分として設定し、作業中、測位精度低下時、および通信不良時の測位間隔をそれぞれ 15 分として設定する場合を例示したが、この測位間隔は、測位対象の移動速度や作業時間に応じて変更してもよい。例えば、測位対象が徒歩以外の交通手段で移動する場合、移動中の測位時間を 5 分より短くすることにより、より詳細に追跡することが可能となる。また、作業先での平均作業継続時間が数時間に及ぶ場合、作業中の測位間隔を 30 分などに変更してもよい。

【0034】

【発明の効果】

以上説明したように本発明によれば、測位対象が移動しない場合や、測位精度の悪化、通信状態の悪化などにおける無駄な測位動作を大幅に省くことが可能となるため、被測位対象である移動体の位置を知らせる測位サービスを提供する際に総消費電力を低減することができる。したがって、移動体位置通報装置を含んだ携帯電話や携帯用通信機器の長時間動作やバッテリーの小型化が可能となるという効果がある。

【図面の簡単な説明】

【図 1】本発明の一実施形態に係る移動体位置通報装置を示すブロック図である。

【図 2】本実施形態の処理手順を示すフローチャートである。

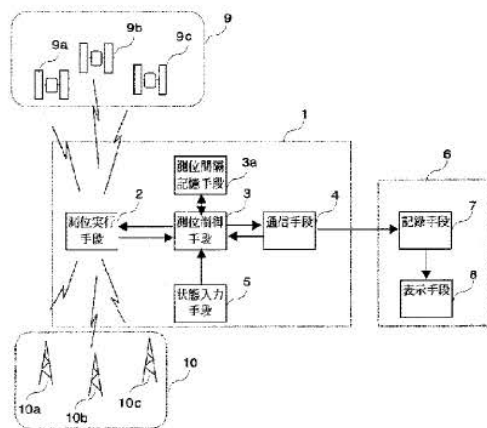
【図 3】本実施形態の動作を説明するタイムチャートである。

【図 4】本実施形態に設けられる状態入力手段の一例を示す図である。

【符号の説明】

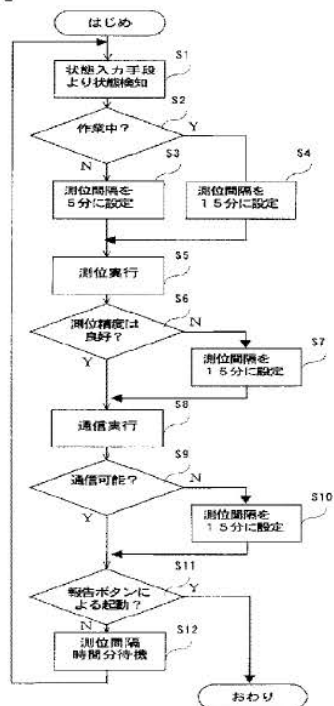
- 1 移動体位置通報装置
- 2 測位実行手段
- 3 測位制御手段
- 3a 測位間隔記憶手段 3
- 4 通信手段
- 5 状態入力手段
- 6 測位センタ
- 7 記録手段
- 8 表示手段
- 9 GPS
- 9a～9c GPS衛星
- 10 携帯電話・PHSシステム
- 10a～10c 基地局
- 50 入力画面
- 51 作業種別入力項目
- 52 お客様番号入力項目
- 53 作業状態入力項目
- 54 個人情報入力項目
- 55 報告ボタン

【図 1】

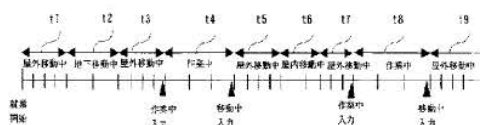


1: 移動体位置通報装置
 9: GPS
 10: 携帯電話・PHSシステム
 6: 測位センタ
 9a~9c: GPS衛星
 10a~10c: 基地局

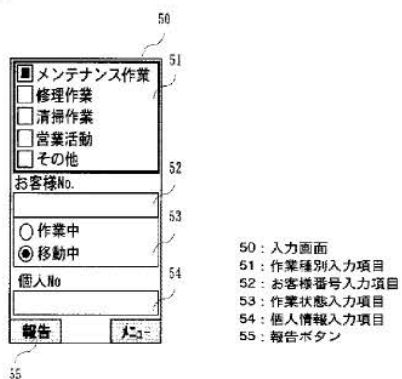
【図 2】



【図 3】



【図 4】



50: 入力画面
 51: 作業種別入力項目
 52: お客様番号入力項目
 53: 作業状態入力項目
 54: 個人情報入力項目
 55: 報告ボタン

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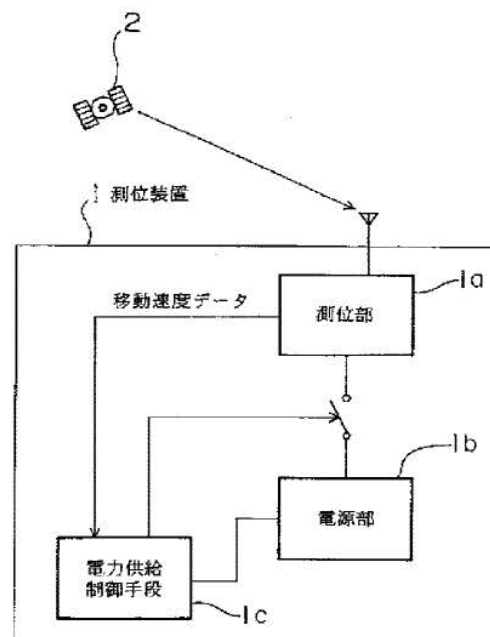
東京都品川区北品川6丁目7番35号 ソニー株式会社内

(54) 【発明の名称】 測位装置

(57) 【要約】

【課題】 間欠的に測位データを受信しながら移動体の現在位置を検出する測位装置において、省電力化を図る一方で、常に最適な移動距離間隔で測位データを受信できるようにする。

【解決手段】 測位部1aは、GPS衛星2から送られる測位データを含んだ電波を受信し、測位装置1が備えられている移動体の現在の位置や移動速度等を検出する。これらの検出データのうち、移動速度データは、電力供給制御手段1cに送られる。電力供給制御手段1cは、電源部1bから測位部1aへの電力供給を周期的に行うように制御している。そして、電力供給制御手段1cは、現在の移動速度が速いほど、電源部1bから測位部1aへの電力供給の周期を短くする。これにより、現在の移動速度が速いほど、測位部1aの受信動作が停止している時間も短くなる。



【特許請求の範囲】

【請求項1】 間欠的に測位データを受信しながら移動体の現在位置を検出する測位装置において、電力供給がなされるたびに前記移動体の現在の位置および移動速度を検出する測位部と、前記測位部へ前記電力供給を行う電源部と、前記移動体の現在の移動速度が速いほど、前記電源部から前記測位部への電力供給の周期を短くする電力供給制御手段と、を有することを特徴とする測位装置。

【請求項2】 前記電力供給制御手段は、前記電力供給の周期を前記移動速度に反比例した値に設定するように構成されていることを特徴とする請求項1記載の測位装置。

【請求項3】 前記電力供給制御手段は、前記移動速度が所定値以下の場合には、前記電力供給の周期を一定の値に保持するように構成されていることを特徴とする請求項1記載の測位装置。

【請求項4】 間欠的に測位データを受信しながら移動体の現在位置を検出する測位装置において、外部からの検出指令信号に応じて前記移動体の現在の位置および移動速度を検出する測位部と、前記現在の移動速度が速いほど前記受信動作の停止時間が短くなるように前記検出指令信号を出力して、前記測位部の受信動作を制御する受信動作制御手段と、を有することを特徴とする測位装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は測位データを受信して移動体の現在位置を検出する測位装置に関し、特に間欠的に測位データの受信を行う測位装置に関する。

【0002】

【従来の技術】ナビゲーションシステムでは、通常、GPS(Global Positioning System)と呼ばれる測位装置を搭載している。測位装置は、GPS衛星から送られる測位データの含まれた電波を受信することにより、移動体の現在位置や速度を検出する。ただし、この電波の受信時には、比較的大きな電力を必要とする。このため、カーナビゲーションのように電源が十分にあるところでの連続受信には問題ないが、携帯型のナビゲーションシステムのように電池を使用するタイプでは、電池の寿命を長くするために、できる限りの省電力化を図ることが必要である。

【0003】そこで、従来は、間欠受信という制御を行っていた。間欠受信とは、測位データの受信を断続的に行って、受信以外の時間は測位装置での電力消費を極力少なくするものである。この間欠受信における受信動作の停止時間は、通常は数分程度に設定されている。

【0004】

【発明が解決しようとする課題】しかし、この受信動作

の停止間隔を一定にすると、移動体の移動速度によって、前回の受信から今回の受信までの移動距離が異なることになる。例えば、5秒間隔で受信を行う場合、移動速度が10km/hの時には、前回の受信時から今回の受信までに移動体が約14m移動する。これに対し、移動速度が100km/hの時には、前回の受信時から今回の受信までに約140m移動する。

【0005】このように、従来の間欠受信では、移動速度に変化があると、その速度差によって受信毎の移動量が大きく違ってしまい、一定の位置検出精度が得られないという問題があった。

【0006】本発明はこのような点に鑑みてなされたものであり、省電力化を図る一方で、位置検出精度の高い測位装置を提供することを目的とする。

【0007】

【課題を解決するための手段】本発明では上記課題を解決するために、間欠的に測位データを受信しながら移動体の現在位置を検出する測位装置において、電力供給がなされるたびに前記移動体の現在の位置および移動速度を検出する測位部と、前記測位部へ前記電力供給を行う電源部と、前記移動体の現在の移動速度が速いほど、前記電源部から前記測位部への電力供給の周期を短くする電力供給制御手段と、を有することを特徴とする測位装置が提供される。

【0008】このような構成の測位装置では、電力供給制御手段が、移動体の現在の移動速度が速いほど、電源部から測位部への電力供給の周期を短くする。これにより、測位部の受信動作の停止時間も、現在の移動速度が速いほど短くなる。

【0009】

【発明の実施の形態】以下、本発明の一形態を図面を参照して説明する。図1は本形態の測位装置の機能の概念図である。測位装置1は、例えばナビゲーション装置であり、電源部1bを電力源としている。測位部1aは、電力供給を受けているとき、GPS衛星2から送られる測位データを含んだ電波を受信し、測位装置1が備えられている移動体の現在の位置や移動速度等を検出する。これらの検出データのうち、位置データは、図示されていないナビゲーション機能部等に送られる。一方、移動速度データは、電力供給制御手段1cに送られる。

【0010】電力供給制御手段1cは、電源部1bから測位部1aへの電力供給を周期的に行うように制御している。そして、電力供給制御手段1cは、現在の移動速度が速いほど、電源部1bから測位部1aへの電力供給の周期を短くする。これにより、現在の移動速度が速いほど、測位部1aの受信動作が停止している時間も短くなる。

【0011】図2は本形態の測位装置としてのナビゲーション装置のハードウェアの概略構成を示すブロック図である。ここで示すナビゲーション装置10は、例えば

徒歩で目的地を探すときに使用できる携帯型の装置である。ナビゲーション装置10は、プロセッサやメモリを中心とする制御ユニット11によって全体が制御される。

【0012】制御ユニット11には、キーボード13、液晶型のモニタ14、スピーカ15等が、図示されていないインタフェースを介して接続されている。制御ユニット11は、キーボード13を介して動作指令等を受け、モニタ14上でナビゲーション表示を行い、スピーカ15からアナウンス音や警告音等を出力する。このようなナビゲーション装置10は、電池12を電力源としている。

【0013】また、ナビゲーション装置10には、測位ユニット20が装着されている。測位ユニット20は、例えばGPS(Global Positioning System)であり、GPS衛星からの測位データを受信する。測位ユニット20は、スイッチ16を介して電池12に接続されている。スイッチ16は、制御ユニット11によって、オン、オフ制御される。

【0014】測位ユニット20は、電池12から電力が供給されているときには、測位データを含む電波を受信する。そして、測位ユニット20は、受信した測位データに基づいて、ナビゲーション装置10が装着された移動体(ここでは、人により携帯されているものとする。)の現在位置や移動速度を検出し、これらのデータを図示されていないインタフェースを介して制御ユニット11に送る。

【0015】制御ユニット11は、測位ユニット20を受信動作させるときには、スイッチ16を一定時間オンにし、測位ユニット20の受信動作を停止させるときには、スイッチ16を移動体の速度に応じた時間だけオフにする。このスイッチ16のオン、オフ制御を連続的に行うことにより、受信動作を間欠的に行うことができる。

