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SCORE Placeholder Sheet for IFW Content

Application Number: 18470513

Document Date: 09/20/2023

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- Drawing

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CLAIMS

What is claimed is:

1. A method comprising:
inputting a plurality of labeled examples into a multi-task network, the multi-task network comprising:

a backbone network, the backbone network generating one or more feature vectors corresponding to each of the labeled examples, and

a plurality of prediction heads coupled to the backbone network;

minimizing a joint loss based on outputs of the plurality of prediction heads, the minimizing the joint loss causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the joint loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the prediction heads.
2. The method of claim 1, wherein the backbone network comprises a convolutional neural network (CNN) and a feature pyramid network (FPN) coupled to the CNN.
3. The method of claim 2, wherein a subset of the plurality of prediction heads receives input from the CNN and a second subset of the plurality of prediction heads receives input from the FPN.
4. The method of claim 2, wherein the CNN comprises an EfficientNet.
5. The method of claim 2, wherein the FPN comprises a bi-directional FPN.
6. The method of claim 2, wherein a subset of the plurality of prediction heads comprises a distraction classification prediction head, the distraction classification head comprising a convolutional layer, pooling layer, and fully connected layer.
7. The method of claim 2, wherein a second subset of the plurality of prediction heads includes one or more of an object detection prediction head and a pose estimation prediction head.
8. The method of claim 7, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, each of the bounding box regression network and the object class prediction network comprising deep neural networks

having a plurality of hidden layers, each hidden layer in the hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

9. The method of claim 7, wherein the pose estimation prediction head comprises a deep neural network, the deep neural network comprising a plurality of hidden layers and an output layer, each of the hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

10. The method of claim 2, wherein storing a distraction classification model after minimizing the joint loss comprises storing parameters of the CNN and at least one of the prediction heads.

11. A non-transitory computer-readable storage medium for tangibly storing computer program instructions capable of being executed by a computer processor, the computer program instructions defining operations of:

inputting a plurality of labeled examples into a multi-task network, the multi-task network comprising:

a backbone network, the backbone network generating one or more feature vectors corresponding to each of the labeled examples, and

a plurality of prediction heads coupled to the backbone network;

minimizing a joint loss based on outputs of the plurality of prediction heads, the minimizing the joint loss causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the joint loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the prediction heads.

12. The non-transitory computer-readable storage medium of claim 11, wherein the backbone network comprises a convolutional neural network (CNN) and a feature pyramid network (FPN) coupled to the CNN.

13. The non-transitory computer-readable storage medium of claim 12, wherein a subset of the plurality of prediction heads receives input from the CNN and a second subset of the plurality of prediction heads receives input from the FPN.
14. The non-transitory computer-readable storage medium of claim 12, wherein the CNN comprises an EfficientNet.
15. The non-transitory computer-readable storage medium of claim 12, wherein the FPN comprises a bi-directional FPN.
16. The non-transitory computer-readable storage medium of claim 12, wherein a subset of the plurality of prediction heads comprises a distraction classification prediction head, the distraction classification head comprising a convolutional layer, pooling layer, and fully connected layer.
17. The non-transitory computer-readable storage medium of claim 12, wherein a second subset of the plurality of prediction heads includes one or more of an object detection prediction head and a pose estimation prediction head.
18. The non-transitory computer-readable storage medium of claim 12, wherein storing a distraction classification model after minimizing the joint loss comprises storing parameters of the CNN and at least one of the prediction heads.
19. A device comprising:
a processor configured to:

input a plurality of labeled examples into a multi-task network, the multi-task network comprising: a backbone network, the backbone network generating one or more feature vectors corresponding to each of the labeled examples, and a plurality of prediction heads coupled to the backbone network,

minimize a joint loss based on outputs of the plurality of prediction heads, the minimizing the joint loss causing a change in parameters of the backbone network, and

store a distraction classification model after minimizing the joint loss, the distraction classification model comprising the parameters of the

backbone network and parameters of at least one of the prediction heads.

20. The device of claim 19, wherein storing a distraction classification model after minimizing the joint loss comprises storing parameters of the backbone network and at least one of the prediction heads.



UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #
18/470,513

RECEIPT DATE / TIME
09/20/2023 10:35:08 AM ET

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY Judi Cordo

PATENT CENTER # 62829137

AUTHORIZED BY George Zalepa

CUSTOMER # 32361

FILING DATE -

CORRESPONDENCE ADDRESS -

FIRST NAMED INVENTOR Ali HASSAN

Payment Information

PAYMENT METHOD
DA / 501561

PAYMENT TRANSACTION ID
E20239J A36288601

PAYMENT AUTHORIZED BY
Judi Cordo

PRE-AUTHORIZED ACCOUNT
501561

PRE-AUTHORIZED CATEGORY

37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.21 (Miscellaneous fees and charges)

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1111	UTILITY PATENT APPL. SEARCH FEE	700.00	1	700.00
1011	BASIC FILING FEE - UTILITY (PAPER FILING ALSO REQUIRES NON-ELECTRONIC FILING FEE UNDER 1.16(T))	320.00	1	320.00
1311	PATENT APPL. EXAMINATION FEE	800.00	1	800.00
TOTAL AMOUNT:				\$1,820.00

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 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 contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		
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.)
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Inventor Information:

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Ali		HASSAN		
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service					
City	Lahore	Country of Residence ⁱ	PK		
Mailing Address of Inventor:					
Address 1		c/o Motive Technologies, Inc.			
Address 2		44 Hawthorne Street, 4th Floor			
City	San Francisco	State/Province	CA		
Postal Code	94105	Country ⁱ	US		
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Ijaz		AKHTER		
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service					
City	Lahore	Country of Residence ⁱ	PK		
Mailing Address of Inventor:					
Address 1		c/o Motive Technologies, Inc.			
Address 2		44 Hawthorne Street, 4th Floor			
City	San Francisco	State/Province	CA		
Postal Code	94105	Country ⁱ	US		
Inventor 3					Remove
Legal Name					

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Muhammad		FAISAL	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				

City	Jhawarian	Country of Residence ⁱ	PK
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Mailing Address of Inventor:

Address 1	c/o Motive Technologies, Inc.		
Address 2	44 Hawthorne Street, 4th Floor		
City	San Francisco	State/Province	
Postal Code		Country ⁱ	PK

Inventor 4	Remove
-------------------	------------------------

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Afsheen	Rafaqat	ALI	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				

City	Gujranwala	Country of Residence ⁱ	PK
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Mailing Address of Inventor:

Address 1	c/o Motive Technologies, Inc.		
Address 2	44 Hawthorne Street, 4th Floor		
City	San Francisco	State/Province	CA
Postal Code	94105	Country ⁱ	US

Inventor 5	Remove
-------------------	------------------------

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ahmed		ALI	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				

City	Lahore	Country of Residence ⁱ	PK
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Mailing Address of Inventor:

Address 1	c/o Motive Technologies, Inc.		
Address 2	44 Hawthorne Street, 4th Floor		
City	San Francisco	State/Province	CA
Postal Code	94105	Country ⁱ	US

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	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

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	32361		
Email Address	njdocket@gtlaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		
Attorney Docket Number	189908.000253	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	9	Suggested Figure for Publication (if any)	

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.

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	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	32361		

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)		
	Continuation of	18068322	2022-12-19		
Prior Application Status	Patented	Remove			
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
18068322	Continuation of	17347682	2021-06-15	11532169	2022-12-20
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)	Remove
			Access Code ⁱ (if applicable)
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

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	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

☐	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.
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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	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

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.

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	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

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. ☒			
Organization Name	MOTIVE TECHNOLOGIES, INC.		
Mailing Address Information For Applicant:			
Address 1	55 Hawthorne Street		
Address 2	4th Floor		
City	San Francisco	State/Province	CA
Country	US	Postal Code	94105
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.

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	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

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:

Remove

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	/George Zalepa/		Date (YYYY-MM-DD)	2023-09-20
First Name	George	Last Name	Zalepa	Registration Number
				72706

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

Add

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	189908.000253
		Application Number	
Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

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.**

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 the Freedom of Information Act requires disclosure of these records.
- 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.
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ABSTRACT

Disclosed are a multi-task training technique and resulting model for detecting distracted driving. In one embodiment, a method is disclosed comprising inputting a plurality of labeled examples into a multi-task network, the multi-task network comprising: a backbone network, the backbone network generating one or more feature vectors corresponding to each of the labeled examples, and a plurality of prediction heads coupled to the backbone network; minimizing a joint loss based on outputs of the plurality of prediction heads, the minimizing the joint loss causing a change in parameters of the backbone network; and storing a distraction classification model after minimizing the joint loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the prediction heads.