【0016】次に、このような構成のナビゲーション装置10における間欠的な受信動作の制御手順について説明する。図3は本形態のナビゲーション装置10における間欠的な受信動作の制御手順を示すフローチャートである。このフローチャートは、測位ユニット20から移動体の速度データが入力される度に実行される。

〔S1〕速度データを取り込む。

〔S2〕移動体の速度 V が $V \leq 0.5 \text{ km/h}$ であればステップS3に進み、 $V > 0.5 \text{ km/h}$ であればステップS4に進む。

〔S3〕受信動作の停止時間を一定値、例えば10秒にセットする。

〔S4〕移動体の速度 V が $V \geq 30 \text{ km/h}$ であればステップS5に進み、 $V < 30 \text{ km/h}$ であればステップS6に進む。

〔S5〕受信動作を連続受信状態(1秒間隔程度)にセ

ットする。

〔S6〕受信動作の停止時間を $k \cdot 1/V$ にセットする。ここで、係数 k は、70程度の数値である。

〔S7〕セットされた受信動作の停止時間に応じて、スイッチ16のオン・オフを切替制御して、間欠的な受信動作を実行する。

【0017】このように、本形態では、間欠的な受信動作の停止時間を $k \cdot 1/V$ となるようにしたので、移動の速度 V に応じて、測位データ検出毎の移動距離を一定にできる。このため、間欠的な受信動作により省電力化を図る一方で、常に最適な移動距離間隔で測位データを受信することができる。

【0018】また、本形態では、移動体の速度 V が $V \leq 0.5 \text{ km/h}$ であれば、受信動作の停止時間を一定値(10秒)としたので、移動体がほとんど停止している状態でも、一定間隔で測位データを受信することができる。

【0019】なお、本形態では、スイッチ16を使用して電池12からの電力供給をオン・オフ制御することにより、測位ユニット20の間欠的な受信動作の停止時間を制御するようにしたが、測位ユニット20内に、外部からの指令信号に応じて受信状態を自らオン、オフできる回路が組み込まれていれば、受信動作の停止時間を制御ユニット11から直接指令するようにしてもよい。

【0020】また、本形態では、GPS衛星からの電波を受信することにより測位を行う例を示したが、他の種類の衛星からの電波や、地表局からの電波等に基づいて測位を行うシステムにも、本発明を適用することができる。

【0021】

【発明の効果】以上説明したように本発明では、現在の移動速度が速いほど電源部から測位部への電力供給の周期を短くするようにしたので、測位部の受信動作の周期も現在の移動速度が速いほど短くできる。よって、移動速度が変わっても、受信毎の移動距離を一定にできるので、間欠的な受信動作により省電力化を図る一方で、位置検出精度を向上させることができる。

【図面の簡単な説明】

【図1】本形態の測位装置の機能の概念図である。

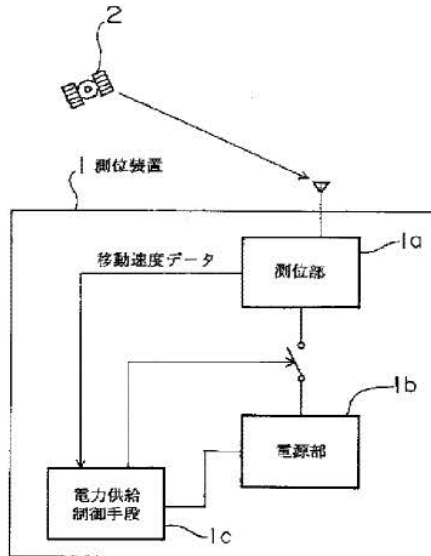
【図2】本形態の測位装置としてのナビゲーション装置のハードウェアの概略構成を示すブロック図である。

【図3】本形態のナビゲーション装置における間欠的な受信動作の制御手順を示すフローチャートである。

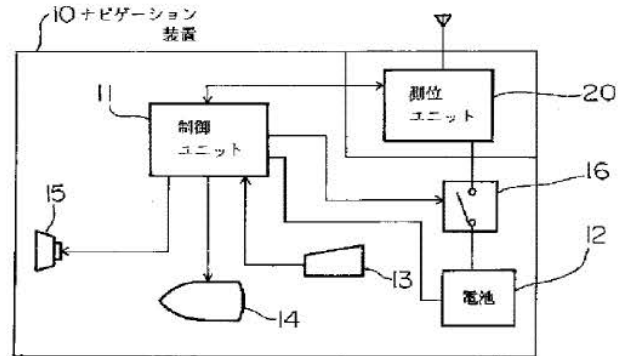
【符号の説明】

1・・・測位装置、1a・・・測位部、1b・・・電源部、1c・・・電力供給制御手段、2・・・GPS衛星、10・・・ナビゲーション装置、11・・・制御ユニット、12・・・電池、16・・・スイッチ、20・・・測位ユニット。

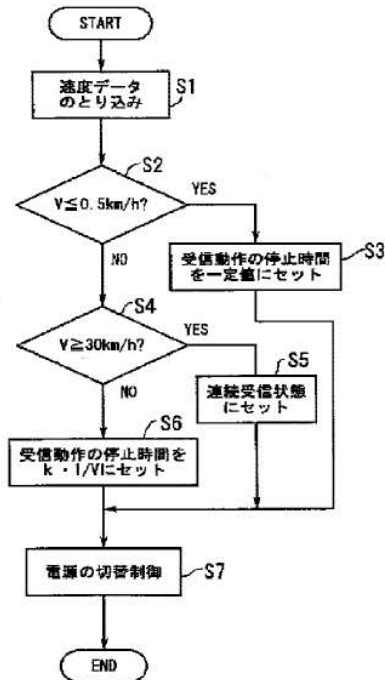
【図1】



【図2】



【図3】



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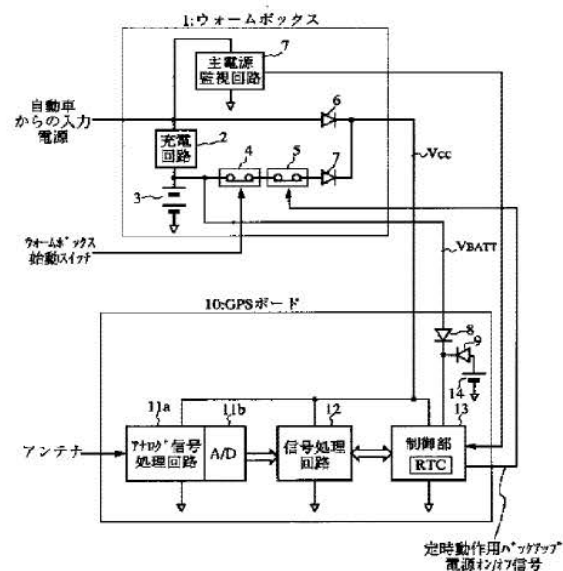
(54) 【発明の名称】 測位装置および測位方法

(57) 【要約】

【目的】 電源オン後最初の測位結果が得られるまでの時間を短くした測位装置および測位方法を提供する。

【構成】 電源オフ期間中に、既に収集されている各衛星の軌道情報の有効時間が経過するまでの周期で、短時間だけ電源をオンし、軌道情報の収集および測位を行う。

【効果】 長い電源オフ期間の後電源をオンした場合でも、衛星の軌道情報を新たに収集する必要がなく、また電源オフ期間中に測位装置が大きく移動しても、電源オン直後からサーチすべき衛星を適正に選択できるため、サーチに要する時間が短縮化して電源オン後速やかに最初の測位結果が得られる。



【特許請求の範囲】

【請求項1】 複数の測位用衛星からの信号を受信し、各測位用衛星の軌道情報を収集して記憶更新する軌道情報収集手段と、前記各測位用衛星の軌道情報を用いて受信点の位置を算出する測位演算手段とを備える測位装置において、

電源オフ期間などの動作停止期間中に、前記軌道情報収集手段により収集された各測位用衛星の軌道情報の有効時間が経過するまでに短時間だけ前記軌道情報収集手段を起動させる短時間起動手段を設けることにより、電源オン時などの動作開始時に前記軌道情報収集手段により既に収集されている軌道情報を用いて前記測位演算手段が受信点の位置を算出することを特徴とする測位装置。

【請求項2】 受信点の推定位置と各衛星の軌道情報を用いて各測位用衛星の信号をサーチし、受信する衛星信号受信手段と、該衛星信号受信手段により受信された信号から各測位用衛星の軌道情報を収集して記憶更新する軌道情報収集手段と、前記各測位用衛星の軌道情報を用いて受信点の位置を算出する測位演算手段とを備える測位装置において、

電源オフ期間などの動作停止期間中に、一定時間毎に短時間だけ前記軌道情報収集手段および前記測位演算手段を起動させる短時間起動手段を設けることにより、電源オン時などの動作開始時に前記測位演算手段により求められた最終の受信点の位置情報を前記受信点の推定位置として前記衛星信号受信手段が各測位用衛星をサーチすることを特徴とする測位装置。

【請求項3】 電源オン期間などの動作期間中に、複数の測位用衛星からの信号を受信し、各測位用衛星の軌道情報を収集して記憶更新し、前記各測位用衛星の軌道情報を用いて受信点の位置を算出し、

電源オフ期間などの動作停止中に、既に収集している各衛星の軌道情報の有効時間が経過するまでに短時間だけ各測位用衛星の軌道情報を収集して記憶更新し、電源オン時などの動作開始時に、既に収集されている軌道情報を用いて受信点の位置を算出することを特徴とする測位方法。

【請求項4】 電源オン期間などの動作期間中に、複数の測位用衛星からの信号をサーチして受信し、各測位用衛星の軌道情報を収集して、これらの軌道情報を用いて受信点の位置を算出し、

電源オフ期間などの動作停止期間中に、一定時間毎に短時間だけ、受信点の推定位置と既に収集している各測位用衛星の軌道情報を用いて各測位用衛星の信号をサーチして受信し、各測位用衛星の軌道情報を用いて受信点の位置を算出し、

電源オン時などの動作開始時に最終の受信点の位置情報を各測位用衛星の信号をサーチする際の受信点の推定位置とするとともに、該受信点の推定位置と各衛星の軌道情報とを用いて各衛星の信号をサーチして受信し、各測

位用衛星の軌道情報を用いて受信点の位置を算出することを特徴とする測位方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明は、測位用衛星から送信される電波を受信して測位を行う測位装置および測位方法に関する。

【0002】

【従来の技術】従来より、例えばGPSなどの測位システムにおいては、各測位用衛星から受信点までの距離を観測するための情報および各測位用衛星の位置を算出するための情報を各測位用衛星から送信されてくる測位用信号から抽出して、各測位用衛星から受信点までの距離と各測位用衛星の位置とを求め、これらの情報から受信点の位置を求めている。具体的には測位装置は各測位用衛星からエフェメリスと呼ばれる軌道情報を受信して収集記憶するとともに、これらの軌道情報から所望の時刻における各衛星の位置を求め、各衛星の位置と各衛星から受信点までの観測距離（擬似距離）とによって、受信点の位置を算出するようにしている。上記エフェメリスは通常1時間毎に更新され、その有効時間は4時間と設定されている。従って、通常はエフェメリスが更新される毎に測位装置の持つ各衛星のエフェメリスデータを更新するようにしている。

【0003】また、このような測位用衛星から送信される電波は、雑音による影響を受けにくくすることと、全ての衛星が同一の搬送波を用いて信号を送信しても、所望の衛星からの電波のみを識別して受信できるようにするため、衛星からの送信時に擬似雑音符号（C/Aコード）を用いてスペクトラム拡散変調が行われている。従って受信しようとする衛星の番号に応じたC/Aコードを発生させて、その位相およびドップラー周波数を変化させることによって所望の衛星からの信号をサーチし、受信するようにしている。

【0004】

【発明が解決しようとする課題】上述したように各衛星のエフェメリスの有効時間は4時間であるため、これを超える時間、継続してその衛星からの信号が受信できなければ、測位装置内に収集している衛星のエフェメリスデータは使用されず、新たなエフェメリスを収集した後測位演算を行うことになる。従って、例えば測位装置を備える自動車で夜9時頃に帰宅して、翌朝7時頃に出発するような場合、測位装置の動作停止時間が4時間を超えるため、翌朝7時の電源オン直後に各衛星のエフェメリスが新たに収集される。各衛星のエフェメリスの収集に要する時間は最低30秒であるから、この場合有効なエフェメリスを保持している状態に比べて、最初の測位結果が得られるまで30秒余計にかかることになる。