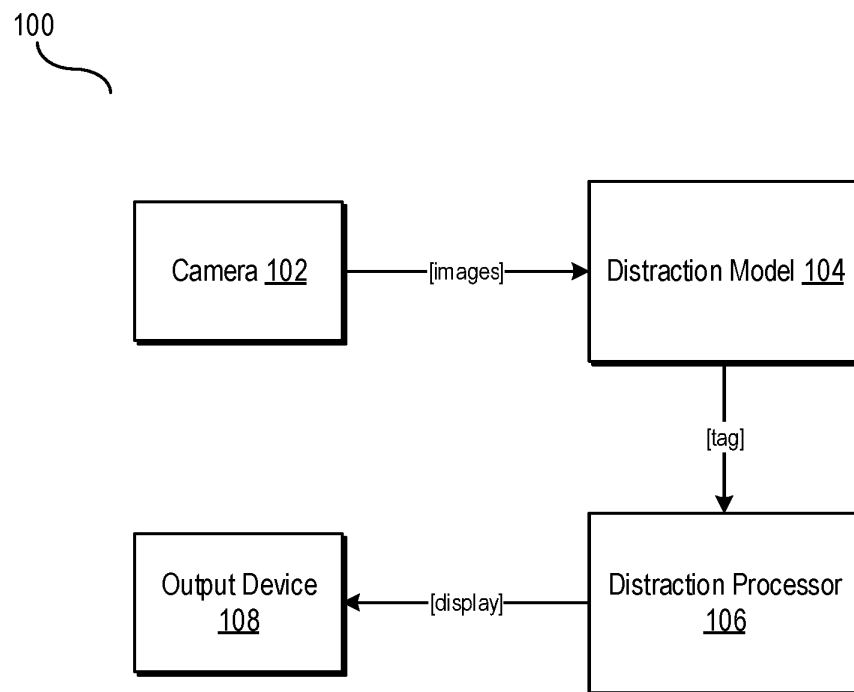


FIG. 1

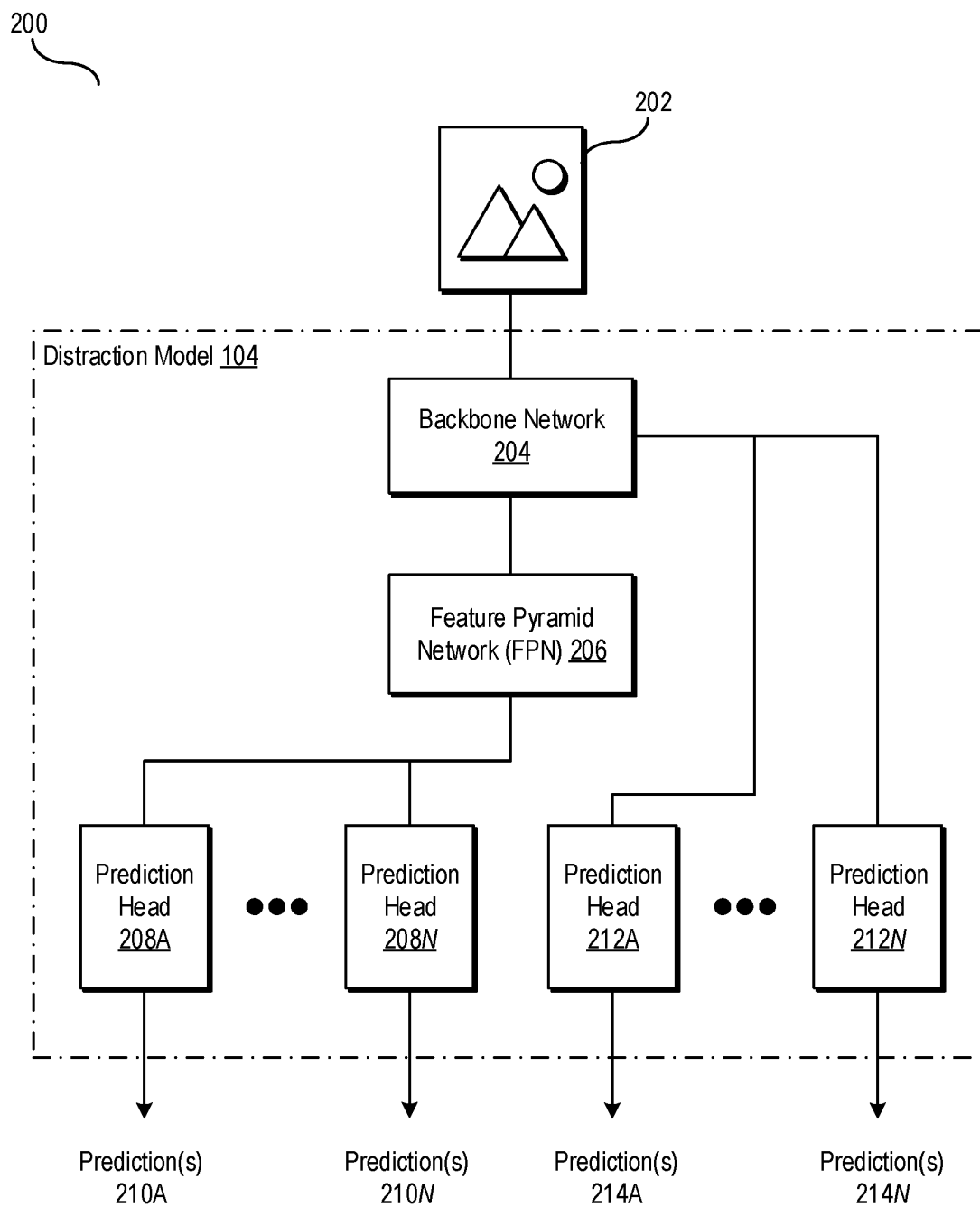


FIG. 2

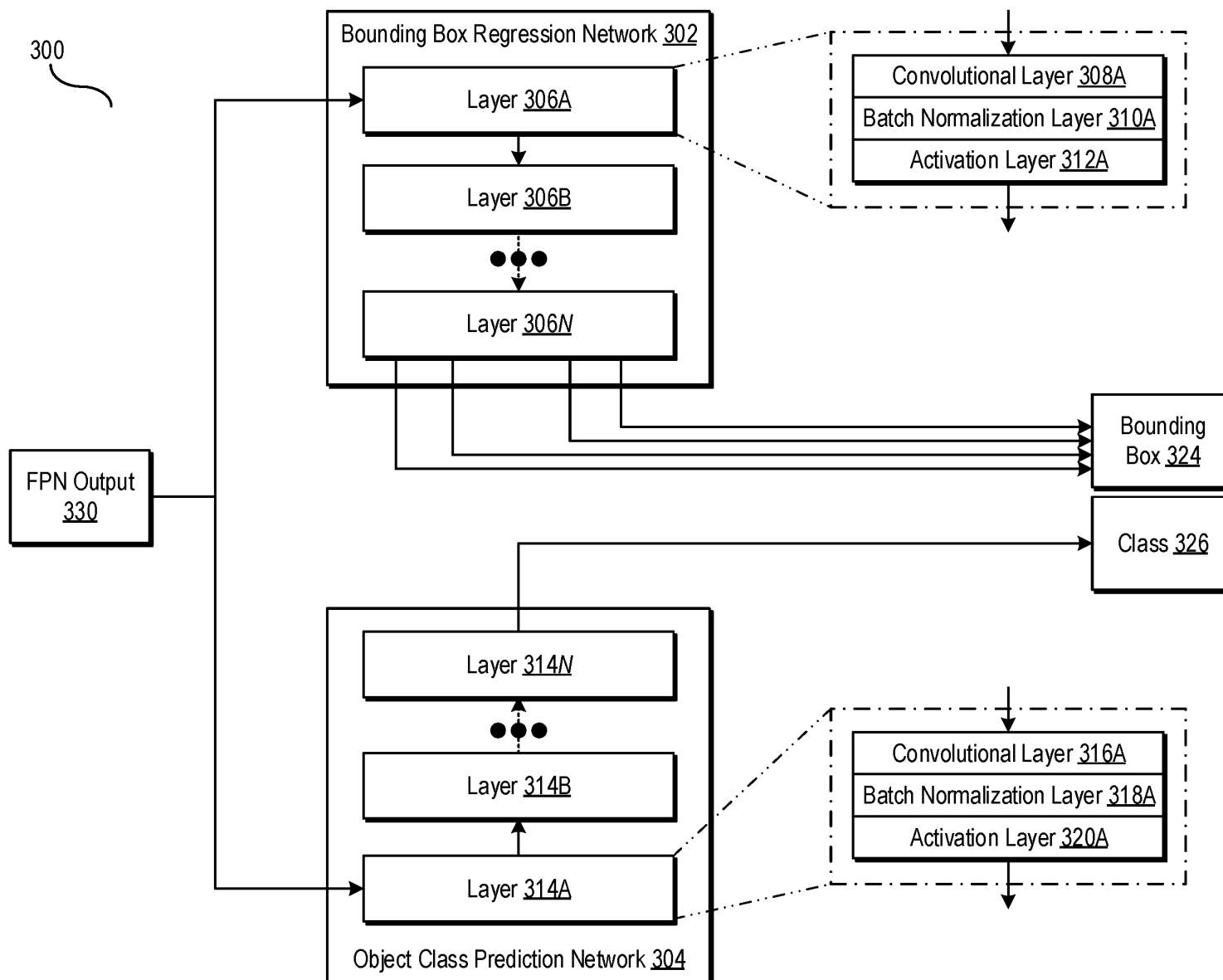


FIG. 3

400

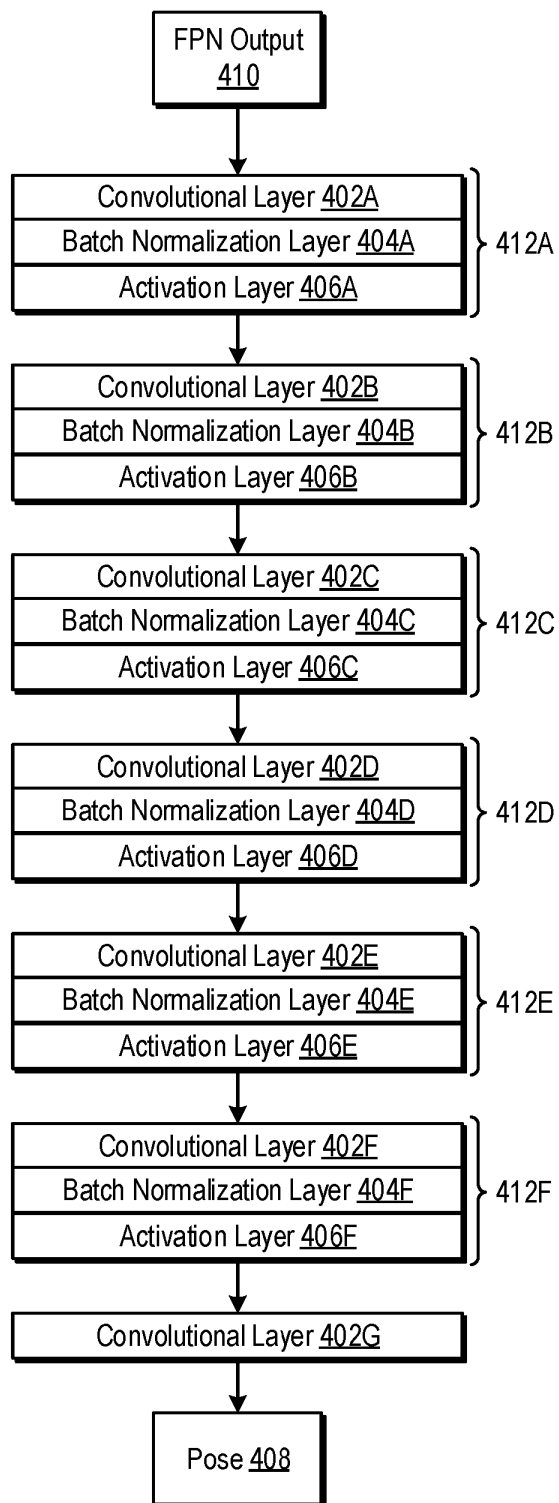


FIG. 4

500

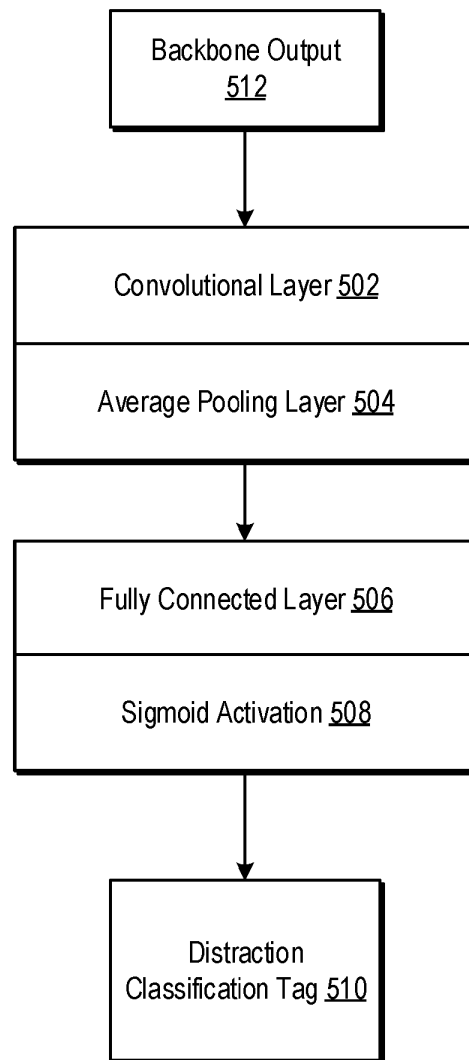


FIG. 5

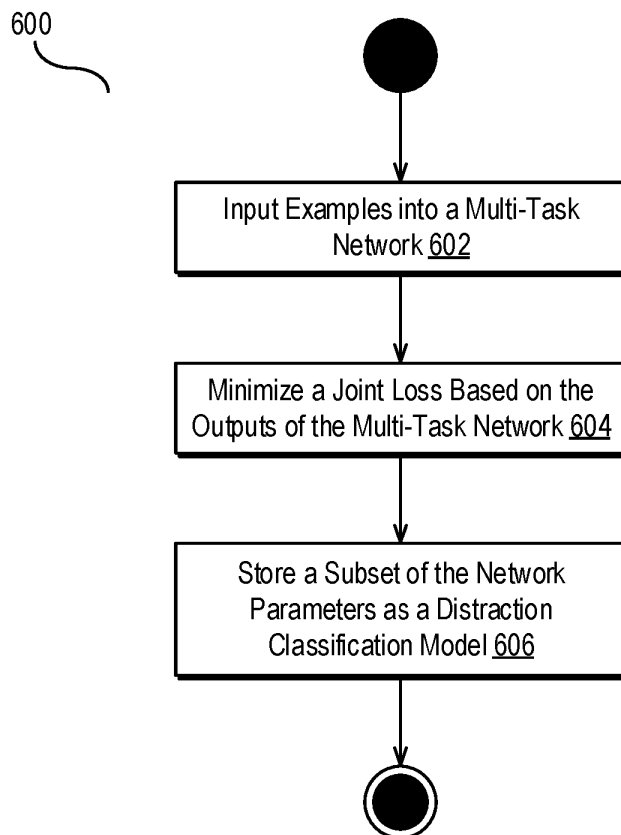


FIG. 6

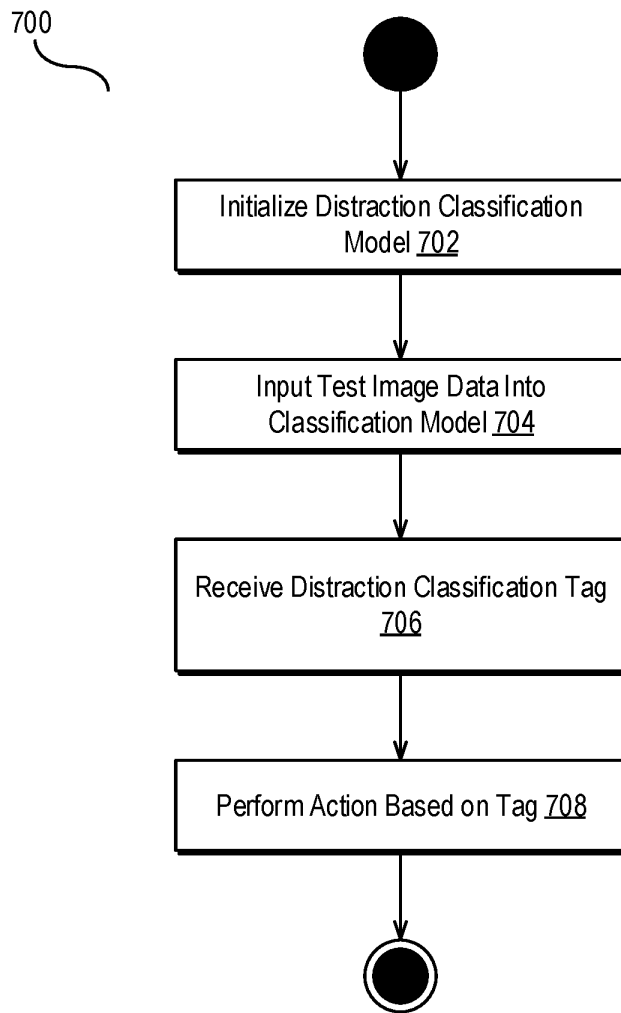


FIG. 7

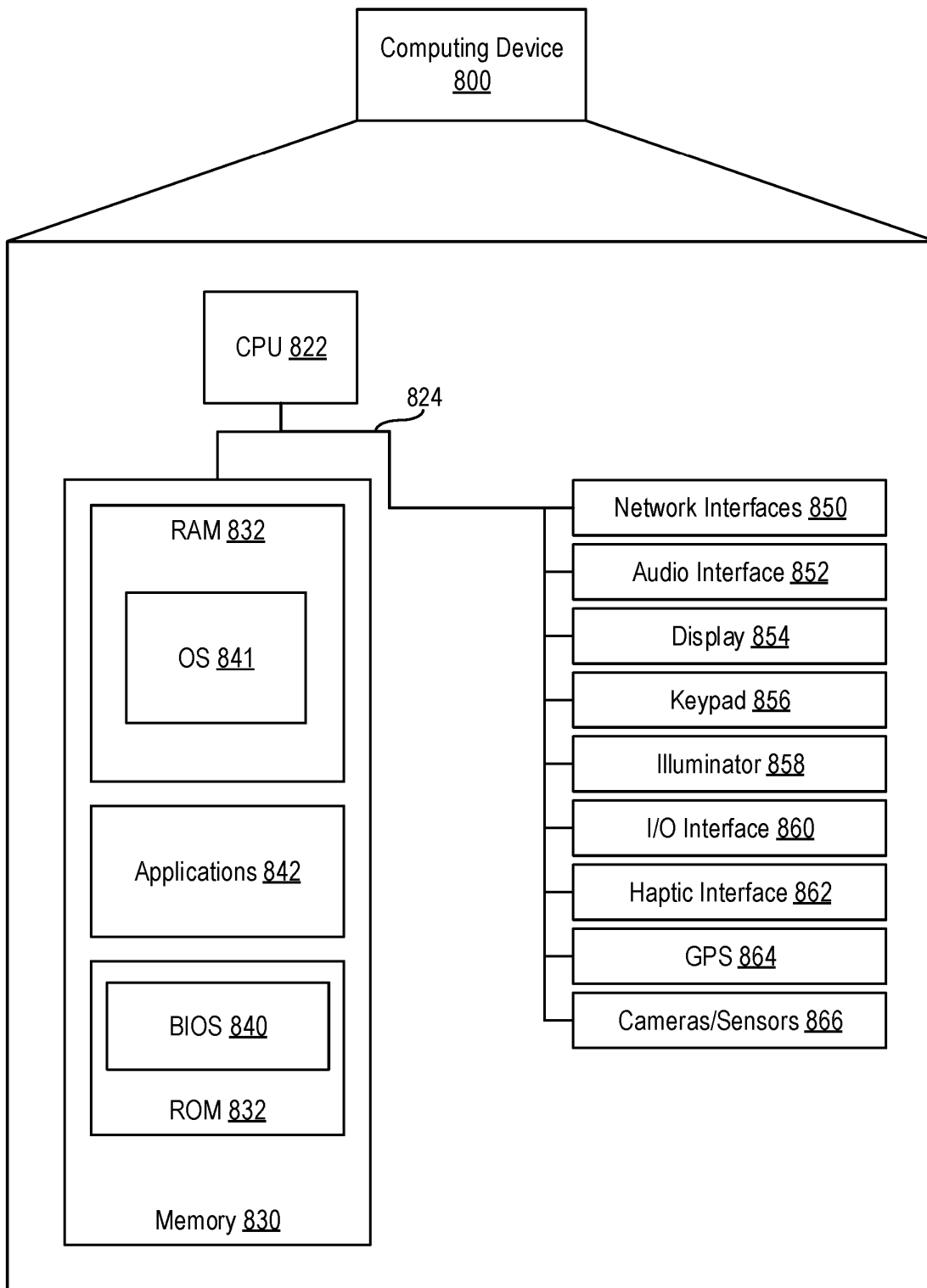


FIG. 8

900

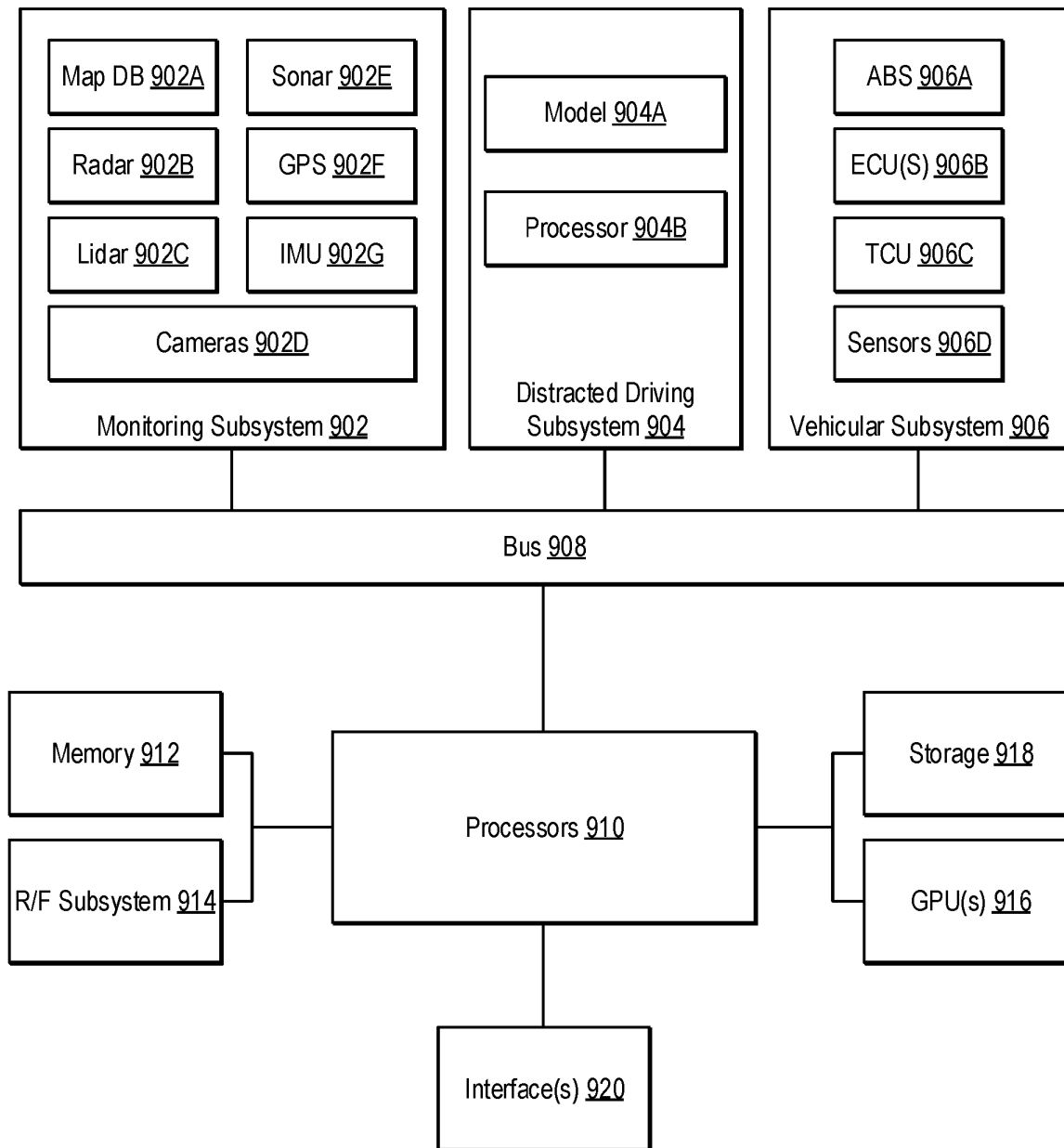


FIG. 9

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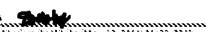
Assignee name and address:

MOTIVE TECHNOLOGIES, INC.
55 Hawthorne Street, 4th Floor, San Francisco, CA 94105

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SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature  Shu White White Play 16, 2022 10:21 PM	Date May 19, 2022
Name Shu White	Telephone 855-232-8506
Title Chief Compliance Officer and Corporate Secretary	

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of
Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States application or PCT international application number _____

filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: Ali Hassan

Date (Optional): _____

Signature: Ali Hassan

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LEGAL NAME OF INVENTOR

Inventor: Ijaz Akhter

Date (Optional): _____

Signature: Ijaz

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The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: Muhammad Faisal Date (Optional): _____

Signature: Faisal
Faisal [Jun 22, 2022 12:54 PM ET+5]

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The above-identified application was made or authorized to be made by me.

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LEGAL NAME OF INVENTOR

Inventor: Afsheen Rafaqat Ali

Date (Optional): _____

Signature: _____

Afsheen

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS
--------------------	--

As the below named inventor, I hereby declare that:

This declaration is directed to: ☐ The attached application, or ☒ United States application or PCT international application number 17/347,682 filed on June 15, 2021.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: Ahmed Ali Date (Optional) _____
Signature: Ahmed Ali

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DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Cross-Reference to Related Applications

[0001] This application is a continuation of, and claims the benefit of, U.S. Pat. Appl. No. 18/068,322, filed on Dec. 19, 2022, which is a continuation of and claims the benefit of U.S. Pat. Appl. No. 17/347,682 filed on June 15, 2021, both of which are hereby incorporated by reference in their entirety.

BACKGROUND

[0002] The disclosed embodiments are directed towards driver distraction detection and, in particular, to improve machine learning (ML) modeling of driver distraction. Currently, many systems for automatic driver distraction detection utilize a transfer learning approach wherein well-known, public training data sets are used to train ML models. Such systems, however, suffer from poor prediction performance when applied to real-world images and/or video.

BRIEF SUMMARY

[0003] Driver distraction detection is an important task for accident prevention as well as fleet management. Currently, driver distraction is one of the major causes of road fatalities, especially involving heavy-duty vehicles. Smart artificial (AI) dashcam solutions to alert or prevent distraction can make a huge impact in terms of accident avoidance. Automatic driver-distraction detection can also be used for driver training and fleet management.

[0004] Existing solutions for driver distraction detection use transfer learning approaches where deep neural networks (DNNs) are trained and tested on small datasets captured in a controlled environment. Such an approach does not work on more challenging (e.g., real-world) datasets as the DNN is unable to learn which parts of the image are important in predicting a distraction tag.

[0005] The disclosed embodiments, by contrast, detect distracted driving by utilizing a multi-task model, which comprises distraction classification and simultaneous detection of a mobile, the

driver's face, their body, and upper-body landmarks. In brief, the disclosed embodiments utilize a unified network and a plurality of downstream prediction heads for each of these tasks (e.g., mobile detection, face detection, etc.). The disclosed embodiments then train the unified network by minimizing a joint loss across the prediction heads.

[0006] By utilizing a multi-task model during training, the network can better learn and predict accurate distraction tags. The disclosed network is also very efficient and is easily extendable to other distraction classes such as eating, drinking, smoking, etc. Indeed, the disclosed embodiments can be extended to the most common distraction classes such as cell phone usage (e.g., talking, texting, other usages), smoking, talking to fellow passengers, talking on a handsfree headset, taking both hands off the wheel, eating/drinking, reading or writing, one-handed driving while the other hand is doing a secondary action. The list of distraction classes can grow or shrink based on the severity of each distraction as decided by the relevant fleets.

[0007] The disclosed embodiments additionally allow for the prediction of multiple tags per image. For example, the model can jointly predict seat-belt violation and multiple distraction tags such as mobile usage, "other" distractions, and undistracted for the same image.

[0008] The disclosed embodiments are significantly more accurate than existing solutions. This accuracy can be critical in some applications as it prevents false alarms and reduces driver/operator annoyance. Further, frequent false positives can reduce confidence in the detections. Further, the disclosed embodiments are capable of being run on edge devices (e.g., on-dash devices) and do not require a centralized model.

[0009] In contrast, existing systems mainly focus on head pose-based driver distraction, and their detection of distraction (e.g., mobile-phone usage) and non-distraction-related tags (e.g., seat-belt violation) are unreliable at best.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] **Figure 1** is a block diagram illustrating a system for distracted driver detection according to some embodiments.

[0011] **Figure 2** is a block diagram of a distraction network according to some embodiments.

[0012] **Figure 3** is a block diagram of an object detection prediction head according to some embodiments.

[0013] **Figure 4** is a block diagram of a pose estimation prediction head according to some embodiments.

[0014] **Figure 5** is a block diagram of a distraction classification prediction head according to some embodiments.

[0015] **Figure 6** is a flow diagram illustrating a method for training a distraction classification model according to some embodiments.

[0016] **Figure 7** is a flow diagram illustrating a method for testing a distraction classification model according to some embodiments.

[0017] **Figure 8** is a block diagram illustrating a computing device showing an example of a client or server device used in the various embodiments of the disclosure.

[0018] **Figure 9** is a block diagram of a vehicle according to some embodiments of the disclosure.

DETAILED DESCRIPTION

[0019] The disclosed embodiments describe a multi-task modeling technique for detecting distracted driving. In one embodiment, the disclosed embodiments can be implemented as methods, devices, and non-transitory computer-readable storage media for tangibly storing computer program instructions capable of being executed by a computer processor.

[0020] The disclosed embodiments include inputting a plurality of labeled examples into a multi-task network, comprising a backbone network coupled with a plurality of prediction heads. The backbone network generates one or more feature vectors corresponding to each of the labeled examples, and the attached heads solve the required tasks. The disclosed embodiments then minimize a joint loss based on outputs of the plurality of prediction heads, causing a change in the parameters of the backbone network. Finally, after minimizing the joint loss, the disclosed

embodiments store a distraction classification model, comprising the parameters of the backbone network and the parameters of at least one of the prediction heads.

[0021] In one embodiment, the backbone network comprises a convolutional neural network (CNN) (e.g., an EfficientNet) and a feature pyramid network (FPN) (e.g., a bi-directional FPN) coupled to the CNN. In one embodiment, a subset of the plurality of prediction heads receives input from the CNN, and a second subset of the plurality of prediction heads receives input from the FPN.

[0022] In one embodiment, a subset of the plurality of prediction heads comprises a distraction classification prediction head, which comprises a convolutional layer, pooling layer, and fully connected layer.

[0023] In one embodiment, the second subset of the plurality of prediction heads includes one or more of an object detection prediction head and a pose estimation prediction head. In one embodiment, the object detection prediction head comprises a bounding box regression network, and an object class prediction network. Each of the bounding box regression network and the object class prediction network comprise deep neural networks having a plurality of hidden layers such as a convolutional layer, a batch normalization layer, and an activation layer. The bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object. In one embodiment, the pose estimation prediction head comprises a deep neural network, comprising a plurality of hidden layers and an output layer. The hidden layers comprise a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprises a convolutional layer.

[0024] In one embodiment, storing a distraction classification model after minimizing the joint loss comprises storing parameters of the CNN and at least one of the prediction heads.

[0025] **Figure 1** is a block diagram illustrating a system 100 for distracted driver detection according to some embodiments. In an embodiment, system 100 includes a camera 102, a distraction model 104, a distraction processor 106, and an output device 108.

[0026] In an embodiment, camera 102 can comprise a still or video camera. In an embodiment, camera 102 can comprise a dash-mounted camera device installed within a vehicle. In an embodiment, camera 102 can comprise a digital or electronic camera device. In some embodiments, camera 102 can be integrated into a single device that includes a distraction model 104, a distraction processor 106, and an output device 108. In other embodiments, camera 102 can comprise a standalone camera communicatively coupled to distraction model 104.

[0027] In an embodiment, camera 102 transmits images to distraction model 104. In an embodiment, images can comprise still images captured by camera 102. In an embodiment, the still images can comprise frames of a captured video. In some embodiments, camera 102 can perform pre-processing on the images before transmitting images to the distraction model 104. For example, camera 102 can crop, down-sample, perform a grayscale conversion, or perform other image processing techniques on the images prior to transmitting them to the distraction model 104.

[0028] In an embodiment, distraction model 104 comprises a machine learning (ML) model configured to receive image inputs and generates a distraction classification tag. In an embodiment, distraction model 104 comprises a backbone network and a distraction classification prediction head (Figure 5). In brief, distraction model 104 comprises a backbone network that can comprise a convolutional neural network (CNN), such as EfficientNet, which generates a plurality of features (e.g., a feature vector or tensor). In an embodiment, the outputs of the CNN are fed to a prediction head that predicts distraction classifications or labels based on the images.

[0029] In an embodiment, the outputs of the distraction model 104 are then fed to a distraction processor 106. In an embodiment, distraction model 104 and distraction processor 106 can be tightly coupled as a single hardware and/or software implementation. In other embodiments, distraction model 104 and distraction processor 106 can be loosely coupled or completely uncoupled (e.g., run in a client-server architecture). In an embodiment, distraction processor 106 can comprise business logic to determine what to display on output device 108 based on the incoming tags. The distraction processor 106 receives a tag from the distraction model 104. In response, distraction processor 106 can be configured with rules or other conditions that define an action to take based on the tag. For example, the distraction processor 106 can be configured to transmit a message to a remote server when the tag output by the distraction model 104 indicates

that a distraction is present. Alternatively, or in conjunction, distraction processor 106 can generate a display or alert and transmit this display or alert to the output device 108. In an embodiment, output device 108 can comprise a heads-up display, monitor, speaker, or any other audio/visual display device installed in the vehicle.

[0030] In an embodiment, the distraction model 104 can comprise a single prediction head. However, as will be discussed in more detail in **Figure 2**, the distraction model can utilize multiple other heads during training, and minimize a joint loss among the heads. Thus, in some embodiments, multiple heads can be used to improve the training of the backbone network and classification head. Once trained, the unneeded heads can be discarded

[0031] **Figure 2** is a block diagram of the distraction network 200 according to some embodiments. In the embodiment, network 200 includes a plurality of prediction heads 208a–208n and 212a–212n. As will be discussed, the prediction heads 208a–208n, 212a–212n may only be present during training and some of the prediction heads 208a–208n, 212a–212n can be removed before deploying the model to an edge-device. As will be discussed, the use of a full set of heads prediction heads 208a–208n, 212a–212n during training can assist in improving the classification accuracy of the network 200.