【0005】ここで一般的な8チャンネルのGPS受信装置を例にとって、電源投入時の状態と電源投入後最初

の測位結果が得られるまでの時間（一般にT T F F : Time To First Fix と呼ばれる。）の値との関係を図7に示す。最終測位位置から電源投入時の実際の位置とのずれが緯度、経度で1度以内で、GPS時刻に対する測位装置の時計のずれが10分以内で、1ヵ月前のアルマナックデータおよび4時間前のエフェメリスデータがバックアップされていた場合、T T F Fは20秒程度となる。また、有効なエフェメリスデータが存在しない場合（GPSシステムではエフェメリスデータの有効時間は4時間であるため、4時間を超える過去のエフェメリスデータがバックアップされていても、それは使用されない）、新たなエフェメリスデータを収集するために約30秒を必要とするため、T T F Fは50秒程度となる。

【0006】また、上述したように、各衛星からの信号は擬似雑音符号（C/Aコード）によりスペクトラム拡散変調が行われているため、所望の測位用衛星からの測位用信号を受信するには、衛星毎に或るサーチ時間を要する。この各衛星からの信号をサーチする際、視野内に存在するものとして予測した衛星からの信号をサーチするように衛星の選択を行うが、各衛星が視野内にあるか視野外にあるかは、各衛星の軌道情報（アルマナック）と受信点の推定位置および現在時刻から推定する。従って、測位装置が電源オフ中に大きく移動し、その後に電源がオンされた場合、受信点の推定位置に大きな誤差が含まれることになるため、各衛星の視野内外の推定を誤る。例えば、視野内にあるものとして推定した衛星が実際には地平線の下など、視野外にあった場合にはサーチに失敗することになり、そのサーチ時間が無駄となる。そのため、必要な数の全ての衛星のサーチが完了するまでの時間が長時間化することになる。

【0007】このように従来の測位装置では、受信機の持つ各衛星の軌道情報または受信点の推定位置が不確かであれば、T T F Fが長くなる傾向にあった。

【0008】この発明の目的は、長い電源オフ期間の後電源をオンした場合でも、衛星の軌道情報を新たに収集する必要性をなくして、電源投入後、受信点の位置が最初に求められるまでの時間（T T F F）を短縮化した測位装置および測位方法を提供することにある。

【0009】この発明の他の目的は、電源オフ期間中に測位装置が大きく移動しても、電源オン直後からサーチすべき衛星を適正に選択できるようにして、サーチに要する時間を短縮してT T F Fを短くした測位装置および測位方法を提供することにある。

【0010】

【課題を解決するための手段】この発明の測位装置は、電源オン直後の最初の測位の際に有効な軌道情報が既に収集されている状態とするために、請求項1に記載の通り、複数の測位用衛星からの信号を受信し、各測位用衛星の軌道情報を収集して記憶更新する軌道情報収集手段と、前記各測位用衛星の軌道情報を用いて受信点の位置

を算出する測位演算手段とを備える測位装置において、電源オフ期間などの動作停止期間中に、前記軌道情報収集手段により収集された各測位用衛星の軌道情報の有効時間が経過するまでに短時間だけ前記軌道情報収集手段を起動させる短時間起動手段を設けることにより、電源オン時などの動作開始時に前記測位演算手段が前記軌道情報収集手段により既に収集されている軌道情報を用いて受信点の位置を算出することを特徴とする。

【0011】また、この発明の測位装置は、電源投入直後、サーチすべき衛星を適正に選択できるようにするため、請求項2に記載の通り、受信点の推定位置と各衛星の軌道情報を用いて各測位用衛星の信号をサーチし、受信する衛星信号受信手段と、該衛星信号受信手段により受信された信号から各測位用衛星の軌道情報を収集して記憶更新する軌道情報収集手段と、前記各測位用衛星の軌道情報を用いて受信点の位置を算出する測位演算手段とを備える測位装置において、電源オフ期間などの動作停止期間中に、一定時間毎に短時間だけ前記軌道情報収集手段および前記測位演算手段を起動させる短時間起動手段を設けることにより、電源オン時などの動作開始時に前記測位演算手段により求められた最終の受信点の位置情報を前記受信点の推定位置として前記衛星信号受信手段が各測位用衛星をサーチすることを特徴とする。

【0012】また、この発明の測位方法は、電源オン直後の最初の測位の際に有効な軌道情報が既に収集されている状態とするために、請求項3に記載の通り、電源オン期間などの動作期間中に、複数の測位用衛星からの信号を受信し、各測位用衛星の軌道情報を収集して記憶更新し、前記各測位用衛星の軌道情報を用いて受信点の位置を算出し、電源オフ期間などの動作停止中に、既に収集している各衛星の軌道情報の有効時間が経過するまでに短時間だけ各測位用衛星の軌道情報を収集して記憶更新し、電源オン時などの動作開始時に、既に収集されている軌道情報を用いて受信点の位置を算出することを特徴とする。

【0013】さらに、この発明の測位方法は、電源投入直後、サーチすべき衛星を適正に選択できるようにするため、請求項4に記載の通り、電源オン期間などの動作期間中に、複数の測位用衛星からの信号をサーチして受信し、各測位用衛星の軌道情報を収集して、これらの軌道情報を用いて受信点の位置を算出し、電源オフ期間などの動作停止期間中に、一定時間毎に短時間だけ、受信点の推定位置と既に収集している各測位用衛星の軌道情報を用いて各測位用衛星の信号をサーチして受信し、各測位用衛星の軌道情報を用いて受信点の位置を算出し、電源オン時などの動作開始時に最終の受信点の位置情報を各測位用衛星の信号をサーチする際の受信点の推定位置とするとともに、該受信点の推定位置と各衛星の軌道情報とを用いて各衛星の信号をサーチして受信し、各測位用衛星の軌道情報を用いて受信点の位置を算出するこ

とを特徴とする。

【0014】

【作用】この発明の請求項1に係る測位装置および請求項3に係る測位方法では、電源オン期間などの動作期間中に複数の測位用衛星からの信号が受信され、各衛星の軌道情報が収集され、各衛星の軌道情報を用いて受信点の位置が算出されるが、電源オフ期間などの動作停止期間中には、既に収集されている軌道情報の有効時間が経過するまでに短時間だけ測位用衛星からの信号の受信および各衛星の軌道情報の収集が定期的に繰り返行われる。これにより、常に有効時間内の軌道情報が収集されている状態となるため、電源オン時などの動作開始時には、既に収集されている有効な軌道情報を用いて受信点の位置を直ちに算出することが可能となり、TTFFが短縮化される。

【0015】請求項2に係る測位装置および請求項4に係る測位方法では、受信点の推定位置と各衛星の軌道情報とを用いて各衛星の信号がサーチされ、その受信された信号から各衛星の軌道情報が収集され、各衛星の軌道情報を用いて受信点の位置が算出されるが、電源オフ期間などの動作停止期間中には、一定時間ごとに短時間だけ各衛星の信号のサーチおよび測位演算が行われて、電源オン時などの動作開始時に、それまでに求められている最終の受信点の位置情報が各衛星の信号のサーチの際に受信点の推定位置情報として用いられる。この受信点の推定位置情報は測位装置が電源オフ期間中に移動しても、一定時間ごとに更新されるため、電源オン直後など動作開始直後の衛星の信号のサーチの際に、視野外の衛星をサーチするといった不都合が回避される。これにより、動作開始直後に所望の衛星を速やかにサーチすることができ、TTFFの長時間化が避けられる。

【0016】

【実施例】この発明の実施例である測位装置の構成を図1～図6を基に以下説明する。

【0017】図1は測位装置の構成を示すブロック図である。同図においてGPSボード10はGPS衛星からの信号を受信して受信点の測位を行う測位制御に関する主要部、ウォームボックス1は電源制御に関する主要部である。この実施例では車載用のGPS測位装置を例としていて、ウォームボックス1において充電回路2は例えば自動車のシガレットライターの電源ラインから電源電圧を入力し、2次電池3を充電する。この2次電池3の電圧は V_{BATT} としてGPSボード10における制御部へRTC（時計回路）に対する電源電圧およびメモリのバックアップ用電源電圧として供給される。スイッチ4は、ウォームボックス始動スイッチ制御信号によってオンオフされるスイッチであり、ウォームボックス1の機能を用いる場合、このスイッチ4はオン状態のままである。スイッチ5は後述するGPSボード10における制御部の出力信号によりオンオフされるスイッチである。

このスイッチ4、5を介しての2次電池3の電圧または自動車からの入力電源電圧はダイオード6、7を介して電源電圧 V_{cc} としてGPSボード10へ供給される。主電源監視回路7は自動車からの入力電源電圧が規定値に達しているか否かを監視する回路であり、電源入力の有無に応じた論理信号をGPSボード10における制御部へ与える。

【0018】GPSボード10において、電池14はリチウム電池などであり、 V_{BATT} ラインにダイオード8および9を介して接続していて、RTCおよびメモリのバックアップ用電圧を供給する。アナログ信号処理回路11aはアンテナの受けたGPS衛星からの信号を中間周波変換し、ADコンバータ11bはその信号をデジタルデータに変換する。信号処理回路12はADコンバータ11bからデジタルデータを入力し、制御部13からC/Aコードパターンデータ、C/Aコード位相データおよびキャリア位相データなどを入力し、C/Aコードパターンの発生およびC/Aコードとの相関演算などを行う。またこの信号処理回路12はさらにGPS時刻の計時を行う。制御部13内のRTCは基準発振器を備え、その基準発振信号を分周して現在時刻を計時する。制御部13はCPU、ROMおよびRAMを備えるマイクロプロセッサから構成していて、CPUはROMに予め書き込んだプログラムを実行して、信号処理回路12から相関データを読み取り、所定のループフィルタ演算を行い、信号処理回路12に対してC/Aコードパターンデータ、C/Aコード位相データおよびキャリア位相データを与えることによってC/Aコード位相およびキャリア位相との同期をとり、擬似距離を求める。またCPUは航法メッセージデータを抽出し、この航法メッセージデータからエフェメリスを抽出し、上記擬似距離を求めた時刻における各衛星の位置情報および上記擬似距離の情報から受信点の位置を算出する。

【0019】図2は測位装置の電源オン中および電源オフ中におけるエフェメリスデータの更新タイミングの例を示す図である。各衛星のエフェメリスは通常すべて同時に1時間ごとに更新されるため、電源オン期間中は1時間ごとに各衛星のエフェメリスデータの更新を行う。その後、ある時点で電源がオフされると、その電源オフ期間中は、前回のエフェメリスデータの更新時から4時間を経過するまでの間に短時間のみ電源をオンして、各衛星からの受信を行ってエフェメリスデータの更新および測位演算を行う。その後、ある時点で電源がオンされたとき、すでに収集されているエフェメリスデータは4時間以内のものであるから、そのエフェメリスデータをそのまま用いて測位を行う。

【0020】図3は電源オン期間中に行うエフェメリスデータの収集およびアラーム設定の処理手順を示すフローチャートである。まず視野内の衛星からの信号をサーチし、各衛星のエフェメリスが更新されたか否かを判定

する(n1→n2)。エフェメリスが更新されていたなら、その新たなエフェメリスを収集し、メモリ上に保持しているエフェメリスデータを更新する(n3)。続いて、RTCの内容(現在時刻)を衛星からの信号の受信によって求められたGPS時刻の秒の桁まで合わせることで、RTCの誤差を修正する(n4)。さらに、RTCがこれから3時間59分後にCPUを起動させるように、RTCに対してアラーム時刻の設定を行う(n5)。その際、RTCの3時間59分すなわち約4時間における累積誤差分を予め考慮してアラーム時刻の設定を行う。これにより、エフェメリスが更新されてから3時間59分後に1秒以内の精度でCPUに起動がかかる。もし、その時点が電源のオフ期間中であれば、後述するようにCPUが起動して各衛星のエフェメリスデータを収集することになる。

【0021】図4は電源オン期間中に15分ごとに行う、RTCのずれを測定する処理内容を示すものであり、そのときのRTC時刻とGPS時刻との差を15分間におけるRTCのずれ量E_qとして求める。この情報は、図3のステップn5で示したRTCに対するアラーム設定の際に用いる。すなわち約4時間後のRTCのずれ量は4×4×E_qであるから、RTCによる現在時刻+3時間59分-4×4×E_qとして正確な3時間59分後のアラームを設定する。

【0022】図5は電源オン期間中に行う測位処理の手順を示すフローチャートである。まず視野内の4衛星以上の擬似距離が求められているか否かを判定し、求められていれば、各擬似距離とそれらの擬似距離を観測した時刻および各衛星の起動情報から受信点の位置を算出し、更新する(n21→n22→n23)。

【0023】図6は電源監視およびウェイクアップ処理の手順を示すフローチャートである。まず主電源監視回路7(図1参照)からの主電源監視信号に基づき、電源のオンオフ状態を判定する(n11)。例えば自動車のエンジンキーがオフされた場合など、主電源の入力が遮断されたことを検知すれば、制御部13のCPUはローパワーストップ命令を実行する(n11→n12)。これによりCPUはパワーセーブモードとなる。続いて定時動作バックアップ電源オン/オフ信号を出力して、図1に示したスイッチ5をオフすることにより、2次電池3のGPSボードにおける電力消費を停止する。これによりRTCのみが図1に示した2次電池3からの電圧V_{BATT}により動作を継続することになる(n13)。

【0024】その後、図3のステップn5の処理により、最後にエフェメリスが収集されたときから3時間59分後にRTCから出力される定時動作バックアップ電源オン/オフ信号によりスイッチ5がオンされると、2次電池3からCPUに電源電圧V_{cc}が印加されて、CPUはリスタートする(n14)。これにより図3および図5に示した処理が開始されて、視野内の衛星から

の信号がサーチされ、各衛星のエフェメリスが収集され、メモリ上のエフェメリスデータが更新される。また、受信点の位置が算出される。そして、視野内衛星数または8つの衛星についてのエフェメリスデータが更新されればステップn11へ戻る(n15→n11)。上記リスタートから視野内の衛星の信号を受信するまで約10秒である。しかし例えば車がガレージ内などの視界の開けていない場所に停車している場合にはエフェメリスデータの更新ができない。もしエフェメリスの更新がCPUのリスタート後1分以内にできなかった場合はRTCに3時間59分後のアラーム設定を設定して、強制的にステップn11へ戻る(n16→n17→n11)。ステップn11へ戻った後、このときまだ電源はオフ状態であるため、再びローパワーストップ命令を実行し、バックアップ電源をオフする(n12→n13)。しかし、図3のステップn5の処理または図6のステップn17により、RTCに再び3時間59分後のアラームが設定されているため、3時間59分後に再びRTCからの信号によりバックアップ電源がオンされ、CPUはリスタートすることになる(n14)。以降同様の処理を繰り返すことによって、電源オフ期間中はエフェメリスの有効時間である4時間を超えない時間間隔でエフェメリスの収集・更新および測位が行われる。

【0025】なお、上記3時間59分のアラーム設定とリスタート後1分以内の動作時間の制限は、2次電池3の消費を極力抑えるためであり、比較的容量の大きな2次電池を使用すれば、例えば2時間毎のアラーム設定やリスタート後すべての視野内衛星のエフェメリスを収集するに十分な時間(例えば3分)を設定することも可能である。

【0026】通常、エフェメリスは毎正時に更新されるので、上述したように、エフェメリスが更新されてから、2時間毎や4時間毎のように、毎正時の直前にCPUをリスタートしてエフェメリスを収集し、メモリ上のエフェメリスデータを更新することによって、電池の消耗を極力少なくしつつ最新のエフェメリスを保持しておくことができる。

【0027】このようにして、常に有効時間内のエフェメリスデータを保持しているため、電源オン直後にエフェメリスを収集する必要がない。そのため、早ければ電源オン後、視野内の4衛星の信号を受信するに要する約10秒と、測位演算に要する約5秒を合わせた約15秒で最初の測位結果が得られる。

【0028】

【発明の効果】この発明の請求項1に係る測位装置および請求項3に係る測位方法によれば、電源オフ期間など動作停止期間でも常に有効時間内の軌道情報が収集されている状態となるため、電源オン時などの動作開始時には、既に収集されている有効な軌道情報を用いて受信点の位置を直ちに算出することが可能となり、TTFが

短縮化される。

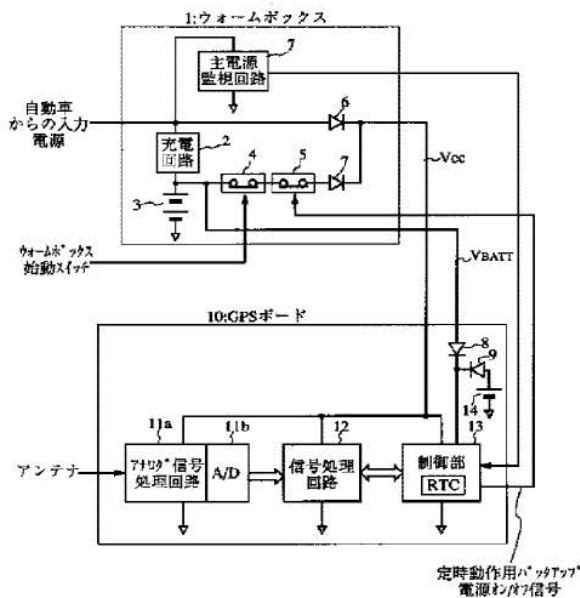
【0029】請求項2に係る測位装置および請求項4に係る測位方法によれば、受信点の推定位置情報は測位装置が電源オフ期間中に移動しても、一定時間ごとに更新されるため、電源オン直後など動作開始直後の衛星の信号のサーチの際に、視野外の衛星をサーチするといった不都合が回避される。これにより、動作開始直後に所望の衛星を速やかにサーチすることができ、TTFBの長時間化が避けられる。

【0030】

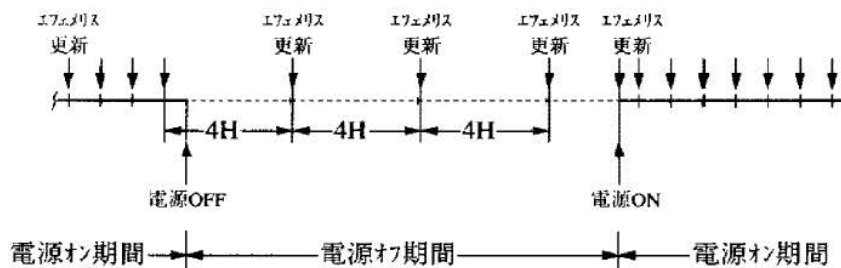
【図面の簡単な説明】

【図1】この発明の実施例である測位装置の構成を示すブロック図である。

【図1】



【図2】



【図2】電源オン期間と電源オフ期間におけるエフェメリスの更新タイミングの例を示す図である。

【図3】測位装置の処理手順を示すフローチャートである。

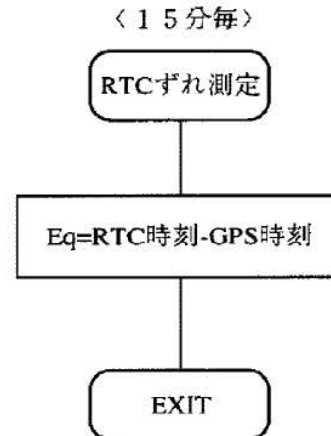
【図4】測位装置の処理手順を示すフローチャートである。

【図5】測位装置の処理手順を示すフローチャートである。

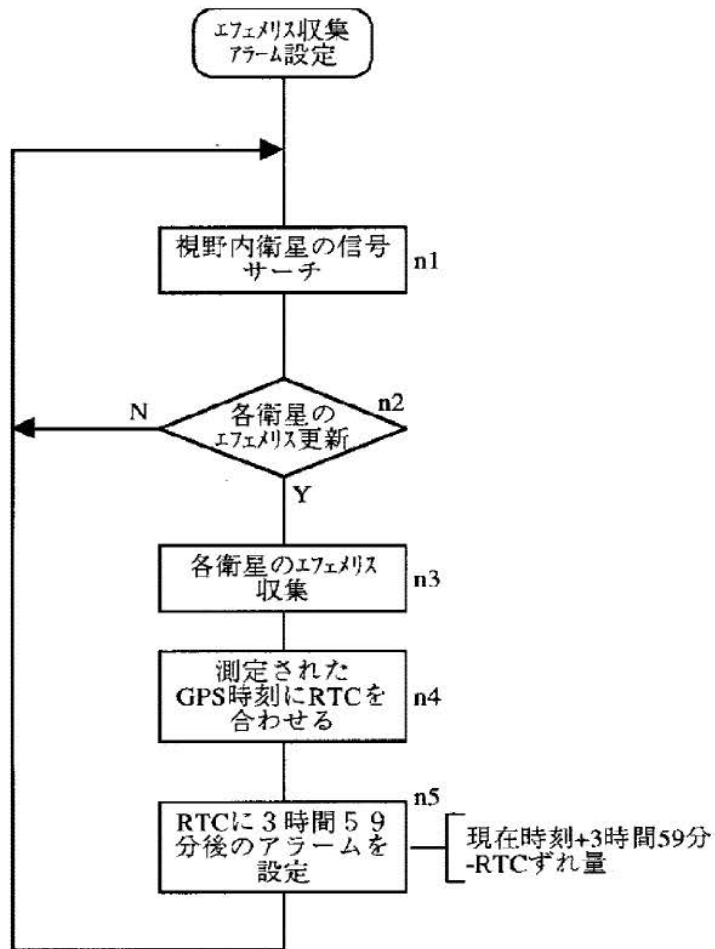
【図6】測位装置の処理手順を示すフローチャートである。

【図7】電源オン時のスタート状態とTTFBとの関係を示す図である。

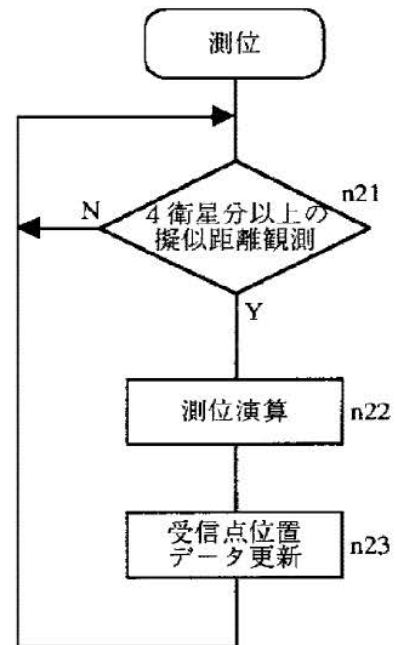
【図4】



【図3】



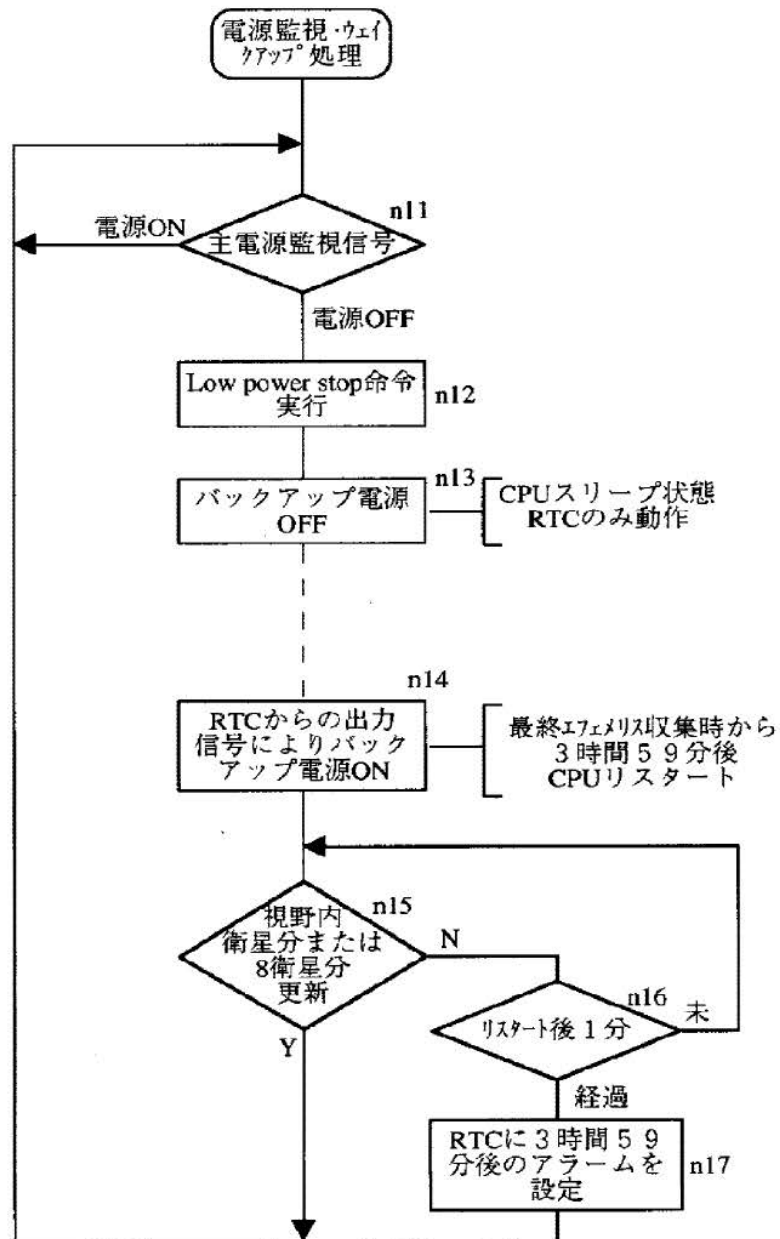
【図5】



【図7】

電源ON時の スタート状態	電源ON時の値		有効期限		TIEF
	位置	時刻	74マック	エフェリス	
スタート1	1度以内	10分以内	1ヶ月	4時間	20秒
スタート2	1度以内	10分以内	1ヶ月	なし	50秒