[0032] In alternative embodiments, network 200 receives an image 202 as an input. As discussed above, image 202 can be obtained from a digital or video camera installed in a vehicle (e.g., a dash-mounted camera). In alternative embodiments, each image can be represented as a tuple of the image height, width, and depth. For example, a 128x128 RGB image has a height and width of 128 pixels and a depth of three for each color (red, green, blue). Similarly, a 1024x1024 grayscale image has a height and width of 1024 pixels with a depth of one (black). Generally, the network is trained in the form of batches of images and the number of images inside a batch is called batch-size. Thus, in some embodiments, the input shape into the CNN can be represented as (b, h, w, d) , where b represents the batch size, h and w represent the height and width of each image, and d represents the color depth of each image. Thus, although a single image 202 is illustrated, in some embodiments, multiple images can be input into the network 200 as part of a batch.

[0033] In alternative embodiments, the network 200 performs an initial processing on the image 202 using a backbone network 204. In one embodiment, backbone network 204 comprises a deep neural network. In some embodiments, backbone network 204 comprises a CNN. In an embodiment, backbone network 204 comprises a scalable CNN, scaled using a compound coefficient. In general, backbone network 204 can comprise any CNN wherein the CNN is scaled by uniformly scaling depth of the network (i.e., the number of layers), the width of each layer, and the resolution (e.g., image height and width) of the input images. In one embodiment, backbone network 204 comprises an EfficientNet model. In one embodiment, backbone network 204 comprises an EfficientNet-B0 network or EfficientNet-lite0 network. In an embodiment, a lightweight network (e.g., EfficientNet-lite0) can be used to support edge prediction, while a heavier model (e.g., EfficientNet-B0) can be used if the model is run on a centralized computing device. Although the foregoing description emphasizes the use of CNNs scaled with uniform compound coefficients (e.g., EfficientNet variants), other networks can be used. For example, the backbone network 204 can comprise a ResNet, VGG16, DenseNet, Inception, Xception, PolyNet, SESNet, NASNet, AmoebaNet, PNASNet, GPipe, or another similar image classification deep neural network.

[0034] As illustrated, backbone network 204 can output a feature vector to a feature pyramid network (FPN) 206. In some embodiments, the FPN comprises a bidirectional FPN (BFPN). In brief, the FPN 206 receives a plurality of detected features from the backbone network 204 and repeatedly applies top-down and bottom-up bidirectional feature fusion. The fused features generated by FPN 206 can then be supplied to one or more downstream prediction heads 208a–208n for prediction or classification. For example, the FPN can detect various objects (e.g., body parts, mobile phones, etc.) of interest at different resolutions of the given image.

[0035] In some embodiments, the FPN 206 may only receive a subset of the features of the backbone network 204. For example, the backbone network 204 may include n of hidden layers, and the FPN 206 may receive the outputs (i.e., features) of m of these hidden layers, where $m < n$.

[0036] In the illustrated embodiment, the distraction model 104 includes a plurality of prediction heads 208a–208n and 212a–212n. As illustrated, some of the prediction heads (e.g., 208a–208n) receive features generated by the FPN 206 as inputs while other prediction heads

(212a–212n) receive features generated by the backbone network 204. As one example, an object detection head (discussed in connection with Figure 3) and a pose estimation head (discussed in connection with Figure 4) can receive features from the FPN 206, while a distraction classification head (discussed in connection with Figure 5) can receive features generated by the backbone network 204.

[0037] During the training of network 200, all prediction heads 208a–208n, 212a–212n are connected to the backbone network 204 or FPN 206. During training, a joint loss can be minimized while all prediction heads are used to generate predictions 210a–210n, 214a–214n. That is, network 200 can be trained by optimizing a joint loss for each of the prediction heads 208a–208n, 212a–212n. Since each of the prediction heads 208a–208n, 212a–212n can be tuned to detect specific features of an image, the joint loss ensures that the backbone network 204 and individual prediction heads 208a–208n, 212a–212n are trained to emphasize critical regions of images useful for distraction classification. The following example provides further detail of this classification.

[0038] In an embodiment, the joint loss minimized during training can be represented as:

$$loss = loss_{detection} + loss_{bbox} + loss_{classification} + loss_{landmarks} + loss_{reg}$$

where, $loss_{detection}$ is the object detection Huber loss for an object detection head, $loss_{bbox}$ is the bounding box detection focal loss for the object detection head, $loss_{classification}$ is a binary cross-entropy loss for a distraction classification head, $loss_{landmarks}$ is a classification loss for the pose detection head expressed as softmax based cross-entropy, and $loss_{reg}$ is an L_2 regularization loss.

[0039] By minimizing the joint loss, the disclosed embodiments are able to train all prediction heads at the same time. In some embodiments, additional prediction heads can be added to further improve the accuracy of the distraction classification by learning good features capable of solving all tasks performed by the prediction heads. In these embodiments, the use of multiple heads and minimizing the joint loss forces model 104 to focus on the part of the image that should be considered in deciding a distraction tag of an image. In particular, the disclosed embodiments force model 104 to focus on a driver's face, the body, the upper-body landmarks, and mobile, if detected, to decide what the driver is doing and what tag should be assigned to the image.

[0040] Once model 104 is trained, the features have been learned in the backbone network 204 that explicitly focus on the parts of the image that are important in predicting the distraction tag. In some embodiments, during testing or production, however, there is no need to compute the response of object detection and upper-body pose head. Thus, these prediction heads can be simply removed, and the extra computations can be avoided. That is, in some embodiments, all prediction heads 208a–208n, 212a–212n can be used for training while less than all (e.g., one) prediction head can be used during testing or production usage, thus reducing the overall size of the testing/production models.

[0041] **Figure 3** is a block diagram of an object detection prediction head 300 according to some embodiments.

[0042] In an embodiment, object detection head 300 comprises two networks: a bounding box regression network 302 and an object class prediction network 304. In an embodiment, both networks 302, 304 receive feature vector inputs from an FPN or similar feature detector.

[0043] In an embodiment, the output of the FPN comprises a set of higher-level features detected via the CNN and FPN. These higher-level features are input into the first layers 306a, 314a, of both bounding box regression network 302 and an object class prediction network 304. As illustrated, the bounding box regression network 302 and an object class prediction network 304 operate on the same feature vector in parallel. As illustrated, each layer (306a, 306b, 306n, 314a, 314b, 314n) comprises multiple sub-layers. In one embodiment, each layer (306a, 306b, 306n, 314a, 314b, 314n) comprises a convolutional layer (e.g., 308a, 316a). In an embodiment, a given convolutional layer (e.g., 308a, 316a) performs a convolution on the features from the FPN (or, in later layers such as 306b and 314b, on the output of the previous layer) using a fixed kernel or filter.

[0044] The outputs of the convolutional layers (e.g., 308a, 316a) can then be input into a batch normalization layer (e.g., 310a, 318a). In an embodiment, a batch normalization layer scales the output of the convolutional layers (e.g., 308a, 316a) by standardizing the activations of each input variable per mini-batch, such as the activations of a node from the previous layer. In an embodiment, the batch normalization layer (e.g., 310a, 318a) can standardize the mean and

variance of each unit in order to stabilize learning but allows the relationships between units and the nonlinear statistics of a single unit to change.

[0045] The outputs of the batch normalization layer (e.g., 310a, 318a) are then input to an activation layer (e.g., 312a, 320a). In an embodiment, the activation layers (e.g., 312a, 320a) comprise functional layers that define the output of the layer as a function of the input (e.g., from batch normalization layers such as 310a, 318a). Various activation functions can be used to implement activation layers (e.g., 312a, 320a) including, but not limited to, linear, rectified linear unit (ReLU), Scaled Exponential Linear Unit (SeLu), Exponential Linear Unit (ELU), sigmoid, Maxout, softmax, or similar activation functions.

[0046] In an embodiment, both the bounding box regression network 302 and an object class prediction network 304 can include multiple layers (306a, 306b, 306n, 314a, 314b, 314n), and the specific number of layers is not limited.

[0047] **Figure 4** is a block diagram of a pose estimation prediction head 400 according to some embodiments.

[0048] In one embodiment, the pose estimation prediction head 400 comprises a deep learning network. In one embodiment, the pose estimation prediction head 400 comprises a deep convolutional neural network. In one embodiment, the pose estimation prediction head 400 comprises a plurality of layers (412a–412f, 402g). In alternative embodiments, the pose estimation prediction head 400 includes seven convolutional layers (402a–402g). In alternative embodiments, each layer, except the final layer 402g, can comprise a plurality of sub-layers (402a–402f, 404a–404f, 406a–406f). In alternative embodiments, the sub-layers are substantially similar across layers and may vary primarily in the convolutional layer dimensions (e.g., filter shape, padding strategy, stride, etc.).

[0049] In alternative embodiments, each of the layers (412a–412f) includes an initial convolutional layer (e.g., 402a–402f). In alternative embodiments, a first layer (412a) inputs the output of the FPN into the first convolutional layer (402a). The first convolutional layer (402a) uses a first layer filter to convolve the input features into a convolutional output. The specific values of the filter are learned via back-propagation of a joint loss, as described elsewhere. The

convolved output is then inputted into a batch normalization layer (404a). In an embodiment, a batch normalization layer scales the output of the convolutional layer (402a) by standardizing the activations of each input variable per mini-batch, such as the activations of a node from the previous layer. In an embodiment, the batch normalization layer (404a) can standardize the mean and variance of each unit in order to stabilize learning but allows the relationships between units and the nonlinear statistics of a single unit to change. The output of the batch normalization layer (404a) is then inputted to an activation layer (406a). In an embodiment, the activation layer (406a) comprises a functional layer that defines the output of the batch normalization layer (404a) as a function of the input. Various activation functions can be used to implement the activation layer (406a), including, but not limited to, linear, rectified linear unit (ReLU), Scaled Exponential Linear Unit (SeLu), Exponential Linear Unit (ELU), sigmoid, Maxout, softmax, or similar activation functions.

[0050] As a result of the foregoing process, a first layer (412a) outputs a convolved, normalized, and activated output. The first layer (412a) passes this output to a second layer (412b) which performs the same process, and the process progresses through each of the first partially connected layers (412a–412f).

[0051] In some embodiments, the layers (412a–412f) may include additional sub-layers not illustrated. For instance, each layer (or some layers) can include a max-pooling or average pooling layer to eliminate portions of the convolution that do not yield relevant features. In some embodiments, each layer (or some layers) can also include a dropout layer that removes unactivated neurons to prevent overfitting. In some embodiments, each layer can include multiple convolutional layers.

[0052] The output (e.g., feature matrix) of the final partially connected layer (412f) is then passed to a single convolutional layer 412g. The final convolutional layer 412g performs a convolution with a filter as described above and outputs a final convoluted output. In alternative embodiments, the final convoluted output comprises a pose vector 408. The pose vector 408 represents pose estimations of the input FPN features. For example, the backbone network and FPN may identify a plurality of body part features (e.g., forearms, biceps, torso, etc.). These features are input into the pose estimation prediction head 400, which can determine pose

parameters (e.g., X and Y, 2D coordinates of the body landmarks) for each feature identified by the backbone network and FPN.

[0053] **Figure 5** is a block diagram of a distraction classification prediction head 500 according to some embodiments.

[0054] In one embodiment, the distraction classification prediction head 500 receives as an input the output 512 of the backbone network. In contrast to heads 300 and 400, the distraction classification prediction head 500 receives inputs directly from the backbone network and not the FPN. As will be discussed, in some embodiments, the backbone network and the distraction classification prediction head 500 may be stored as the final distraction classification model; thus the distraction classification prediction head 500 receives input directly from the backbone network to enable training of the distraction classification prediction head 500.

[0055] The distraction classification prediction head 500 passes the backbone output 512 to a convolutional layer 502. The convolutional layer (502) uses a filter to convolve the input features into a convolutional output. The specific values of the filter are learned via back-propagation of a joint loss, as described elsewhere. The convolved output of the convolutional layer 502 is input into an average pooling layer 504. The average pooling layer 504 segments the convolved output into a plurality of blocks, each block containing a plurality of outputs. The average pooling layer 504 then computes the average of the outputs within a given block and outputs an averaged convolution. Notably, since the average pooling layer 504 operates on blocks of a convolved input, the resulting output is necessarily reduced in dimensionality. Further, the use of an average pooling layer 504 ensures that the locality of features is preserved when convolving an input feature matrix.

[0056] The output of the average pooling layer 504 is then passed to a fully connected layer 506, also referred to as a dense network or feed-forward neural network. In the illustrated embodiment, the input shape of the fully connected layer 506 matches the output shape of the average pooling layer 504. In the fully connected layer 506, each neuron is connected to every other neuron in layer 506. Thus, in one embodiment, the feature matrix output by the average pooling layer 504 is converted (i.e., flattened) to a feature vector and used as the input to the fully connected layer 506. Each neuron of the fully connected layer 506 receives all values of the feature vector and is also connected to each input neuron of the next layer. In some embodiment, the next

layer comprises a second layer of neurons. In some embodiments, the fully connected layer 506 can comprise multiple layers of neurons. Ultimately, a final layer of hidden neurons is connected to the sigmoid activation layer 508. In the illustrated embodiment, each layer of the fully connected layer 506 has a size (i.e., number of neurons) and corresponding weight vector learned during training.

[0057] In the illustrated embodiment, the output vector of the fully connected layer 506 is received by the sigmoid activation layer 508. In one embodiment, the sigmoid activation layer 508 comprises neurons equal to the size of the desired output. Each neuron in the sigmoid activation layer 508 receives the outputs of all neurons of the final layer of the fully connected layer 506. In one embodiment, the number of neurons in the sigmoid activation layer 508 corresponds to the number of classification tags desired. In one embodiment, the neurons of the sigmoid activation layer 508 perform a sigmoid operation on the inputs to generate a value between 0 and 1.

[0058] As illustrated, the resulting output of the sigmoid activation layer 508 comprises a distraction classification tag 510. In one embodiment, the classification tag 510 can comprise a vector of values (between 0 and 1), where each value represents the probability of a given tag being applicable to the input image.

[0059] As discussed above, heads 300, 400, and 500 can all be connected to the backbone network and FPN during training. In this arrangement, back-propagation is used to perform a gradient descent operation to minimize a loss function. This back-propagation results in changes to the weights and other model parameters to minimize such a loss function. Since the model, during training, includes multiple heads, there are multiple loss functions for each head and, in some instances, multiple loss functions for a single head, such as the object detection prediction head. Thus, as will next be described, a joint loss function is used to perform back-propagation. Since a joint loss function is used, the entire network is optimized based on the outputs of all prediction heads, which forces the network to focus on the features detected by the prediction heads. By contrast, existing systems rely primarily on image classification, which is unable to consider features such as pose estimation and object detection and instead relies exclusively on labeled image data to train a classifier. As a result, such systems are relatively inaccurate, since

the model does not fundamentally understand which *regions* of an image are of interest for the problem of distraction classification.

[0060] As discussed previously, good features for driver distraction are not trivial to automatically learn by transfer-learning. By using the disclosed architecture of a network 200, good features for distraction classification can be learned by re-posing the learning objective as a multi-task problem, where solving those tasks should help solve the original problem of distraction classification. Thus, as discussed above, the disclosed embodiments can use face detection, person detection, mobile detection, upper-body pose estimation, etc., to improve the overall learning objective. For example, person detection can help the overall network 200 locate a driver; face detection can help in detecting where the driver is looking; mobile detection can help in classifying the distraction as mobile usage; and upper-body pose estimation can help distinguish between undistracted and distracted classes (e.g., body-pose during normal driving should be different than the one when the driver is using a mobile or eating or drinking). The disclosed embodiments utilize a unified network (backbone and FPN) with separate prediction heads corresponding to each of these tasks. As will be discussed next, network 200 can be trained by minimizing a joint loss among the prediction heads. Additional heads for other related problems such as facial landmarks detection, human-body segmentation can be added to the system and to the joint loss function to improve or adjust performance. Similarly, additional objects such as food and drink items, and cigarettes and cigars can also be included in the object detection framework to the same effect.

[0061] **Figure 6** is a flow diagram illustrating a method for training a distraction classification model according to some embodiments.

[0062] In block 602, method 600 comprises inputting a plurality of labeled examples into a multi-task network.

[0063] In one embodiment, the multi-task network comprises the network 200 previously discussed in connection with Figure 2. In one embodiment, the multi-task network comprises a backbone network, the backbone network generating one or more feature vectors corresponding to each of the labeled examples, and a plurality of prediction heads coupled to the backbone network.

[0064] In one embodiment, the backbone network comprises a CNN and an FPN coupled to the CNN. In one embodiment, the CNN comprises an EfficientNet. Alternatively, or in conjunction with the foregoing, the FPN can comprise a bi-direction FPN. As discussed in Figure 2, training image data is fed to the CNN, and the output of the CNN is fed to the FPN in some embodiments. In some embodiments, the prediction heads can comprise their own deep learning models (i.e., a CNN or similar network). In some embodiments, the prediction heads receive their input from either the CNN or the FPN.

[0065] The number of prediction heads is not limited. In one embodiment, the prediction heads include a distraction classification prediction head (Figure 5), an object detection prediction head (Figure 3), and a pose estimation prediction head (Figure 4). The structures of these prediction heads are described in the corresponding Figures and are not repeated herein. While only three heads are described, other heads may be added as desired. For example, facial landmarks detection, human-body segmentation, and other networks can be added as prediction heads. Indeed, any neural network or machine learning algorithm that can generate an output amenable to joint loss aggregation can be used. Thus, the prediction heads are arbitrarily extendible based on the underlying needs of the classifier.

[0066] In block 604, method 600 comprises minimizing a joint loss based on outputs of the plurality of prediction heads, minimizing the joint loss causing a change in parameters of the backbone network.

[0067] Each of the prediction heads of the multi-task network outputs a result vector in response to an input vector (i.e., example). In method 600, each example is associated with an expected result vector. Each prediction head can compare the result vector with the expected result vector (i.e., the label) and compute an error vector. Thus, each prediction head can compute at least one loss value. Some prediction heads can compute multiple loss values, as will be discussed.

[0068] In one embodiment, a distraction classification prediction head (Figure 5) can employ a cross-entropy loss function. In some embodiments, the distraction classification head can employ a binary cross-entropy loss function as the loss function. Other loss functions can be used based on the needs of the system. The loss of the distraction classification head is referred to as *loss_{classification}*. In one embodiment, a pose estimation prediction head (Figure 4) can employ a

softmax-based cross-entropy loss function. The loss of the pose estimation prediction head is referred to as $loss_{landmarks}$. In one embodiment, an object detection prediction head (Figure 3) includes two separate models and two separate outputs. Thus, such a head can employ multiple loss functions. As an example, the object detection prediction head can use a Huber loss function ($loss_{detection}$) to compute the loss for object classification and a focal loss function ($loss_{bbox}$) to generate the loss for bounding box determination. In some embodiments, method 600 can additionally compute an L_2 regularization loss also referred to as a least-squares error loss and referred to as $loss_{reg}$. In some embodiments, this L_2 regularization loss can be computed across all prediction head outputs. In other embodiments, the L_2 regularization loss can be computed across all regression outputs of the prediction heads.

[0069] As discussed, the aforementioned losses across all prediction heads can be combined to form a unified/joint loss function:

$$loss = \sum_{i=1}^n loss_i$$

where n represents the number of individual loss functions, $loss_i$ represents a given loss function wherein $loss_i = f(x, y)$, x representing the output of the model and y representing the expected output. As discussed examples of $loss_i$ can include $loss_{detection}$, $loss_{bbox}$, $loss_{classification}$, $loss_{landmarks}$, and $loss_{reg}$ among others.

[0070] In one embodiment, method 600 employs back-propagation and stochastic gradient descent to adjust individual model parameters. In one embodiment, method 600 uses a stochastic gradient descent algorithm to optimize model parameters based on gradients at each level of the network calculated using back-propagation. In some embodiments, method 600 performs back-propagation throughout the entire network (i.e., from the prediction head output through the backbone network). In other embodiments, method 600 can perform back-propagation only through the backbone network and FPN.

[0071] In block 606, method 600 comprises storing a distraction classification model after minimizing the joint loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the prediction heads.

[0072] In block 604, method 600 computes parameters across both the backbone network, FPN, and individual prediction heads. In one embodiment, method 600 can store all parameters and thus store the entire network. In another embodiment, however, method 600 can store only the parameters associated with the backbone network and a subset of the prediction heads. In one embodiment, method 600 only stores the backbone network parameters and the distraction classification prediction head (Figure 5) parameters. In some embodiments, method 600 can segment all of the parameters and thus save all parameters for re-training but segment the backbone network parameters and the distraction classification prediction head (Figure 5) parameters for testing purposes. Specifically, in some embodiments, only the parameters and thus models for the backbone network and distraction classification prediction head may be transmitted and stored by edge device (e.g., in-vehicle devices) for image classification.

[0073] Thus, in the foregoing embodiments, during training, method 600 uses the joint loss across all prediction heads, so that the network could learn distraction classification with the help of auxiliary tasks involving the additional heads. During testing/production, however, the model can be reduced to only a backbone network and distraction classification prediction head. These two models can then be used to perform quick distraction classification on edge devices.

[0074] **Figure 7** is a flow diagram illustrating a method for testing a distraction classification model according to some embodiments.

[0075] In block 702, method 700 comprises initializing a distraction classification model. In one embodiment, the parameters learned in method 600 are transmitted or otherwise stored in a classification device. In some embodiments, a classification device can comprise a device as that depicted in Figure 1. In brief, the classification device stores the model parameters and includes logic for loading the model parameters, receiving images, and classifying the images using the model.

[0076] In block 704, method 700 comprises inputting image data to the distraction classification model. In an embodiment, method 700 receives images from a camera (still or video) and inputs the images into the distraction classification model. As discussed in Figures 2 and 5, the distraction classification model can comprise a backbone network (e.g., CNN) and a distraction classification prediction head. Images are fed into the backbone network, which generates a feature

matrix based on the image. The feature matrix is then input to the distraction classification prediction head, which generates a classification of the image.

[0077] In block 706, method 700 comprises receiving a distraction classification tag from the distraction classification model. In one embodiment, the distraction classification tag comprises a vector output that indicates the likelihood of a plurality of classes or labels. For example, the distraction classification prediction head can be trained to classify images as undistracted, mobile usage, or other distracted. Of course, other labels can be used during training and these three labels are only provided as examples. In some embodiments, the distraction classification prediction head outputs a vector representing the likelihood (i.e., probability) of the label being appropriate.

[0078] In block 708, method 700 comprises performing at least one action based on the distraction classification tag.

[0079] Based on the output prediction, method 700 can perform various non-limiting actions based on the prediction. In one embodiment, method 700 can update a display on a device to notify the user of the distraction. In one embodiment, method 700 can play an audible sound (e.g., alarm) to cause the driver to pay attention. Alternatively, or in conjunction with the foregoing, method 700 can transmit the prediction (and, in some embodiments, image frames causing the prediction) to a remote server to enable logging of distractions. In some embodiments, the edge device can cache the predictions/images and transmit the data in bulk when connected to a network.

[0080] **Figure 8** is a block diagram illustrating a computing device showing an example of a client or server device used in the various embodiments of the disclosure.

[0081] The computing device (800) may include more or fewer components than those shown in Figure 8, depending on the deployment or usage of the device (800). For example, a server computing device, such as a rack-mounted server, may not include an audio interface (852), display (854), keypad (856), illuminator (858), haptic interface (862), Global Positioning System (GPS) receiver (864), or cameras/sensor (866). Some devices may include additional components not shown, such as graphics processing unit (GPU) devices, cryptographic co-processors, artificial intelligence (AI) accelerators, or other peripheral devices.

[0082] As shown in the figure, the device (800) includes a central processing unit (CPU) (822) in communication with a mass memory (830) via a bus (824). The computing device (800) also includes one or more network interfaces (850), an audio interface (852), a display (854), a keypad (856), an illuminator (858), an input/output interface (860), a haptic interface (862), an optional global positioning systems (GPS) receiver (864) and a camera(s) or other optical, thermal, or electromagnetic sensors (866). Device (800) can include one camera/sensor (866) or a plurality of cameras/sensors (866). The positioning of the camera(s)/sensor(s) (866) on the device (800) can change per device (800) model, per device (800) capabilities, and the like, or some combination thereof.

[0083] In some embodiments, the CPU (822) may comprise a general-purpose CPU. The CPU (822) may comprise a single-core or multiple-core CPU. The CPU (822) may comprise a system-on-a-chip (SoC) or a similar embedded system. In some embodiments, a GPU may be used in place of, or in combination with, a CPU (822). Mass memory (830) may comprise a dynamic random-access memory (DRAM) device, a static random-access memory device (SRAM), or a Flash (e.g., NAND Flash) memory device. In some embodiments, mass memory (830) may comprise a combination of such memory types. In one embodiment, the bus (824) may comprise a Peripheral Component Interconnect Express (PCIe) bus. In some embodiments, the bus (824) may comprise multiple busses instead of a single bus.

[0084] Mass memory (830) illustrates another example of computer storage media for the storage of information such as computer-readable instructions, data structures, program modules, or other data. Mass memory (830) stores a basic input/output system (“BIOS”) (840) for controlling the low-level operation of the computing device (800). The mass memory also stores an operating system (841) for controlling the operation of the computing device (800).

[0085] Applications (842) may include computer-executable instructions which, when executed by the computing device (800), perform any of the methods (or portions of the methods) described previously in the description of the preceding Figures. In some embodiments, the software or programs implementing the method embodiments can be read from a hard disk drive (not illustrated) and temporarily stored in RAM (832) by CPU (822). CPU (822) may then read the software or data from RAM (832), process them, and store them in RAM (832) again.

[0086] The computing device (800) may optionally communicate with a base station (not shown) or directly with another computing device. Network interface (850) is sometimes known as a transceiver, transceiving device, or network interface card (NIC).

[0087] The audio interface (852) produces and receives audio signals such as the sound of a human voice. For example, the audio interface (852) may be coupled to a speaker and microphone (not shown) to enable telecommunication with others or generate an audio acknowledgment for some action. Display (854) may be a liquid crystal display (LCD), gas plasma, light-emitting diode (LED), or any other type of display used with a computing device. Display (854) may also include a touch-sensitive screen arranged to receive input from an object such as a stylus or a digit from a human hand.

[0088] Keypad (856) may comprise any input device arranged to receive input from a user. Illuminator (858) may provide a status indication or provide light.

[0089] The computing device (800) also comprises an input/output interface (860) for communicating with external devices, using communication technologies, such as USB, infrared, Bluetooth™, or the like. The haptic interface (862) provides tactile feedback to a user of the client device.

[0090] The optional GPS receiver (864) can determine the physical coordinates of the computing device (800) on the surface of the Earth, which typically outputs a location as latitude and longitude values. GPS receiver (864) can also employ other geo-positioning mechanisms, including, but not limited to, triangulation, assisted GPS (AGPS), E-OTD, CI, SAI, ETA, BSS, or the like, to further determine the physical location of the computing device (800) on the surface of the Earth. In one embodiment, however, the computing device (800) may communicate through other components, provide other information that may be employed to determine the physical location of the device, including, for example, a MAC address, IP address, or the like.

[0091] **Figure 9** is a block diagram of a vehicle according to some embodiments of the disclosure.

[0092] The system (900) illustrated in **Figure 9** may be installed entirely within a vehicle. In some embodiments, some components may comprise existing autonomous vehicle subsystems,

although, in some embodiments, autonomous vehicle subsystems are optional. Thus, the vehicle in **Figure 9** may comprise either an autonomous, semi-autonomous, or non-autonomous vehicle. Descriptions made herein are primarily described with respect to autonomous vehicles; however, this is not intended to be limiting.

[0093] In the illustrated embodiment, the system includes a monitoring subsystem (902). In the illustrated embodiment, the monitoring subsystem (902) includes map database (902a), radar devices (902b), Lidar devices (902c), digital cameras (902d), sonar devices (902e), global positioning system (GPS) receivers (902f), and inertial measurement unit (IMU) devices (902g). The components of the monitoring subsystem (902) comprise standard components provided in most current autonomous vehicles or ADAS. In one embodiment, a map database (902a) stores a plurality of high-definition three-dimensional maps used for routing and navigation. Radar devices (902b), Lidar devices (902c), digital cameras (902d), sonar devices (902e), GPS receivers (902f), and inertial measurement units (902g) may comprise various respective devices installed at various positions throughout the autonomous vehicle as known in the art. For example, these devices may be installed along the perimeter of an autonomous vehicle to provide location awareness, collision avoidance, and other standard autonomous vehicle or ADAS functionality. As discussed, in some embodiments, the monitoring subsystem (902) may be optional or limited such as any form of an ADAS. For example, a non-autonomous vehicle may only include one camera device, such as a dash-mounted camera device. In this embodiment, the camera may be included in the sensors (906d).

[0094] The vehicular subsystem (906) is additionally included within the system. The vehicular subsystem (906) includes various anti-lock braking system (ABS) devices (906a), engine control unit (ECU) devices (906b), transmission control unit (TCU) devices (906c), and various other sensors (906d) such as heat/humidity sensors, emissions sensors, etc. These components may be utilized to control the operation of the vehicle. In some embodiments, these components perform operations in response to the streaming data generated by the monitoring subsystem (902). The standard autonomous vehicle interactions between the monitoring subsystem (902) and vehicular subsystem (906) are generally known in the art and are not described in detail herein.

[0095] The processing side of the system includes one or more processors (910), short-term memory (912), a radio-frequency (RF) system (914), graphics processing units (GPUs) (916), long-term storage (918), and one or more interfaces (920).