【図6】



Electronic Acknowledgement Receipt	
EFS ID:	28306030
Application Number:	15376627
International Application Number:	
Confirmation Number:	2064
Title of Invention:	SELF MONITORING GPS ON MOBILE DEVICE
First Named Inventor/Applicant Name:	Robert Anderson Malaney
Customer Number:	132250
Filer:	Robert Anderson Malaney
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	08-FEB-2017
Filing Date:	12-DEC-2016
Time Stamp:	19:38:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	EngAbs.pdf	46604	no	2
			8fc972f90dbaf195ce69ea2ae1bb7b351495de8d		
Warnings:					

Information:					
2	Non Patent Literature	japanRepTRAN.pdf	10108	no	4
			f6197481437e1b9c75607546ef8dea689eb56bea		
Warnings:					
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3	Non Patent Literature	japanRepUNTRAN.pdf	4481782	no	5
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Warnings:					
Information:					
4	Foreign Reference	JP2001215268A.pdf	309727	no	6
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Warnings:					
Information:					
5	Foreign Reference	JP2001242235A.pdf	515045	no	10
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Warnings:					
Information:					
6	Foreign Reference	JP2003207351A.pdf	505055	no	8
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Information:					
8	Foreign Reference	JPH1038993A.pdf	182832	no	4
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Warnings:					
Information:					

9	Foreign Reference	JPH08327718A.pdf	407477 812ae90b4138881ec279140bf98e2df56bb0219d	no	8
Warnings:					
Information:					
Total Files Size (in bytes):			6937853		
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
15/376,627	12/12/2016	3662	1590		18	3

CONFIRMATION NO. 2064
UPDATED FILING RECEIPT



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Date Mailed: 04/14/2017

Receipt is acknowledged of this reissue patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

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Applicant(s)

Robert Anderson Malaney, East Lindfield, AUSTRALIA;

Assignment For Published Patent Application

Robert Anderson Malaney

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a REI of 14/031,992 09/19/2013 PAT RE46237
which is a REI of 11/661,707 02/11/2008 PAT 8022870
which is a 371 of PCT/AU2005/001351 08/31/2005

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AUSTRALIA 2004905024 09/02/2004 No Access Code Provided

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page 1 of 3

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/376,627**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

SELF MONITORING GPS ON MOBILE DEVICE

Preliminary Class

342

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/376,627				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	140		N/A				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	1080		N/A				
TOTAL CLAIMS (37 CFR 1.16(i))	18	minus 20 = *	x 40 =	0.00	OR					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *	x 210 =	0.00						
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00						
				TOTAL		TOTAL				
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL		TOTAL				
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/376,627				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	140		N/A				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	1080		N/A				
TOTAL CLAIMS (37 CFR 1.16(i))	18	minus 20 = *	x 40 =	0.00	OR					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *	x 210 =	0.00						
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00						
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	1520		TOTAL				
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=	OR	x	=
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=	OR	x	=
	Application Size Fee (37 CFR 1.16(s))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
15/376,627	12/12/2016	3993	1590		18	3

CONFIRMATION NO. 2064
UPDATED FILING RECEIPT



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Date Mailed: 04/18/2017

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Applicant(s)

Robert Anderson Malaney, East Lindfield, AUSTRALIA;

Assignment For Published Patent Application

Robert Anderson Malaney

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a REI of 14/031,992 09/19/2013 PAT RE46237
which is a REI of 11/661,707 02/11/2008 PAT 8022870
which is a 371 of PCT/AU2005/001351 08/31/2005

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)
AUSTRALIA 2004905024 09/02/2004 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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If Required, Foreign Filing License Granted: 12/21/2016

page 1 of 3

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/376,627**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

SELF MONITORING GPS ON MOBILE DEVICE

Preliminary Class

342

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

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Litigation Search Report CRU 3999

APPLICATION NUMBER 15/376,627

TO: EILEEN LILLIS
Location: CRU
Art Unit: 3993
Date: 04/25/2017

From: MANUEL SALDANA
Location: CRU 3999
MDE 5D14
Phone: (571) 272-7740

MANUEL.SALDANA@uspto.gov

Search Notes

Litigation was NOT found for US Patent Number: RE46237

- 1) I performed a KeyCite Search in Westlaw, which retrieves all history on the patent including any litigation.
- 2) I performed a search on the patent in Lexis CourtLink for any open dockets or closed cases.
- 3) I performed a search in Lexis in the Federal Courts and Administrative Materials databases for any cases found.
- 4) I performed a search in Lexis in the IP Journal and Periodicals database for any articles on the patent.
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Patent Search RE46237 4/25/2017

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1. RE 46237, December 13, 2016, Self monitoring GPS on mobile device, Malaney, Robert Anderson, East Lindfield, Australia(AU); 031992, December 12, 2016, ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS)., MALANEY, ROBERT ANDERSON, 16 CARLYLE RD, EAST LINDFIELD, AUSTRALIA(), 2070, reel-frame:040887/0213, NARISTE NETWORKS PTY LTD, New South Wales, Australia(AU), Australia
RE 46237

2. 46237, February 7, 1865, SHEARS FOR CUTTING METAL., JULIUS HORNIG, OF NEW TOEK.; 000237,
46237

No Documents Found

No documents were found for your search terms
"46237 OR 46,237 "

Click "Save this search as an Alert" to schedule your search to run in the future.

- OR -

Click "Search Using Natural Language" to run your search as Natural Language search.

- OR -

Click "Edit Search" to return to the search form and modify your search.

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- Remove some search terms.
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1 of 1 DOCUMENT

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US Fed News

December 13, 2016 Tuesday 1:59 PM EST

LENGTH: 184 words

HEADLINE: US Patent Issued on Dec. 13 for "Self monitoring GPS on mobile device" (Australian Inventor)

DATELINE: ALEXANDRIA, Va.

BODY:

ALEXANDRIA, Va., Dec. 13 -- United States Patent no. RE46,237, issued on Dec. 13.

"Self monitoring GPS on mobile device" was invented by NARISTE NETWORKS PTY LTD (New South Wales, Australia). According to the abstract* released by the U.S. Patent & Trademark Office: "A method, a mobile device and a computer program product for acquiring GPS on a mobile device possessing GPS capability are disclosed. The method comprises the step of setting a current value of the period of the power-up phase of the GPS dependent upon adaptive predictions of when the GPS should be powered on to meet specifications on positioning accuracy and GPS acquisition time." The patent was filed on Sept. 19, 2013, under Application No. 14/031,992. *For further information, including images, charts and tables, please visit:

<http://patft.uspto.gov/netaagi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fmetahtml%2FPTO%2Fsearch-bool.html&t=1>
For any query with respect to this article or any other content requirement, please contact Editor at
htsyndication@hindustantimes.com

LOAD-DATE: December 13, 2016

Citing References (3)

Treatment	Title	Date	Type	Depth	Headnote(s)
—	1. GLOBAL POSITIONING SYSTEM (GPS) ACQUIRING METHOD FOR MOBILE DEVICE E.G. MOBILE PHONE, INVOLVES SETTING CURRENT VALUE OF THE POWER-UP PHASE PERIOD OF GPS-DEPENDENT UPON CRAMER-RAO BOUND INFORMATION AND ADAPTIVE PREDICTIONS FOR POWERING GPS Out Of Page DWPI 2006-221832	Sep. 02, 2004	DWPI	—	—
—	2. RF 040887/0213 Out Of Page	Dec. 12, 2016	Assignments	—	—
—	3. PatStat RE46237	Apr. 18, 2017	Patent Status Files	—	—



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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
15/376,627	12/12/2016	3993	1590		18	3

CONFIRMATION NO. 2064
REPLACEMENT FILING RECEIPT



CC00000091234675

132250
Robert Malaney
16 Carlyle Rd
East Lindfield, NSW, 2070
AUSTRALIA

Date Mailed: 05/10/2017

Receipt is acknowledged of this reissue patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Robert Anderson Malaney, East Lindfield, AUSTRALIA;

Applicant(s)

Robert Anderson Malaney, East Lindfield, AUSTRALIA;

Assignment For Published Patent Application

Robert Anderson Malaney

Power of Attorney: None**Domestic Priority data as claimed by applicant**

This application is a REI of 14/031,992 09/19/2013 PAT RE46237
which is a REI of 11/661,707 02/11/2008 PAT 8022870
which is a 371 of PCT/AU2005/001351 08/31/2005

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)
AUSTRALIA 2004905024 09/02/2004 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes**Permission to Access Search Results:** Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

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page 1 of 3

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Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/376,627	12/12/2016	Robert Anderson Malaney		2064

132250 7590 08/18/2017
Robert Malaney
16 Carlyle Rd
East Lindfield, NSW, 2070
AUSTRALIA

EXAMINER

GRAHAM, MATTHEW C

ART UNIT	PAPER NUMBER
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3993

MAIL DATE	DELIVERY MODE
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08/18/2017

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 15/376,627	Applicant(s) MALANEY, ROBERT ANDERSON	
	Examiner MATTHEW C. GRAHAM	Art Unit 3993	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 37-54 is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) _____ is/are allowed.
- 7) ☒ Claim(s) 37-54 is/are rejected.
- 8) ☐ Claim(s) _____ is/are objected to.
- 9) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☒ All b) ☐ Some** c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 11/661707.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date 02/08/2017.
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 4) ☐ Other: _____.

NON-FINAL REJECTION

1. For reissue applications filed before September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the law and rules in effect on September 15, 2012. Where specifically designated, these are “pre-AIA” provisions.

For reissue applications filed on or after September 16, 2012, all references to 35 U.S.C. 251 and 37 CFR 1.172, 1.175, and 3.73 are to the current provisions.

2. The 3.73 (c) statement is objected to because it fails to include the documentation of the complete chain of title from Nariste Networks Pty Ltd back to Robert Anderson Maloney by indicating the reel and frame where the document is recorded, or supplying a copy of this document. The deed accompanying the 3.73(c) statement is noted. However this document does not show the title chain from Nariste Networks Pty Ltd back to Robert Anderson Maloney.

3. The Application Data Sheet (ADS) is objected to because it fails to properly identify the application number of the patent for which reissue is sought in the Domestic Benefit/National Stage Information Section. The pending reissue is sought for application number 11/661,707 (US Patent 8,022,870). The pending reissue is also a continuation of reissue application 14/031,992 (RE 46,237). The specification should also be amended to properly identify the reissue and continuation domestic benefit/national stage information (i.e., that more than one reissue application has been filed for the same patent). Applicant should also request a corrected filing receipt that properly identifies this domestic benefit/national stage information.

4. The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

(a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 37-54 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention. The phrase “satellite positioning system” is considered to be new matter. A GPS (Global Positioning System) is described in the specification. The phrase “satellite positioning system” is not a recognized art term and the scope of this phrase is unclear. In addition, the determination of the “position error” as recited in the claims is not fully supported by the description. The specification states that the position error is determined from the difference between the predicted position and the actual position. However, the specification lacks details as to how the predicted position is determined other than stating that previous positions can be used to determine the predicted position based upon testing of an adaptive learning algorithm.

And it also unclear as to how the actual location is determined prior to the GPS being powered up as a position from the network service is not an actual position. The actual position is determined via the GPS. Thus, how can the actual position be determined before the GPS is turned on?

6. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7. Claims 37-54 are rejected under 35 U.S.C. 101 because the claimed invention is directed to a judicial exception (i.e., a law of nature, a natural phenomenon, or an abstract idea) without significantly more. Claims 37-54 are directed to an abstract idea. The claim(s) does/do not include additional elements that are sufficient to amount to significantly more than the judicial exception because the method of claim 37 relates only to a mathematical determination, which is an abstract idea. The claims recite determining when an embedded satellite module should be turned on. However, there is no step of actually turning on of the module or any steps relating to the manner in which it is being turned, or controlling the power while the module is turned on. Likewise independent claim 47 relates to a communication device and only recites the determination of when the module should be turned on. The recitation of a processor and a memory are generic computer components. There is nothing that is significantly more, such as a power control circuit and/or controlling the power to turn on the module.