[0096] One or more processors (910) may comprise central processing units, field-programmable gate arrays (FPGAs), or any range of processing devices needed to support the operations of the autonomous vehicle. Memory (912) comprises dynamic random-access memory (DRAM) or other suitable volatile memory for the temporary storage of data required by processors (910). RF system (914) may comprise a cellular transceiver and/or satellite transceiver. Long-term storage (918) may comprise one or more high-capacity solid-state drives (SSDs). In general, long-term storage (918) may be utilized to store, for example, high-definition maps, routing data, and any other data requiring permanent or semi-permanent storage. GPUs (916) may comprise one or more high throughput GPU/VPU/TPU devices for processing data received from the monitoring subsystem (902). Finally, interfaces (920) may comprise various display units positioned within the autonomous vehicle (e.g., an in-dash screen).

[0097] Each of the devices is connected via a bus (908). In one embodiment, the bus (908) may comprise a controller area network (CAN) bus. In some embodiments, other bus types may be used (e.g., a FlexRay or Media Oriented Systems Transport, MOST, bus). Additionally, each subsystem may include one or more additional busses to handle internal subsystem communications (e.g., Local Interconnect Network, LIN, busses for lower bandwidth communications).

[0098] The system additionally includes a distracted driving subsystem (904) which performs the operations required by the methods illustrated in the preceding Figures. In the illustrated embodiment, the distracted driving subsystem (904) includes a model (904a) that stores the parameters of the backbone network and classification prediction head as described above. The distracted driving subsystem (904) additionally includes a processor (904b) that executes the model, classifies images, receives distracted driving classification tags, and performs actions on those tags, as previously discussed.

[0099] The present disclosure has been described with reference to the accompanying drawings, which form a part hereof, and which show, by way of non-limiting illustration, certain

example embodiments. Subject matter may, however, be embodied in a variety of different forms and, therefore, covered or claimed subject matter is intended to be construed as not being limited to any example embodiments set forth herein; example embodiments are provided merely to be illustrative. Likewise, a reasonably broad scope for claimed or covered subject matter is intended. Among other things, for example, the subject matter may be embodied as methods, devices, components, or systems. Accordingly, embodiments may, for example, take the form of hardware, software, firmware, or any combination thereof (other than software per se). The preceding detailed description is, therefore, not intended to be taken in a limiting sense.

[0100] Throughout the specification and claims, terms may have nuanced meanings suggested or implied in context beyond an explicitly stated meaning. Likewise, the phrase “in some embodiments” as used herein does not necessarily refer to the same embodiment, and the phrase “in another embodiment” as used herein does not necessarily refer to a different embodiment. It is intended, for example, that claimed subject matter includes combinations of example embodiments in whole or in part.

[0101] In general, terminology may be understood at least in part from usage in context. For example, terms such as “and,” “or,” or “and/or,” as used herein may include a variety of meanings that may depend at least in part upon the context in which such terms are used. Typically, “or” if used to associate a list, such as A, B, or C, is intended to mean A, B, and C, here used in the inclusive sense, as well as A, B, or C, here used in the exclusive sense. In addition, the term “one or more” as used herein, depending at least in part upon context, may be used to describe any feature, structure, or characteristic in a singular sense or may be used to describe combinations of features, structures, or characteristics in a plural sense. Similarly, terms, such as “a,” “an,” or “the,” again, can be understood to convey a singular usage or to convey a plural usage, depending at least in part upon context. In addition, the term “based on” may be understood as not necessarily intended to convey an exclusive set of factors and may, instead, allow for the existence of additional factors not necessarily expressly described, again, depending at least in part on context.

[0102] The present disclosure has been described with reference to block diagrams and operational illustrations of methods and devices. It is understood that each block of the block diagrams or operational illustrations, and combinations of blocks in the block diagrams or

operational illustrations, can be implemented by means of analog or digital hardware and computer program instructions. These computer program instructions can be provided to a processor of a general-purpose computer to alter its function as detailed herein, a special purpose computer, ASIC, or other programmable data processing apparatus, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, implement the functions/acts specified in the block diagrams or operational block or blocks. In some alternate implementations, the functions/acts noted in the blocks can occur out of the order noted in the operational illustrations. For example, two blocks shown in succession can, in fact, be executed substantially concurrently, or the blocks can sometimes be executed in the reverse order, depending upon the functionality/acts involved.

[0103] For the purposes of this disclosure, a non-transitory computer-readable medium (or computer-readable storage medium/media) stores computer data, which data can include computer program code (or computer-executable instructions) that is executable by a computer, in machine-readable form. By way of example, and not limitation, a computer-readable medium may comprise computer-readable storage media for tangible or fixed storage of data or communication media for transient interpretation of code-containing signals. Computer-readable storage media, as used herein, refers to physical or tangible storage (as opposed to signals) and includes without limitation volatile and non-volatile, removable and non-removable media implemented in any method or technology for the tangible storage of information such as computer-readable instructions, data structures, program modules or other data. Computer-readable storage media includes, but is not limited to, RAM, ROM, EPROM, EEPROM, flash memory or other solid-state memory technology, CD-ROM, DVD, or other optical storage, cloud storage, magnetic cassettes, magnetic tape, magnetic disk storage, or other magnetic storage devices, or any other physical or material medium which can be used to tangibly store the desired information or data or instructions and which can be accessed by a computer or processor.

[0104] In the preceding specification, various example embodiments have been described with reference to the accompanying drawings. However, it will be evident that various modifications and changes may be made thereto, and additional embodiments may be implemented without departing from the broader scope of the disclosed embodiments as set forth in the claims that

follow. The specification and drawings are accordingly to be regarded in an illustrative rather than restrictive sense.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Motive Technologies, Inc.

Application No./Patent No.: Not Yet Assigned Filed/Issue Date: Concurrently Herewith

Titled: DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Motive Technologies, Inc., a corporation

(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: Inventors To: Keep Truckin, Inc.

The document was recorded in the United States Patent and Trademark Office at
Reel 062146, Frame 0879, or for which a copy thereof is attached.

2. From: Keep Truckin, Inc. To: Motive Technologies, Inc.

The document was recorded in the United States Patent and Trademark Office at
Reel 062279, Frame 0412, 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.**

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STATEMENT UNDER 37 CFR 3.73(c)

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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.

/George Zalepa/

September 20, 2023

Signature

Date

George Zalepa

72706

Printed or Typed Name

Title or Registration Number



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
18/470,513

RECEIPT DATE / TIME
09/20/2023 10:35:08 AM ET

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY Judi Cordo

PATENT CENTER # 62829137

FILING DATE -

CUSTOMER # 32361

FIRST NAMED Ali HASSAN
INVENTOR

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY George Zalepa

Documents

TOTAL DOCUMENTS: 10

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
189908_000253_ads.pdf	10	Application Data Sheet	1227 KB
189908_000253_power.PDF	1	Power of Attorney	141 KB
189908_000253_decs.PDF	5	Oath or Declaration filed	442 KB
189908_000253_assignee_statement.PDF	2	Assignee showing of ownership per 37 CFR 3.73	96 KB
189908_000253_abstract-ABST.docx	1	Abstract	70 KB
189908_000253_spec-SPEC.docx	25	Specification	89 KB

189908_000253_transmittal.PDF	2	Transmittal of New Application	293 KB
189908_000253_claims-CLM.docx	4	Claims	71 KB
189908_000253_pdf_version_of_docx_docs.pdf	30	Auxiliary PDF of Application	320 KB
189908_000253_figs.pdf	9	Drawings-other than black and white line drawings	85 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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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 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.

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UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket No.	189908.000253
	First Named Inventor	HASSAN, Ali
	Title	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS
	Priority Mail Express® Label No.	

APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450
1. ☐ Fee Transmittal Form (PTO/SB/17 or equivalent) 2. ☐ Applicant asserts small entity status. See 37 CFR 1.27 3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent. 4. ☒ Specification [Total Pages <u>30</u>] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement) 5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>9</u>] 6. Inventor's Oath or Declaration [Total Pages <u>5</u>] (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e)) a. ☐ Newly executed (original or copy) b. ☒ A copy from a prior application (37 CFR 1.63(d)) 7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent) 8. CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix) ☐ Landscape Table on CD 9. 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 or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	ACCOMPANYING APPLICATION PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 11. ☒ 37 CFR 3.73(c) Statement ☒ Power of Attorney (when there is an assignee) 12. ☐ English Translation Document (if applicable) 13. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached 14. ☐ Preliminary Amendment 15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized) 16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 18. ☐ Other: _____ _____ _____ _____

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS					
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Name (Print/Type)			George Zalepa		September 20, 2023
			Registration No. (Attorney/Agent)		72706

This collection of information is required by 37 CFR 1.53(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.**

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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.
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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 inspection or an issued patent.
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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
18/470,513	09/20/2023		1820	189908.000253	20	3

CONFIRMATION NO. 7970

FILING RECEIPT



0000000062589124

32361
GREENBERG TRAURIG (NY)
One Vanderbilt Avenue
NEW YORK, NY 10017

Date Mailed: 09/29/2023

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Inventor(s)

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Applicant(s)

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Power of Attorney: The patent practitioners associated with Customer Number 32361

Domestic Priority data as claimed by applicant

This application is a CON of 18/068,322 12/19/2022
which is a CON of 17/347,682 06/15/2021 PAT 11,532,169

Foreign Applications for which priority is claimed (You may be eligible to benefit from the Patent Prosecution Highway program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 18/470,513**

Projected Publication Date: 01/04/2024

Non-Publication Request: No

Early Publication Request: No
Title

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Preliminary Class

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 18/470,513	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		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	320
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = * 0				x = 0	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *				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 \$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
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	* Minus **	=	x =			x =
	Independent (37 CFR 1.16(h))	* Minus ***	=	x =			x =
	Application Size Fee (37 CFR 1.16(s))						
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)
	Total (37 CFR 1.16(i))	* Minus **	=	x =			x =
	Independent (37 CFR 1.16(h))	* Minus ***	=	x =			x =
	Application Size Fee (37 CFR 1.16(s))						
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
			TOTAL ADD'L FEE			TOTAL ADD'L FEE	
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Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office

Derrick Brent

Deputy Under Secretary of Commerce for Intellectual Property and
Deputy Director of the United States Patent and Trademark Office

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 18/470,513		Filing Date 09/20/2023		☐ 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 \$100 =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$480 =					
☐ 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	10/19/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0			x \$100 =		0	
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0			x \$480 =		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 \$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		LIE	
* 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".								/CHRISTINE V MOORE/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".											
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Docket No. 189908-000253
Appl. No. 18/470,513
Preliminary Amendment

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s)	A. Hassan <i>et al.</i>	Examiner	<i>To be assigned</i>
Serial No.	18/470,513	Art Unit	<i>To be assigned</i>
Filed	Sept. 20, 2023	Confirmation	7970
Title	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

PRELIMINARY AMENDMENT

COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

Dear Sir:

Before examination, please amend the application as follows.

LISTING OF THE CLAIMS

The following listing of claims replaces all previous listings.

1–20. (Canceled)

21. (New) A method comprising:

inputting labeled examples into a multi-task network, the multi-task network comprising:

a backbone network, and

one or more prediction heads coupled, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

minimizing a joint loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the joint loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

22. (New) The method of claim 21, wherein the distraction classification prediction head includes a convolutional layer, pooling layer, and fully connected layer.

23. (New) The method of claim 21, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

24. (New) The method of claim 23, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

25. (New) The method of claim 21, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

26. (New) The method of claim 21, further comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

27. (New) The method of claim 26, further comprising performing at least one action based on the distraction classification tag.

28. (New) A non-transitory computer-readable storage medium for tangibly storing computer program instructions capable of being executed by a computer processor, the computer program instructions defining steps of:

inputting labeled examples into a multi-task network, the multi-task network comprising: a backbone network, and one or more prediction heads coupled, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

minimizing a joint loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the joint loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

29. (New) The non-transitory computer-readable storage medium of claim 28, wherein the distraction classification prediction head includes a convolutional layer, pooling layer, and fully connected layer.

30. (New) The non-transitory computer-readable storage medium of claim 28, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

31. (New) The non-transitory computer-readable storage medium of claim 30, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

32. (New) The non-transitory computer-readable storage medium of claim 28, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

33. (New) The non-transitory computer-readable storage medium of claim 28, the steps further comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

34. (New) The non-transitory computer-readable storage medium of claim 33, the steps further comprising performing at least one action based on the distraction classification tag.

35. (New) A device comprising:

a processor; and

a storage medium for tangibly storing thereon program logic for execution by the processor, the program logic comprising:

logic, executed by the processor, for inputting labeled examples into a multi-task network, the multi-task network comprising: a backbone network, and one or more prediction heads coupled, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head,

logic, executed by the processor, for minimizing a joint loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network, and

logic, executed by the processor, for storing a distraction classification model after minimizing the joint loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

36. (New) The device of claim 35, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

37. (New) The device of claim 36, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

38. (New) The device of claim 35, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

39. (New) The device of claim 35, the program logic further comprising logic, executed by the processor, for comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

40. (New) The device of claim 39, the program logic further comprising logic, executed by the processor, for performing at least one action based on the distraction classification tag.

REMARKS

Claims 21 through 40 are pending. Claims 1 through 20 are canceled without prejudice or disclaimer of the subject matter. Claims 21 through 40 are newly added, no new matter has been added. Examination and passage to allowance are respectfully requested.

Should there be any matters which the Examiner believes could be resolved in a telephone interview, the Examiner is requested to telephone the Applicant's undersigned attorney. In this regard, Applicant's undersigned attorney may be reached by phone at (973) 443-3241. All correspondence should continue to be directed to the below-listed address.