The steps (and means) for providing a “capability” and determining an error and are abstract ideas of numerical manipulation and merely parts of an algorithm.

And independent claim 49 relates solely to a computer program with means for acquiring a signal (data input) and storing and determining.

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jesson and Salkhi show GPS units with power saving features.

9. Any inquiry concerning this communication should be directed to MATTHEW C. GRAHAM at telephone number (571)-272-7116. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gay Ann Spahn can be reached on (571)-272-7731.

Matthew C. Graham

/Matthew C. Graham/

Conferees: /GAS/ /PCE/

Notice of References Cited	Application/Control No. 15/376,627	Applicant(s)/Patent Under Reexamination MALANEY, ROBERT ANDERSON	
	Examiner MATTHEW C. GRAHAM	Art Unit 3993	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-7,102,565 B2	09-2006	Jesson; Joseph E.	G01S19/34	342/357.63
*	B	US-7,148,844 B2	12-2006	Salkhi; Amin	G01S19/235	342/357.62
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
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Search Notes 	Application/Control No. 15376627	Applicant(s)/Patent Under Reexamination MALANEY, ROBERT ANDERSON
	Examiner MATTHEW C GRAHAM	Art Unit 3993

CPC- SEARCHED		
Symbol	Date	Examiner
g01s 19/34	8/9/2017	mcg

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
See attached EAST Search History	8/9/2017	mcg

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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RECEIPT DATE: 02/08/2017

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)

Approved for use through 07/31/2012. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15376627
	Filing Date	2016-12-12
	First Named Inventor	Robert Anderson MALANEY
	Art Unit	~~3662~~ 3993
	Examiner Name	Matthew C. Graham
	Attorney Docket Number	

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	6590525	B2	2003-07-08	Yule, et al.	
	2	6298229	B1	2001-10-02	Tomlinson, Jr., et al.	
	3	5864315	A	1999-01-26	Welles, et al.	
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	Filing Date		2016-12-12	
	First Named Inventor		Robert Anderson MALANEY	
	Art Unit		~~3662~~ 3993	
	Examiner Name		Matthew C. Graham	
	Attorney Docket Number			

9	6765958	B1	2004-07-20	Dowling	
10	6703971	B2	2004-03-09	Pande, et al.	
11	6903684	B1	2005-06-07	Simic, et al.	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15376627	
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	Art Unit		~~3662~~ 3993	
	Examiner Name		Matthew C. Graham	
	Attorney Docket Number			

	20	7256731	B2	2007-08-14	Siegel, et al.	
	21	8515667	B2	2013-08-20	Haatainen	

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	1	20030083814	A1	2003-05-01	Gronemeyer	
	2	20030107514	A1	2003-06-12	Syrjarinne, et al.	
	3	20020091956	A1	2002-07-11	Potter, et al.	
	4	20050162306	A1	2005-07-28	Babitch, et al.	
	5	20040225439	A1	2004-11-11	Gronemeyer	
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	Art Unit		3662 3993	
	Examiner Name		Matthew C. Graham	
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8	20030004640	A1	2003-01-02	Vayanos
9	20140188638	A1	2014-07-03	Jones, et al.

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	1	2002088769	WO	A1	2002-11-07	Lee at al.		
	2	2394134	GB	A	2004-04-14	Haddrell		
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	Examiner Name		Matthew C. Graham	
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	8	H1038993	JP	A	1998-02-13	Kumai		
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	1	"How A-GPS Works" (2001) SnapTrack, A QUALCOMM Company, White Paper (http://www.snaptrack.com/pdf/How_aGPS_works.pdf)	
	2	"TricklePower" in REFERENCE GUIDELINE TO TF GPS ENGINE BOARD by Laipac Technology, Inc. (2001) (http://www.laipac.com/datasheets/gps/TF%20GPS%20Series.pdf)	
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	Filing Date		2016-12-12
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	Art Unit	3662 3993	
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	Examiner Name	Matthew C. Graham	
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29	International Search Report dated 14 October 2005 re counterpart PCT/AU2005/01351
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RECEIPT DATE: 02/08/2017 INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		15376627
	Filing Date		2016-12-12
	First Named Inventor		Robert Anderson MALANEY
	Art Unit		~~3662~~ 3993
	Examiner Name		Matthew C. Graham
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31	Japanese Notification of Reasons for Refusal dated 28th February 2012 for Japanese Patent Application No. 2007-528529 and an English version thereof		
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CONFIRMATION NO. 2064

SERIAL NUMBER 15/376,627	FILING or 371(c) DATE 12/12/2016 RULE	CLASS 342	GROUP ART UNIT 3993	ATTORNEY DOCKET NO.	
APPLICANTS INVENTORS Robert Anderson Malaney, East Lindfield, AUSTRALIA; ** CONTINUING DATA ***** This application is a REI of 14/031,992 09/19/2013 PAT RE46237 which is a REI of 11/661,707 02/11/2008 PAT 8022870 which is a 371 of PCT/AU2005/001351 08/31/2005 ** FOREIGN APPLICATIONS ***** AUSTRALIA 2004905024 09/02/2004 ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED *** SMALL ENTITY ** 12/21/2016					
Foreign Priority claimed ☒ Yes ☐ No 35 USC 119(a-d) conditions met ☒ Yes ☐ No Verified and /MATTHEW C GRAHAM/ Acknowledged Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY AUSTRALIA	SHEETS DRAWINGS 6	TOTAL CLAIMS 18	INDEPENDENT CLAIMS 3
ADDRESS Robert Malaney 16 Carlyle Rd East Lindfield, NSW, 2070 AUSTRALIA					
TITLE SELF MONITORING GPS ON MOBILE DEVICE					
FILING FEE RECEIVED 1590	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

<i>Index of Claims</i> 	Application/Control No. 15376627	Applicant(s)/Patent Under Reexamination MALANEY, ROBERT ANDERSON
	Examiner MATTHEW C GRAHAM	Art Unit 3993

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant		☐ CPA		☐ T.D.		☐ R.1.47			
CLAIM		DATE							
Final	Original	08/09/2017							
	1	-							
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<i>Index of Claims</i> 	Application/Control No. 15376627	Applicant(s)/Patent Under Reexamination MALANEY, ROBERT ANDERSON
	Examiner MATTHEW C GRAHAM	Art Unit 3993

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	08/09/2017								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								
	43	✓								
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	52	✓								
	53	✓								
	54	✓								

Doc Code: ECOMM.AUTH/ECOMM.WTDW

Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS	Application No.	15/376,627
	Filing Date	12/12/2016
	First Named Inventor	Robert Anderson Malaney
	Art Unit	3993
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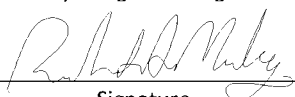
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International Application Number:	
Confirmation Number:	2064
Title of Invention:	SELF MONITORING GPS ON MOBILE DEVICE
First Named Inventor/Applicant Name:	Robert Anderson Malaney
Customer Number:	132250
Filer:	Robert Anderson Malaney
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Applicant: Malaney, Robert Anderson

) PATENTS

Application No: 15/376,627

) Group Art Unit: 3993

Title: SELF MONITORING GPS ON MOBILE DEVICE

Filing Date: 12/12/2016

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Alexandria, VA 22313-1450

Dear Sir:

This communication is responsive to an Office Action mailed on 08/18/2017. This communication is filed 12/18/17 using the USPTO's Electronic Filing system. No new matter has been added.

REMARKS

Introduction and status of claims

Applicant provides the following comments. Responses are made in order of the list of sections in the Office Action, for ease of reference.

2. 3.73 (c) Statement

Applicant respectfully submits that the chain of title from Nariste Networks back to Robert Anderson Malaney was in fact submitted to the USPTO at the time of filing in the form of documentation showing that and a copy of that documentation is available on the US PAIR System.

3. ADS

Applicant respectfully submits that the following text was included in the original filing in the form of an additional transmittal letter: - " The application currently being filed is a reissue continuation application, meaning it is a continuation of reissue application 14,031,992 and is also a reissue of U.S. Patent No. 8,022,870. Application 15/364,195 is another pending re-issue of 8,022,870."

If the above text does not overcome the objection, applicant requests the examiner kindly assist by informing the applicant of the correct instructions via Internet communication (email robert@nariste.com)

5. Claim Rejections – 35 USC §112

Claims 37-54 are rejected under 35 U.S.C. 112(a) or pre-AIA 35 U.S.C. 112.

The examiner states the phrase "satellite positioning system" is new matter. In the amended independent claims applicant to makes clear that that phrase means "Global Positioning Systems technologies using line-of-sight measurements to satellites," text which is to be found in the original specification (col. 1 line 23-24).

Examiner states the term "position error" is not fully supported. In order to expedite prosecution applicant has removed reference that term in all independent claims.

Examiner states that it is unclear how the actual location is determined. Applicant notes that determination of a position using wireless networks alone (i.e. without GPS) is well known in the art and the specification makes this clear (col. 1, lines 17-24). For example, determining a position alone using a wireless network forms part of E911 capabilities in the USA. This estimated position is not in general exactly the same as the actual location reported by a GPS due to noise in the wireless network signal. The amended independent claims make clear that we are referring to this wireless network position "a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system."

7. Claim Rejections – 35 USC §101

Claims 37-54 are rejected under 35 U.S.C. 101.

Examiner states there is no step of actually turning on the embedded module or steps related to the manner in which it is turned on or being controlled. In the amended independent claims applicant to makes clear that that phrase "powered on" means "said powered on being the power up of said embedded satellite positioning system module using electronic circuits". Use of electronic circuits to control power to an embedded GPS system is well known in the art. Most mobile phones contain circuitry that do this function. The amended claim makes clear that this function is enacted upon dependent on a specific position of the mobile device reported by the wireless network. Support for this amendment can be found throughout the specification (e.g. col. 3 lines 60-65, col. 10 lines 27-35 col. 1 lines 6-8, col. 1 lines 60-61, fig. 1, fig. 2)

Given the independent claims have been amended, the dependent claims dependent on an allowable base claim, are allowable for at least that reason.

Conclusions

Without acquiescing in the rejection of previously independent claims 37, 43, and 49, applicant has amended independent claims 37, 43 and 49 for the purpose of expediting prosecution.

In light of the foregoing remarks, Applicant respectfully requests favorable reconsideration and early passage to issue of the present application. Should this not be the case applicant kindly requests a telephone interview with the examiner. Email instructions regarding that interview can be made by email at robert@nariste.com.

Respectfully submitted,

/Robert A Malaney/

Robert A Malaney 16 Carlyle Rd, East Lindfield, NSW, 2070.

IN THE CLAIMS

The following is a complete listing of the claims, and replaces all earlier versions and listings.

37 (currently amended). A method of acquiring a satellite positioning system position on a mobile wireless communication device for a wireless communications network, said satellite positioning system being Global Positioning Systems technologies using line-of-sight measurements to satellites, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system for satellite positioning system capability, said method comprising:

determining when said embedded satellite positioning system module should be powered on, said powered on being a switch on of power to said embedded satellite positioning system module using electronic circuits,

said when said embedded satellite positioning system module should be powered on being dependant on ~~at least one of a position error determined from the wireless communications network and~~ a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

38 (original). The method according to claim 37, wherein said satellite positioning system is a Global Positioning System (GPS).

39 (original). The method according to claim 37, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

40 (original). The method according to claim 37, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

41 (original). The method according to claim 37, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.

42 (original). The method according to claim 37, wherein said determining when said embedded satellite positioning system module should be powered on is also dependent on at least one of; a last satellite position; a last position determined by the satellite positioning system; a last time determined by the satellite positioning system; a previous position.

43 (currently amended). A mobile wireless communication device for a wireless communications network, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system module for satellite positioning system capability, said satellite positioning system being Global Positioning Systems technologies using line-of-sight measurements to satellites, said mobile wireless communication device comprising: a processor; a memory coupled to said processor; an embedded satellite positioning system module coupled to said processor providing a satellite positioning capability for said mobile wireless communication device; and means for determining when said embedded satellite positioning system module should be powered on, said powered on being a switch on of power to said embedded satellite positioning system module using electronic circuits, said determining when said embedded satellite positioning system module should be powered on being dependant on ~~at least one of a position error determined from the wireless communications network and~~ a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

44 (original). The mobile device according to claim 43, wherein said satellite positioning system is a Global Positioning System (GPS).

45 (original). The mobile device according to claim 43, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

46 (original). The mobile device according to claim 43, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

47 (original). The mobile device according to claim 43, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.

48 (original). The mobile device according to claim 43, wherein said determining when said embedded satellite positioning system module should be powered on is also dependent on at least one of; a last satellite position; a last position determined by the satellite positioning system; last time determined by the satellite positioning system; a previous position.

49 (currently amended). A computer program product for a mobile wireless communication device for a wireless communication network, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system module for satellite positioning system capability, said satellite positioning system being Global Positioning Systems technologies using line-of-sight measurements to satellites, said computer program product having a non-transitory computer readable medium storing a computer program for acquiring a satellite positioning system position on a said mobile wireless communication device, comprising: computer program code means for interfacing with the satellite positioning system capability of said mobile wireless communication device; and computer program code means for determining when said embedded satellite positioning system module should be powered on, said powered on being a switch on of power to said embedded satellite positioning system module using electronic circuits,

said determining when said embedded satellite positioning system module should be powered on being dependant on ~~at least one of a position error determined from the wireless communications network and~~ a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

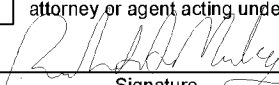
50 (original). The computer program product according to claim 49, wherein said satellite positioning system is a Global Positioning System (GPS).

51 (original). The computer program product according to claim 49, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

52 (original). The computer program product according to claim 49, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

53 (original). The computer program product according to claim 49, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.

54 (original). The computer program product according to claim 49, wherein said determining when said embedded satellite positioning system module should be powered on is also dependent on at least one of; a last satellite position; a last position determined by the satellite positioning system; a last time determined by the satellite positioning system; and a previous position.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)		Docket Number (Optional)																														
Application Number 15637627	Filed 12/12/2016																															
For Self monitoring GPS on mobile device																																
Art Unit 3993	Examiner Graham, Matthew C																															
This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application. The requested extension and fee are as follows (check time period desired and enter the appropriate fee below): <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 15%; text-align: center;"><u>Fee</u></th> <th style="width: 15%; text-align: center;"><u>Small Entity Fee</u></th> <th style="width: 15%; text-align: center;"><u>Micro Entity Fee</u></th> <th style="width: 25%;"></th> </tr> </thead> <tbody> <tr> <td>☒ One month (37 CFR 1.17(a)(1))</td> <td style="text-align: center;">\$200</td> <td style="text-align: center;">\$100</td> <td style="text-align: center;">\$50</td> <td>\$ <u>100</u></td> </tr> <tr> <td>☐ Two months (37 CFR 1.17(a)(2))</td> <td style="text-align: center;">\$600</td> <td style="text-align: center;">\$300</td> <td style="text-align: center;">\$150</td> <td>\$ _____</td> </tr> <tr> <td>☐ Three months (37 CFR 1.17(a)(3))</td> <td style="text-align: center;">\$1,400</td> <td style="text-align: center;">\$700</td> <td style="text-align: center;">\$350</td> <td>\$ _____</td> </tr> <tr> <td>☐ Four months (37 CFR 1.17(a)(4))</td> <td style="text-align: center;">\$2,200</td> <td style="text-align: center;">\$1,100</td> <td style="text-align: center;">\$550</td> <td>\$ _____</td> </tr> <tr> <td>☐ Five months (37 CFR 1.17(a)(5))</td> <td style="text-align: center;">\$3,000</td> <td style="text-align: center;">\$1,500</td> <td style="text-align: center;">\$750</td> <td>\$ _____</td> </tr> </tbody> </table> ☒ Applicant asserts small entity status. See 37 CFR 1.27. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously. ☐ A check in the amount of the fee is enclosed. ☐ Payment by credit card. Form PTO-2038 is attached. ☐ The Director has already been authorized to charge fees in this application to a Deposit Account. ☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____. ☒ Payment made via EFS-Web. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. I am the ☒ applicant/inventor. ☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96). ☐ attorney or agent of record. Registration number _____. ☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.  _____ Signature Robert Anderson Malaney _____ Typed or printed name 12/17/2017 _____ Date _____ Telephone Number NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*. ☐ * Total of _____ forms are submitted.				<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>		☒ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ <u>100</u>	☐ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____	☐ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ _____	☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____	☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____
	<u>Fee</u>	<u>Small Entity Fee</u>	<u>Micro Entity Fee</u>																													
☒ One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ <u>100</u>																												
☐ Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____																												
☐ Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ _____																												
☐ Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____																												
☐ Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____																												

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

if you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:		15376627		
Filing Date:		12-Dec-2016		
Title of Invention:		SELF MONITORING GPS ON MOBILE DEVICE		
First Named Inventor/Applicant Name:		Robert Anderson Malaney		
Filer:		Robert Anderson Malaney		
Attorney Docket Number:				
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 1 month with \$0 paid	2251	1	100	100
Miscellaneous:				
Total in USD (\$)				100

Electronic Acknowledgement Receipt	
EFS ID:	31250316
Application Number:	15376627
International Application Number:	
Confirmation Number:	2064
Title of Invention:	SELF MONITORING GPS ON MOBILE DEVICE
First Named Inventor/Applicant Name:	Robert Anderson Malaney
Customer Number:	132250
Filer:	Robert Anderson Malaney
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	17-DEC-2017
Filing Date:	12-DEC-2016
Time Stamp:	20:24:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$100
RAM confirmation Number	121817INTEFSW20274700
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	15376627_remarks.pdf	99165	no	4
			772f4a8e6471fba61d97787977394f0382c3088		
Warnings:					
Information:					
2	Claims	15376627_claims_amended.pdf	66378	no	4
			a6b9b1f97282020627740ec59ec9b97c0acabfac		
Warnings:					
Information:					
3	Extension of Time	sb0022-signed.pdf	190927	no	2
			d218e2904d5aada7d57b1c4c2d4becae4d49bc15		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30147	no	2
			162cf221b3738c370526aa71e7068c501cd32ef0e		
Warnings:					
Information:					
Total Files Size (in bytes):			386617		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/376,627		Filing Date 12/12/2016		☐ To be Mailed	
ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO									
APPLICATION AS FILED – PART I									
(Column 1)		(Column 2)							
FOR		NUMBER FILED	NUMBER EXTRA	RATE (\$)		FEE (\$)			
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A	N/A					
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))		N/A	N/A	N/A					
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A	N/A					
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =	*	X \$ =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*	X \$ =					
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
				TOTAL					
* If the difference in column 1 is less than zero, enter "0" in column 2.									
APPLICATION AS AMENDED – PART II									
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	12/17/2017	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 18	Minus	** 18	= 0	X \$40 =		0	
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	X \$210 =		0	
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE		0	
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =			
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.									
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".									
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									
LIE RHONDA BELL									

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/376,627	12/12/2016	Robert Anderson Malaney		2064
132250	7590	06/19/2019		
Robert Malaney 16 Carlyle Rd East Lindfield, NSW, 2070 AUSTRALIA			EXAMINER PEIKARI, BEHZAD	
			ART UNIT 3992	PAPER NUMBER
			MAIL DATE 06/19/2019	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<i>Notice of Non-Compliant Amendment (37 CFR 1.121)</i>	Application No. 15/376,627	Applicant(s) Malaney, Robert Anderson	
	Examiner BEHZAD PEIKARI	Art Unit 3992	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

The amendment document filed on 12/17/2017 is considered non-compliant because it has failed to meet the requirements of 37 CFR 1.121 or 1.4. In order for the amendment document to be compliant, correction of the following item(s) is required.

THE FOLLOWING MARKED (X) ITEM(S) CAUSE THE AMENDMENT DOCUMENT TO BE NON-COMPLIANT:

- ☒ 1. Amendments to the specification:
 - ☐ A. Amended paragraph(s) do not include markings.
 - ☐ B. New paragraph(s) should not be underlined.
 - ☒ C. Other See Continuation Sheet .
- ☐ 2. Abstract:
 - ☐ A. Not presented on a separate sheet. 37 CFR 1.72.
 - ☐ B. Other _____ .
- ☐ 3. Amendments to the drawings:
 - ☐ A. The drawings are not properly identified in the top margin as "Replacement Sheet", "New Sheet", or "Annotated Sheet" as required by 37 CFR 1.121(d).
 - ☐ B. The practice of submitting proposed drawing correction has been eliminated. Replacement drawings showing amended figures, without markings, in compliance with 37 CFR 1.84 are required.
 - ☐ C. Other _____ .
- ☒ 4. Amendments to the claims:
 - ☐ A. A complete listing of all of the claims is not present.
 - ☐ B. The listing of claims does not include the text of all pending claims (including withdrawn claims)
 - ☒ C. Each claim has not been provided with the proper status identifier, and as such, the individual status of each claim cannot be identified. Note: the status of every claim must be indicated after its claim number by using one of the following status identifiers: (Original), (Currently amended), (Canceled), (Previously presented), (New), (Not entered), (Withdrawn) and (Withdrawn-currently amended).
 - ☐ D. The claims of this amendment paper have not been presented in ascending numerical order.
 - ☒ E. Other: See Continuation Sheet .
- ☒ 5. Other (e.g., the amendment is unsigned or not signed in accordance with 37 CFR 1.4):
See Continuation Sheet

For further explanation of the amendment format required by 37 CFR 1.121, see MPEP § 714.

TIME PERIODS FOR FILING A REPLY TO THIS NOTICE:

1. Applicant is given **no new time period if the non-compliant amendment is an** after-final amendment or an amendment filed after allowance. If applicant wishes to resubmit the non-compliant after-final amendment with corrections, the **entire corrected amendment** must be resubmitted.
2. Applicant is given **two months** from the mail date of this notice to supply the correction, if the non-compliant amendment is one of the following: a preliminary amendment, a non-final amendment (including a submission for a request for continued examination (RCE) under 37 CFR 1.114), a supplemental amendment filed within a suspension period under 37 CFR 1.103(a) or (c), and an amendment filed in response to a *Quayle* action. If any of above boxes 1. to 4. are checked, the correction required is only the **corrected section** of the non-compliant amendment in compliance with 37 CFR 1.121.

Extensions of time are available under 37 CFR 1.136(a) only if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action.

Failure to timely respond to this notice will result in:

- Abandonment** of the application if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action; or
- Non-entry** of the amendment if the non-compliant amendment is a preliminary amendment or supplemental amendment.

/B. James Peikari/ Primary Examiner, Art Unit 3992	/A.J.K/ Supervisory Patent Examiner, Art Unit 3992
---	---

Continuation of 1(c) Other: The required amendment to the specification has not been made. Section 3 of the previous Office action stated: "The specification should also be amended to properly identify the reissue and continuation domestic benefit/national stage information (i.e., that more than one reissue application has been filed for the same patent)."

Continuation of 4(e) Other: The amendment to the claims is improper for the following reasons*:

(i) The claims have been submitted with improper status identifiers. In reissue applications, all All amendments must be made relative to the patent specification, including the claims, and drawings, which are in effect as of the date of filing of the reissue application. See 37 CFR 1.173 (g). Therefore, claims which were identified as "currently amended" in the amendment should be identified as "new, amended". Claims which were identified as "original" in the amendment were not in the original patent. These should be identified as "new". Note the examples shown in MPEP 1453.

(ii) The claims have been submitted with strikethrough deletions. Strikethrough is not permitted in reissue amendments. The matter to be omitted by reissue must be enclosed in brackets. See 37 CFR 1.173 (d)(1).

(iii) As stated above, all amendments must be made relative to the patent specification, including the claims. See 37 CFR 1.173 (g). Furthermore, the matter to be added by reissue must be underlined. See 37 CFR 1.173 (d)(2). Thus, all of the claims submitted with the amendment should have been fully underlined, including status identifiers.

* Note: While it is helpful to have in the record an informal copy of the claims marked up to show changes relative to the prior amendment, only a formal amendment in compliance with CFR 1.173 may actually be entered.

Continuation of 5 Other: The amendment is also non-compliant for the following reasons:

(i) With regard to the requirements for the 3.73(c) statement, MPEP 1410.02 lists two ways to show proof of ownership of assignee:

"(A) filing in the reissue application documentary evidence of a chain of title from the original owner to the assignee; or

(B) specifying in the record of the reissue application where such evidence is recorded in the Office (e.g., reel and frame number, etc.)."

Applicant has chosen method (B) to show the title chain from Robert Anderson Maloney to Nariste Networks Pty Ltd. This was correctly shown with the reel and frame number, etc.