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Respectfully submitted,
/George Zalepa/
George Zalepa
Reg. No. 72,706

GREENBERG TRAURIG, LLP
CUSTOMER NUMBER 32361
Phone: (973) 443-3241



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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
18/470,513

RECEIPT DATE / TIME
10/19/2023 10:38:48 AM ET

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY Judi Cordo

PATENT CENTER # 63031118

FILING DATE 09/20/2023

CUSTOMER # 32361

FIRST NAMED
INVENTOR Ali HASSAN

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY George Zalepa

Documents

TOTAL DOCUMENTS: 3

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
189903_000253_prelim.pdf		7	-	190 KB
189903_000253_prelim-A.PE.pdf	(1-1)	1	Preliminary Amendment	143 KB
189903_000253_prelim-CLM.pdf	(2-6)	5	Claims	102 KB
189903_000253_prelim-REM.pdf	(7-7)	1	Applicant Arguments/Remarks Made in an Amendment	64 KB

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DOCUMENT**MESSAGE DIGEST(SHA-512)**

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189903_000253_prelim-REM.pdf	7AFF29018B08B13E42A331F9B6A946AC1CB1CD6D15F81EBD1 04C955CC99DC5C79EA5D8005C5BD2E64EC399A98D1C003B1 173D4248D1B1B40B64BD72AFAC7FFA4

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
18/470,513	09/20/2023	Ali HASSAN	189908.000253

CONFIRMATION NO. 7970

32361
GREENBERG TRAURIG (NY)
One Vanderbilt Avenue
NEW YORK, NY 10017

PUBLICATION NOTICE



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Date Mailed: 01/04/2024

Title: DISTRACED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Publication No. US-2024-0005678-A1

Publication Date: 01/04/2024

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/> PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION # 18/470,513	RECEIPT DATE / TIME 02/21/2024 04:02:36 PM Z ET	ATTORNEY DOCKET # 189908.000253
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Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	7970	FILED BY	Judi Cordo
PATENT CENTER #	64399505	FILING DATE	09/20/2023
CUSTOMER #	32361	FIRST NAMED INVENTOR	Ali HASSAN
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	George Zalepa

Documents

TOTAL DOCUMENTS: 3

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
189908_000253_prelim.pdf		10	-	202 KB
189908_000253_prelim-A.PE.pdf	(1-1)	1	Preliminary Amendment	144 KB
189908_000253_prelim-CLM.pdf	(2-9)	8	Claims	112 KB
189908_000253_prelim-REM.pdf	(10-10)	1	Applicant Arguments/Remarks Made in an Amendment	64 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
189908_000253_prelim.pdf	9D18863FDD428F1388C81714777F668274D9D9E8E3353F5F09

	463326156030549B8692ADB2C8ADE17A48F41FE3113B7A8169 B5A7B6B221D89A19B882A5FA6526
189908_000253_prelim- A.PE.pdf	35DE060962651E2091BFBAD6948414A4C0A9D737361AC438A B2B5E71C28B19F92F876CD4C4031E6BE21D13E41B6FEABEC 59222411618B2273D816EE8750632E8
189908_000253_prelim- CLM.pdf	C8DECD579F4810FB7B7FB641BE89CB6F4F0AB3B9E4698B18 C3004E1FAE4DDCC5E7EA87A1AB6589DD8E80067D77FBEA5 2360D703E47351B1BA229703A04741527
189908_000253_prelim- REM.pdf	C67F52B596804944FB085633B7665DC0945B73541E96B1107C EF8CF3FCF1F8DB6E58E8A939CF96158602F0175B1247D49BA F50A007DA85C626A2509953D68CEF

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 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.

Docket No. 189908-000253
Appl. No. 18/470,513
Preliminary Amendment

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s)	A. Hassan <i>et al.</i>	Examiner	<i>To be assigned</i>
Serial No.	18/470,513	Art Unit	<i>To be assigned</i>
Filed	Sept. 20, 2023	Confirmation	7970
Title	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

PRELIMINARY AMENDMENT

COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

Dear Sir:

Before examination, please amend the application as follows.

LISTING OF THE CLAIMS

The following listing of claims replaces all previous listings.

1–20. (Canceled)

21. (Currently Amended) A method comprising:

inputting labeled examples into a ~~multi-task~~neural network, the ~~multi-task~~neural network comprising:

a backbone network, and

one or more prediction heads coupled to the backbone network, the one or more prediction heads ~~selected from a group consisting of~~comprising one or more of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

minimizing a ~~joint~~-loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the ~~joint~~-loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

22. (Previously Presented) The method of claim 21, wherein the distraction classification prediction head includes a convolutional layer, pooling layer, and fully connected layer.

23. (Previously Presented) The method of claim 21, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

24. (Previously Presented) The method of claim 23, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

25. (Previously Presented) The method of claim 21, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

26. (Previously Presented) The method of claim 21, further comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

27. (Previously Presented) The method of claim 26, further comprising performing at least one action based on the distraction classification tag.

28. (Currently Amended) A non-transitory computer-readable storage medium for tangibly storing computer program instructions capable of being executed by a computer processor, the computer program instructions defining steps of:

inputting labeled examples into a ~~multi-task~~neural network, the ~~multi-task~~neural network comprising: a backbone network, and one or more prediction heads coupled, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

minimizing a ~~joint~~-loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the ~~joint~~-loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

29. (Previously Presented) The non-transitory computer-readable storage medium of claim 28, wherein the distraction classification prediction head includes a convolutional layer, pooling layer, and fully connected layer.

30. (Previously Presented) The non-transitory computer-readable storage medium of claim 28, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

31. (Previously Presented) The non-transitory computer-readable storage medium of claim 30, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden

layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

32. (Previously Presented) The non-transitory computer-readable storage medium of claim 28, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

33. (Previously Presented) The non-transitory computer-readable storage medium of claim 28, the steps further comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

34. (Previously Presented) The non-transitory computer-readable storage medium of claim 33, the steps further comprising performing at least one action based on the distraction classification tag.

35. (Currently Amended) A device comprising:

a processor; and

a storage medium for tangibly storing thereon program logic for execution by the processor, the program logic comprising:

logic, executed by the processor, for inputting labeled examples into a ~~multi-task~~neural network, the ~~multi-task~~neural network comprising: a backbone network, and one or more prediction heads coupled, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head,

logic, executed by the processor, for minimizing a ~~joint~~-loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network, and

logic, executed by the processor, for storing a distraction classification model after minimizing the ~~joint~~-loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

36. (Previously Presented) The device of claim 35, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

37. (Previously Presented) The device of claim 36, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

38. (Previously Presented) The device of claim 35, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

39. (Previously Presented) The device of claim 35, the program logic further comprising logic, executed by the processor, for comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

40. (Previously Presented) The device of claim 39, the program logic further comprising logic, executed by the processor, for performing at least one action based on the distraction classification tag.

41. (New) The method of claim 21, wherein the distraction classification prediction head classifies an input vector with a label, the label comprising one or more of an undistracted, mobile usage, or other distracted label.

42. (New) The method of claim 21, wherein the object detection prediction head detects a location of an object within an input vector.

43. (New) The method of claim 21, wherein the pose estimation prediction head detects an orientation of one or more body parts of a user depicted in an input vector.

44. (New) The method of claim 21, wherein storing a distraction classification model comprises storing the distraction classification model in a dash-mounted camera device.

45. (New) The method of claim 27, the at least one action comprising one or more of updating a display of a computing device, playing an audible alarm, transmitting or a prediction to a remote server.

46. (New) A method comprising:

storing a distraction classification model in a dash-mounted camera device, the distraction classification model comprising: a backbone network and one or more prediction heads coupled to the backbone network, the one or more prediction heads comprising one or more of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

capturing an image of an interior of a vehicle using a sensor in the dash-mounted camera device;

inputting the image into the distraction classification model;

receiving a distraction classification tag output by the distraction classification model; and

performing at least one action by the dash-mounted camera device based on the distraction classification tag, the at least one action comprising one or more of updating a display of a computing device, playing an audible alarm, transmitting or a prediction to a remote server.

47. (New) The method of claim 46, wherein the distraction classification prediction head classifies the image with a label, the label comprising one or more of an undistracted, mobile usage, or other distracted label.

48. (New) The method of claim 46, wherein the object detection prediction head detects a location of an object within the image.

49. (New) The method of claim 46, wherein the pose estimation prediction head detects an orientation of one or more body parts of a user depicted in the image.

50. (New) A dash-mounted camera device comprising:

a memory configured to: store a distraction classification model, the distraction classification model comprising: a backbone network and one or more prediction heads coupled to the backbone network, the one or more prediction heads comprising one or more of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

a sensor oriented toward an interior of a vehicle; and

a processor configured to:

capture an image of an interior of a vehicle;

input the image into the distraction classification model;

receive a distraction classification tag output by the distraction classification model; and

perform at least one action by the dash-mounted camera device based on the distraction classification tag, the at least one action comprising one or more of updating a display of a computing device, playing an audible alarm, transmitting or a prediction to a remote server.

51. (New) The dash-mounted camera device of claim 50, wherein the distraction classification prediction head classifies the image with a label, the label comprising one or more of an undistracted, mobile usage, or other distracted label.

52. (New) The dash-mounted camera device of claim 50, wherein the object detection prediction head detects a location of an object within the image.

53. (New) The dash-mounted camera device of claim 50, wherein the pose estimation prediction head detects an orientation of one or more body parts of a user depicted in the image.

REMARKS

Claims 21 through 40 are pending. Claims 1 through 20 were previously canceled without prejudice or disclaimer of the subject matter. Claims 21 through 40 are hereby amended and claims 42–53 are newly added, no new matter has been added. Examination and passage to allowance are respectfully requested.

Should there be any matters which the Examiner believes could be resolved in a telephone interview, the Examiner is requested to telephone the Applicant's undersigned attorney. In this regard, Applicant's undersigned attorney may be reached by phone at (973) 443-3241. All correspondence should continue to be directed to the below-listed address.

The Commissioner is hereby authorized to charge any required fee in connection with the submission of this paper, any additional fees which may be required, now or in the future, or credit any overpayment to Account No. 50-1561. Please ensure that the Attorney Docket Number is referred when charging any payments or credits for this case.

Respectfully submitted,
/George Zalepa/
George Zalepa
Reg. No. 72,706

GREENBERG TRAURIG, LLP
CUSTOMER NUMBER 32361
Phone: (973) 443-3241

<i>Index of Claims</i> 	Application/Control No. 18/470,513	Applicant(s)/Patent Under Reexamination HASSAN et al.
	Examiner CASEY L KRETZER	Art Unit 2635

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

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original	04/09/2024								
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/470,513	09/20/2023	Ali HASSAN	189908.000253	7970
32361	7590	04/15/2024		
GREENBERG TRAURIG (NY) One Vanderbilt Avenue NEW YORK, NY 10017			EXAMINER KRETZER, CASEY L	
			ART UNIT	PAPER NUMBER
			2635	
			NOTIFICATION DATE	DELIVERY MODE
			04/15/2024	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

cordesp@gtlaw.com
mendozae@gtlaw.com
njdocket@gtlaw.com

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 21-45, drawn to training a neural network using labeled inputs and minimizing loss, classified in G06N3/084.

II. Claims 46-53, drawn to using a neural network in a vehicular imaging system to determine if a driver is distracted, classified in G06V20/597.

The inventions are independent or distinct, each from the other because: Inventions I and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because invention I goes into details of training the claimed neural network which is not required in the combination. The subcombination has

separate utility such as detecting a driver's attentiveness and creating a corrective action.

The examiner has required restriction between combination and subcombination inventions. Where applicant elects a subcombination, and claims thereto are subsequently found allowable, any claim(s) depending from or otherwise requiring all the limitations of the allowable subcombination will be examined for patentability in accordance with 37 CFR 1.104. See MPEP § 821.04(a). Applicant is advised that if any claim presented in a divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application.

Restriction for examination purposes as indicated is proper because all the inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and/or examination burden if restriction were not required because one or more of the following reasons apply:

- * *inventions have acquired a separate status in the art in view of their different classification*
- *the inventions have acquired a separate status in the art due to their recognized divergent subject matter*
- *the inventions require a different field of search (e.g., searching different classes /subclasses or electronic resources, or employing different search strategies or search queries).*

Applicant is advised that the reply to this requirement to be complete must include (i) an election of an invention to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected invention.**

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other invention.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CASEY L KRETZER whose telephone number is (571)272-5639. The examiner can normally be reached M-F 10:00-7:00 PM PDT.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on (571)272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CASEY L KRETZER/
Examiner, Art Unit 2635



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32361	7590	04/23/2024		
GREENBERG TRAURIG (NY) One Vanderbilt Avenue NEW YORK, NY 10017			EXAMINER KRETZER, CASEY L	
			ART UNIT	PAPER NUMBER
			2635	
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			04/23/2024	ELECTRONIC

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cordesp@gtlaw.com
mendozae@gtlaw.com
njdocket@gtlaw.com

<i>Applicant-Initiated Interview Summary</i>	Application No. 18/470,513	Applicant(s) HASSAN et al.		
	Examiner CASEY L KRETZER	Art Unit 2635	AIA (First Inventor to File) Status Yes	Page 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	Title	Type
CASEY L KRETZER	Primary Examiner	Telephonic
George Zalepa	Attorney of Record	

Date of Interview: 18 April 2024

Issues Discussed:

Election/Restriction

Applicant's representative inquired about the previous restriction requirement and the Examiner stated that if dependent claims 46 and 50 were amended to include claim 21 or 35, or if dependent claims were added (from claims 46 and 50) that recited the specific training steps of claim 21 or 35, the restriction requirement would be withdrawn. Applicant's representative stated they would speak with Applicant about the suggestion.

/CASEY L KRETZER/ Examiner, Art Unit 2635	
Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04 Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing	

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Doc Code: ECOMM.AUTH/ECOMM.WTDW

Doc Description: Internet Communications Authorization/Internet Communications Authorization Withdrawal

PTO/SB/439 (11-15)

**AUTHORIZATION FOR INTERNET
COMMUNICATIONS IN A PATENT
APPLICATION OR REQUEST TO
WITHDRAW AUTHORIZATION FOR
INTERNET COMMUNICATIONS**

Application No.	8/470,513
Filing Date	September 20, 2023
First Named Inventor	Ali HASSAN
Art Unit	2635
Examiner Name	CASEY L KRETZER
Practitioner Docket No.	189908.000253

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

I. To authorize permission for Internet Communications.

☒ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☒ attorney or agent of record. Registration number 72706.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/George Zalepa/

Signature

April 25, 2024

Date

George Zalepa

Typed or printed name

973-443-3241

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. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☒ * Total of 1 forms are submitted.

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
18/470,513

RECEIPT DATE / TIME
04/25/2024 11:08:03 AM Z ET

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY Judi Cordo

PATENT CENTER # 65240405

FILING DATE 09/20/2023

CUSTOMER # 32361

FIRST NAMED
INVENTOR Ali HASSAN

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY George Zalepa

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
189908__000253__internet__auto rization.pdf	2	Internet Communications Authorization	192 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
189908__000253__internet__auto rization.pdf	E860369BDE805C148DFE645271DC660C6BBC188146EC0036D BDBB524492EA56E74B2AB92D8C25D46F29E192A954B98CA4 C1357BC81592F4E1BF404BE1C408CB8

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If a new application is being filed and the application includes the necessary components for 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

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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.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 18/470,513		Filing Date 09/20/2023		☐ 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 \$100 =							
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$480 =							
☐ 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	05/02/2024		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))		* 33		Minus ** 20		= 13		x \$100 =		1300		
	Independent (37 CFR 1.16(h))		* 5		Minus *** 3		= 2		x \$480 =		960		
	☐ Application Size Fee (37 CFR 1.16(s))												
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))												
										TOTAL ADD'L FEE		2260	
AMENDMENT			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".										/ALLYSON PURNELL/			
*** 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.													