Applicant relies on method (A) to show the title chain from Nariste Networks Pty Ltd back to Robert Anderson Maloney, but has not provided an accompanying statement affirming that the documentary evidence of the chain of title from the original owners to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11. See MPEP 1410.02.

(ii) With regards to the requirements for the ADS, applicant has requested guidance. It is noted that the previous Office action clearly explains what is in error relative to the ADS, and how that error may be corrected. The priority information noted by applicant should be included in the ADS and the specification, as explained in the previous Office action.



UNITED STATES PATENT AND TRADEMARK OFFICE
USPTO Automated Interview Request (AIR)

Aug 6 2019

This paper requesting to schedule and/or conduct an interview is appropriate because:

I have previously submitted an authorization for internet communications in a patent application. See form SB/0439.

Name(s) :

Robert Malaney

S-signature:

/Robert Malaney/

Registration Number:

U.S. Application Number:

15376627

Confirmation Number:

2064

E-mail Address:

Robert@malaney.net

Phone Number:

+61 294161983

Proposed Time of Interview:

8-15-2019 4:00 PM ET

Preferred Interview Type:

Telephonic

I am the applicant or applicant's representative for this application.

Topic for Discussion:



UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/376,627		Filing Date 12/12/2016		☐ To be Mailed		
ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO										
APPLICATION AS FILED - PART I										
		(Column 1)	(Column 2)							
FOR		NUMBER FILED	NUMBER EXTRA	RATE (\$)		FEE (\$)				
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A	N/A						
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A	N/A						
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A	N/A						
TOTAL CLAIMS (37 CFR 1.16(j))		minus 20 =	*	x \$40 =						
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*	x \$210 =						
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL						
APPLICATION AS AMENDED - PART II										
		(Column 1)	(Column 2)	(Column 3)						
AMENDMENT	08/16/2019	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)			
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0	x \$ 50 =		0		
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	x \$ 230 =		0		
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
					TOTAL ADD'L FEE		0			
AMENDMENT		(Column 1)	(Column 2)	(Column 3)						
		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)			
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$ 0 =				
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$ 0 =				
	☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
					TOTAL ADD'L FEE					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.					LIE					
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".					/LAVINIA D JOHNSON/					
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".										
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.										

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

17-Aug-2019 03:47 From Robert Malaney. Phone #0294161983

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Recipient Information

To: Patent Office
Company: USPTO
Fax #: 15712738300

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Sender Information

From: Robert Malaney
Email address: robert@malaney.net (from 122.106.241.103)
Phone #: 0294161983
Sent on: Friday, August 16 2019 at 11:46 PM EDT

Claims (informal - to assist examiner) for application 15,376,627

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FaxZero.com has a zero tolerance policy for abuse and junk faxes. If this fax is spam or abusive, please e-mail support@faxzero.com or send a fax to 855-330-1238, or phone 707-400-6360. Specify fax #25061323. We will add your fax number to the block list.

IN THE CLAIMS

The following is a complete listing of the claims, and replaces all earlier versions and listings.
This is an informal listing to assist examiner.

37 (new, amended). A method of acquiring a satellite positioning system position on a mobile wireless communication device for a wireless communications network, said satellite positioning system being Global Positioning Systems technologies using line-of-sight measurements to satellites, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system for satellite positioning system capability, said method comprising:

determining when said embedded satellite positioning system module should be powered on, said embedded satellite positioning system module then being powered on,
said powered on being a switch on of power to said embedded satellite positioning system module using electronic circuits,

said when said embedded satellite positioning system module should be powered on being dependant on ~~at least one of a position error determined from the wireless communications network and a position determined from the wireless communications network~~, said wireless communications network being different from said satellite positioning system.

38 (new). The method according to claim 37, wherein said satellite positioning system is a Global Positioning System (GPS).

39 (new). The method according to claim 37, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

40 (new). The method according to claim 37, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

41 (new). The method according to claim 37, wherein said powered on comprises

said module powering up from a low-power mode such as a TricklePower power-down mode.

42 (new). The method according to claim 37, wherein said determining when said embedded satellite positioning system module should be powered on is also dependent on at least one of; a last satellite position; a last position determined by the satellite positioning system; a last time determined by the satellite positioning system; a previous position.

43 (new, amended). A mobile wireless communication device for a wireless communications network, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system module for satellite positioning system capability, said satellite positioning system being Global Positioning Systems technologies using line-of-sight measurements to satellites, said mobile wireless communication device comprising:

a processor; a memory coupled to said processor; an embedded satellite positioning system module coupled to said processor providing a satellite positioning capability for said mobile wireless communication device; and means for determining when said embedded satellite positioning system module should be powered on, said embedded satellite positioning system module then being powered on, said powered on being a switch on of power to said embedded satellite positioning system module using electronic circuits,

said determining when said embedded satellite positioning system module should be powered on being dependant on ~~at least one of a position error determined from the wireless communications network and~~ a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

44 (new). The mobile device according to claim 43, wherein said satellite positioning system is a Global Positioning System (GPS).

45 (new). The mobile device according to claim 43, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

46 (new). The mobile device according to claim 43, wherein any dependency on said position

determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

47 (new). The mobile device according to claim 43, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.

48 (new). The mobile device according to claim 43, wherein said determining when said embedded satellite positioning system module should be powered on is also dependent on at least one of; a last satellite position; a last position determined by the satellite positioning system; last time determined by the satellite positioning system; a previous position.

49 (new, amended). A computer program product for a mobile wireless communication device for a wireless communication network, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system module for satellite positioning system capability, said satellite positioning system being Global Positioning Systems technologies using line-of-sight measurements to satellites, said computer program product having a non-transitory computer readable medium storing a computer program for acquiring a satellite positioning system position on a said mobile wireless communication device, comprising: computer program code means for interfacing with the satellite positioning system capability of said mobile wireless communication device; and computer program code means for determining when said embedded satellite positioning system module should be powered on, said embedded satellite positioning system module then being powered on, said powered on being a switch on of power to said embedded satellite positioning system module using electronic circuits.

said determining when said embedded satellite positioning system module should be powered on being dependant on ~~at least one of a position error determined from the wireless communications network and~~ a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

50 (new). The computer program product according to claim 49, wherein said satellite

positioning system is a Global Positioning System (GPS).

51 (new). The computer program product according to claim 49, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

52 (new). The computer program product according to claim 49, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

53 (new). The computer program product according to claim 49, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.

54 (new). The computer program product according to claim 49, wherein said determining when said embedded satellite positioning system module should be powered on is also dependent on at least one of, a last satellite position; a last position determined by the satellite positioning system; a last time determined by the satellite positioning system; and a previous position.

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To: Patent Office
Company: USPTO
Fax #: 15712738300

AUG 16 2019

fax

Sender Information

From: Robert Malaney
Email address: robert@malaney.net (from 122.106.241.103)
Phone #: 0294161983
Sent on: Friday, August 16 2019 at 11:38 PM EDT

ADS for Application 15/376,627

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FaxZero.com has a zero tolerance policy for abuse and junk faxes. If this fax is spam or abusive, please e-mail support@faxzero.com or send a fax to 855-330-1238, or phone 707-400-6360. Specify fax #25061311. We will add your fax number to the block list.

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor 1 Remove				
Legal Name				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Robert	Anderson	Malaney	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
City	East Lindfield	Country of Residence ⁱ	AU	
Mailing Address of Inventor:				
Address 1		16 Carlyle Rd		
Address 2		East Lindfield		
City	New South Wales	State/Province		
Postal Code	2070	Country ⁱ	AU	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add				

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence information of this application.			
Customer Number	132250		
Email Address	robert@malaney.net	Add Email	Remove Email

Application Information:

Title of the Invention	SELF MONITORING GPS ON MOBILE DEVICE		
Attorney Docket Number		Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)	2

EFS Web 2.2.12

PTO/AIA/14 (11-15)

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:
☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	132250		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15376627	Continuation of	14031992	2013-09-19

EFS Web 2.2.12

PTO/AIA/14 (11-15)

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number			
		Application Number			
Title of Invention		SELF MONITORING GPS ON MOBILE DEVICE			
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14031992	reissued of	11661707	2008-02-11	8022870	2011-09-20
Prior Application Status				Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
11661707	a 371 of international	PCT/AU2005/001351	2005-08-31		
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.					

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)¹ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number		Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
2004905024		AU	2004-09-02	
Additional Foreign Priority Data may be generated within this form by selecting the Add button.				

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. ☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.
--

PTO/AIA/14 (11-15)

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (11-15)

Approved for use through 04/30/2017. OMB 0851-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Applicant 1				
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.				
Clear				
☐ Assignee		☐ Legal Representative under 35 U.S.C. 117		☐ Joint Inventor
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest		
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
Name of the Deceased or Legally Incapacitated Inventor:				
If the Applicant is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Applicant:				
Address 1				
Address 2				
City		State/Province		
Country		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Applicant Data may be generated within this form by selecting the Add button.				

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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PTO/AIA/14 (11-15)

Approved for use through 04/30/2017. OMB 0651-0032

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is **not** checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Robert A. Malaney/		Date (YYYY-MM-DD)	2019-08-17
First Name	Robert	Last Name	Malaney	Registration Number
Additional Signature may be generated within this form by selecting the Add button.				

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	
		Application Number	
Title of Invention	SELF MONITORING GPS ON MOBILE DEVICE		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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- 2 A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
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- 5 A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
- 6 A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
- 7 A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
- 8 A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
- 9 A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Robert Anderson Malaney

Group Art Unit: 3992

Application No.: 15/376,627

Examiner: PEIKARI, BEHZAD

Confirmation No.: 2064

For: SELF MONITORING GPS ON MOBILE DEVICE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the examiner's points I note the following;

1(c): I kindly request that the specification be amended to note the following.
This application is a continuation reissue of application no. 14,031,992, which is an application for reissue of U.S. Patent No. 8,022,870, now RE46,237.

[Please also note that another application, 15/364,195, is now abandoned. 15/364,195, was another continuation reissue of application no. 14,031,992, which is an application for reissue of U.S. Patent No. 8,022,870, now RE46,237.]

4(e): Attached also is a new set of claims to reflect suggestions made by the examiner. An informal set of the new claims is also attached to assist the examiner.

5(i): Attached is a corrected assignment sheet showing the real and frame number of assignment from original owners to the assignee

5(ii): Attached is a corrected ADS. A corrected filing receipt is requested.

Other matters:

Previous examiner has asked how does a device gets positioned without GPS being switched on? Beyond my answer to this in my previous correspondence, I again note that positioning a device without using GPS is well known in the art. These are the network-based technologies referred to as (1) in the 2nd paragraph of the original specification. Such techniques are well known for positioning of mobile devices in a wireless network (see paragraph 1 of original specification). Such techniques do not use GPS. The specification makes clear network-based technologies do not use GPS. If current examiner believes that the following does not add new matter to specification, I kindly request the specification be amended to add the following - "Network-based technologies are known to position a mobile device without use of a GPS."

Respectfully Submitted,

/Robert A. Malaney/

Robert A. Malaney, Customer Number 132250

16 Carlyle Rd
East Lindfield, NSW 2070,
Australia

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To: Patent Office
Company: USPTO
Fax #: 15712738300

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Sent on: Friday, August 16 2019 at 11:29 PM EDT

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Transmittal Letter for Application 15/376,627

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From: Robert Malaney
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Claims (Formal) for application 15,376,627

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IN THE CLAIMS

The following is a complete listing of the claims, and replaces all earlier versions and listings.

37 (new, amended). A method of acquiring a satellite positioning system position on a mobile wireless communication device for a wireless communications network, said satellite positioning system being Global Positioning Systems technologies using line-of-sight measurements to satellites, said mobile wireless communication device possessing wireless communications capability for said wireless communications network and an embedded satellite positioning system for satellite positioning system capability, said method comprising:

determining when said embedded satellite positioning system module should be powered on, said embedded satellite positioning system module then being powered on, said powered on being a switch on of power to said embedded satellite positioning system module using electronic circuits,

said when said embedded satellite positioning system module should be powered on being dependant on a position determined from the wireless communications network, said wireless communications network being different from said satellite positioning system.

38 (new). The method according to claim 37, wherein said satellite positioning system is a Global Positioning System (GPS).

39 (new). The method according to claim 37, wherein said embedded satellite positioning system module comprises an embedded satellite positioning system device.

40 (new). The method according to claim 37, wherein any dependency on said position determined from the wireless communications network comprises a dependency independent of the speed of said mobile wireless communication device, said speed derived from said position determined from the wireless communications network.

41 (new). The method according to claim 37, wherein said powered on comprises said module powering up from a low-power mode such as a TricklePower power-down mode.