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
18/470,513

RECEIPT DATE / TIME
05/02/2024 08:05:40 PM Z ET

ATTORNEY DOCKET #
189908.000253

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DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY Judi Cordo

PATENT CENTER # 65360018

FILING DATE 09/20/2023

CUSTOMER # 32361

FIRST NAMED Ali HASSAN
INVENTOR

CORRESPONDENCE ADDRESS -

AUTHORIZED BY George Zalepa

Documents

TOTAL DOCUMENTS: 3

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
189908__000253__response.pdf	11	-	227 KB
189908__000253__response-ELC_.pdf	(1-1) 1	Response to Election / Restriction Filed	148 KB
189908__000253__response-CLM.pdf	(2-9) 8	Claims	74 KB
189908__000253__response-REM.pdf	(10-11) 2	Applicant Arguments/Remarks Made in an Amendment	119 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
189908__000253__response.pdf	825A9FD805BA33C9CF88F1CD1AD721864EB6989A3874ED809 4FB29B8EEA5BBA2F9A53B472F0EE7D48E8DAA2468D39BFA7 7945CCB1B7B117C43C40E33251E0B1A
189908__000253__response- ELC..pdf	BF313605B093FFC40B1534D9498D0CC368B1ECEFADDAC8AE 32F63D00BD102C16C34014123B382D0D235D8E913FAA94131 AB26EOD8600F62825CBBB31CD99B9CF
189908__000253__response- CLM.pdf	69DC57B8BA3B12010341279F13E7B540DB385AE6746F774907 382E6113CE2F2EB641E98B6C1F228972234C53D1DF93C93CD 266982078AD0D820D761E50CFCFAC
189908__000253__response- REM.pdf	1F1568168E0EFE455F5A4EE4F5C496214C0C374688DD62B4E F53B2FEBE0928CA99855526AD9432F61CE7B40060B15BD5F5 7EB917EDCAF5F2E243B0AEC5C66431

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New Applications Under 35 U.S.C. 111

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s)	A. Hassan <i>et al.</i>	Examiner	<i>To be assigned</i>
Serial No.	18/470,513	Art Unit	<i>To be assigned</i>
Filed	Sept. 20, 2023	Confirmation	7970
Title	DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS		

RESPONSE TO RESTRICTION

COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

Dear Sir:

In response to the restriction requirement dated Apr. 15, 2024, Applicant respectfully requests reconsideration in view of the following amendments to the claims.

LISTING OF THE CLAIMS

The following listing of claims replaces all previous listings.

1–20. (Canceled)

21. (Previously Presented) A method comprising:

inputting labeled examples into a neural network, the neural network comprising:

a backbone network, and

one or more prediction heads coupled to the backbone network, the one or more prediction heads comprising one or more of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

minimizing a loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the ~~joint~~ loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

22. (Previously Presented) The method of claim 21, wherein the distraction classification prediction head includes a convolutional layer, pooling layer, and fully connected layer.

23. (Previously Presented) The method of claim 21, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

24. (Previously Presented) The method of claim 23, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

25. (Previously Presented) The method of claim 21, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

26. (Previously Presented) The method of claim 21, further comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

27. (Previously Presented) The method of claim 26, further comprising performing at least one action based on the distraction classification tag.

28. (Previously Presented) A non-transitory computer-readable storage medium for tangibly storing computer program instructions capable of being executed by a computer processor, the computer program instructions defining steps of:

inputting labeled examples into a neural network, the neural network comprising: a backbone network, and one or more prediction heads coupled, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

minimizing a loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the ~~joint~~ loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

29. (Previously Presented) The non-transitory computer-readable storage medium of claim 28, wherein the distraction classification prediction head includes a convolutional layer, pooling layer, and fully connected layer.

30. (Previously Presented) The non-transitory computer-readable storage medium of claim 28, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

31. (Previously Presented) The non-transitory computer-readable storage medium of claim 30, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden

layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

32. (Previously Presented) The non-transitory computer-readable storage medium of claim 28, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

33. (Previously Presented) The non-transitory computer-readable storage medium of claim 28, the steps further comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

34. (Previously Presented) The non-transitory computer-readable storage medium of claim 33, the steps further comprising performing at least one action based on the distraction classification tag.

35. (Previously Presented) A device comprising:

a processor; and

a storage medium for tangibly storing thereon program logic for execution by the processor, the program logic comprising:

logic, executed by the processor, for inputting labeled examples into a neural network, the neural network comprising: a backbone network, and one or more prediction heads coupled, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head,

logic, executed by the processor, for minimizing a loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network, and

logic, executed by the processor, for storing a distraction classification model after minimizing the loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

36. (Previously Presented) The device of claim 35, wherein the object detection prediction head comprises a bounding box regression network and an object class prediction network, wherein the bounding box regression network outputs coordinates of a bounding box enclosing a detected object and the object class prediction network outputs a class corresponding to the detected object.

37. (Previously Presented) The device of claim 36, wherein each of the bounding box regression network and the object class prediction network comprising deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

38. (Previously Presented) The device of claim 35, wherein the pose estimation prediction head includes a plurality of hidden layers and an output layer, each of the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and an activation layer, and the output layer comprising a convolutional layer.

39. (Previously Presented) The device of claim 35, the program logic further comprising logic, executed by the processor, for comprising inputting image data into the distraction classification model and receiving a distraction classification tag from the distraction classification model based on the image data.

40. (Previously Presented) The device of claim 39, the program logic further comprising logic, executed by the processor, for performing at least one action based on the distraction classification tag.

41. (Previously Presented) The method of claim 21, wherein the distraction classification prediction head classifies an input vector with a label, the label comprising one or more of an undistracted, mobile usage, or other distracted label.

42. (Previously Presented) The method of claim 21, wherein the object detection prediction head detects a location of an object within an input vector.

43. (Previously Presented) The method of claim 21, wherein the pose estimation prediction head detects an orientation of one or more body parts of a user depicted in an input vector.

44. (Previously Presented) The method of claim 21, wherein storing a distraction classification model comprises storing the distraction classification model in a dash-mounted camera device.

45. (Previously Presented) The method of claim 27, the at least one action comprising one or more of updating a display of a computing device, playing an audible alarm, transmitting or a prediction to a remote server.

46. (Currently Amended) A method comprising:

storing a distraction classification model in a dash-mounted camera device, the distraction classification model comprising: a backbone network and one or more prediction heads coupled to the backbone network, the one or more prediction heads comprising one or more of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head, wherein the distraction classification model comprises a model trained by inputting labeled examples into the distraction classification model and minimizing a loss based on outputs of the one or

more prediction heads causing a change in parameters of the backbone network;

capturing an image of an interior of a vehicle using a sensor in the dash-mounted camera device;

inputting the image into the distraction classification model;

receiving a distraction classification tag output by the distraction classification model; and

performing at least one action by the dash-mounted camera device based on the distraction classification tag, the at least one action comprising one or more of updating a display of a computing device, playing an audible alarm, transmitting or a prediction to a remote server.

47. (Previously Presented) The method of claim 46, wherein the distraction classification prediction head classifies the image with a label, the label comprising one or more of an undistracted, mobile usage, or other distracted label.

48. (Previously Presented) The method of claim 46, wherein the object detection prediction head detects a location of an object within the image.

49. (Previously Presented) The method of claim 46, wherein the pose estimation prediction head detects an orientation of one or more body parts of a user depicted in the image.

50. (Currently Amended) A dash-mounted camera device comprising:

a memory configured to: store a distraction classification model, the distraction classification model comprising: a backbone network and one or more prediction heads coupled to the backbone network, the one or more prediction heads comprising one or more of a distraction classification prediction head, object detection prediction head, and a pose estimation

prediction head, wherein the distraction classification model comprises a model trained by inputting labeled examples into the distraction classification model and minimizing a loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network;

a sensor oriented toward an interior of a vehicle; and

a processor configured to:

capture an image of an interior of a vehicle;

input the image into the distraction classification model;

receive a distraction classification tag output by the distraction classification model; and

perform at least one action by the dash-mounted camera device based on the distraction classification tag, the at least one action comprising one or more of updating a display of a computing device, playing an audible alarm, transmitting or a prediction to a remote server.

51. (Previously Presented) The dash-mounted camera device of claim 50, wherein the distraction classification prediction head classifies the image with a label, the label comprising one or more of an undistracted, mobile usage, or other distracted label.

52. (Previously Presented) The dash-mounted camera device of claim 50, wherein the object detection prediction head detects a location of an object within the image.

53. (Previously Presented) The dash-mounted camera device of claim 50, wherein the pose estimation prediction head detects an orientation of one or more body parts of a user depicted in the image.

REMARKS

Claims 21 through 40 are pending. Claims 21 through 53 are pending.

1 Interview Summary

Applicant thanks the Examiner for the courtesies extended during the interview conducted on April 18. During the interview, the parties discussed the amendments to the claims and reached an agreement regarding withdrawal of the restriction requirement.

2 Restriction

The Office Action included a restriction requirement identifying two allegedly distinct groups:

1. Claims 21-45, drawn to training a neural network using labeled inputs and minimizing loss, classified in G06N3/084.
2. Claims 46-53, drawn to using a neural network in a vehicular imaging system to determine if a driver is distracted, classified in G06V20/597.

While Applicant disagrees with the restriction requirement, Applicant hereby amends the claims rendering the restriction moot. As such, Applicant traverses the restriction requirement and requests withdrawal of the same.

3 Conclusion

Should there be any matters which the Examiner believes could be resolved in a telephone interview (e.g., double patenting), the Examiner is requested to telephone the Applicant's undersigned attorney. In this regard, Applicant's undersigned attorney may be reached by phone at (973) 443-3241. The Commissioner is hereby authorized to charge any required fee in connection with the submission of this paper, any additional fees which may be required, now or in the future, or credit any

overpayment to Account No. 50-1561. Please ensure that the Attorney Docket Number is referred when charging any payments or credits for this case.

Respectfully submitted,
/George Zalepa/
George Zalepa
Reg. No. 72,706

GREENBERG TRAURIG, LLP
CUSTOMER NUMBER 32361
Phone: (973) 443-3241



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18470513

Effective Date

05/02/2024

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I202456B43598581	1202	CLAIMS IN EXCESS OF 20	\$1,300.00	Deposit Account
I202456B43598581	1201	INDEPENDENT CLAIMS IN EXCESS OF 3	\$960.00	Deposit Account



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APPROVAL LETTER

APPLICATION #
18/470,513

FILING DATE
09/20/2023

APPLICANT/PATENT UNDER REEXAMINATION
Ali HASSAN

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Electronic terminal disclaimer filed on 06/12/2024

☒ Approved

This patent is subject to a Terminal Disclaimer

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APPLICATION #
18470513

FILING DATE
09/20/2023

FIRST NAMED INVENTOR
Ali HASSAN

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS



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Total	100%

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11522169

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In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.



Terminal disclaimer fee under 37 CFR 1.20(d) included with Electronic Terminal Disclaimer request.

Applicant claims the following entity status:
Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I certify, in accordance with 37 CFR 1.4(d)(4) that I am: An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Signature	Name	Registration #
/George Zalepa/	George Zalepa	72706

* Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP 324.



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PATENT AND TRADEMARK OFFICE

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
18/470,513

RECEIPT DATE / TIME
06/12/2024 05:17:56 PM Z ET

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY George Zalepa

PATENT CENTER # 65942716

FILING DATE 09/20/2023

CUSTOMER # 32361

FIRST NAMED INVENTOR Ali HASSAN

CORRESPONDENCE ADDRESS -

AUTHORIZED BY -

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
petition-request.pdf	3	Terminal Disclaimer-Filed (Electronic)	49 KB
grantLetter.pdf	1	Terminal Disclaimer-Electronic- Approved	19 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
petition-request.pdf	1A78AF6E0F3F29B5945D13C1F33BB9273EB075293628B79422 2472E0702F62DF7BC11A0CB2B58C0B570CCCFCAA843166A7

BDC8E7A9BACFB7C37AA0CD73A9CD23

grantLetter.pdf

5081356AC8B151A1169017746DD6902285427C79955533E2C47
FB773140358B9EF01CFCD46A6E4D9955D930B8FDB7E5FFF05
53318CC39FA2E697F76515080F05

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 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.



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APPLICATION #
18/470,513

RECEIPT DATE / TIME
06/12/2024 05:17:56 PM Z ET

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY George Zalepa

PATENT CENTER # 65942716

AUTHORIZED BY -

CUSTOMER # 32361

FILING DATE 09/20/2023

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Ali HASSAN

Payment Information

PAYMENT METHOD
DA / 501561

PAYMENT TRANSACTION ID
E202468H18278194

PAYMENT AUTHORIZED BY
George Zalepa

PRE-AUTHORIZED ACCOUNT
501561

PRE-AUTHORIZED CATEGORY
37 CFR 1.16 (National application filing, search, and examination fees); 37
CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19
(Document supply fees); 37 CFR 1.21 (Miscellaneous fees and charges)

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1814	STATUTORY DISCLAIMER, INCLUDING TERMINAL DISCLAIMER	170.00	1	170.00
TOTAL AMOUNT:				\$170.00

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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 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.

<i>Examiner-Initiated Interview Summary</i>	Application No. 18/470,513	Applicant(s) HASSAN et al.		
	Examiner CASEY L KRETZER	Art Unit 2635	AIA (First Inventor to File) Status Yes	Page 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	Title	Type
CASEY L KRETZER	Primary Examiner	Telephonic
George Zalepa	Attorney of Record	

Date of Interview: 12 June 2024

Issues Discussed:

Proposed Amendment(s)

The Examiner proposed minor amendments to overcome clarity issues. Applicant's representative agreed and authorized the Examiner's Amendment.

Non-statutory Double Patenting

The Examiner proposed filing a terminal disclaimer listing two related patents in order to overcome non-statutory double patenting rejections. Applicant's representative agreed, and the disclaimer was filed and approved.

/CASEY L KRETZER/ Primary Examiner, Art Unit 2635	
Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04 Please further see: MPEP 713.04 Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b) 37 CFR § 1.2 Business to be transacted in writing	

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Notice of References Cited	Application/Control No. 18/470,513		Applicant(s)/Patent Under Reexamination HASSAN et al.	
	Examiner CASEY L KRETZER		Art Unit 2635	Page 1 of 1

U.S. PATENT DOCUMENTS						
*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Name	CPC Classification	US Classification
*	A	US-20210117728-A1	2021-04-22	Lee; Joonseok	G06V10/464	1/1
*	B	US-20170357866-A1	2017-12-14	Welland; Robert Victor	G06V10/772	1/1
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS						
*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS		
*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

Issue Classification 	Application/Control No. 18/470,513	Applicant(s)/Patent Under Reexamination HASSAN et al.
	Examiner CASEY L KRETZER	Art Unit 2635

CPC						
Symbol					Type	Version
G06V	/	20	/	597	F	2022-01-01
G06V	/	10	/	22	I	2022-01-01
G06V	/	10	/	95	I	2022-01-01
G06F	/	18	/	2148	I	2023-01-01
G06F	/	18	/	2185	I	2023-01-01

CPC Combination Sets							
Symbol				Type	Set	Ranking	Version
	/		/				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/CASEY L KRETZER/ Primary Examiner, Art Unit 2635	12 June 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	28	2

Issue Classification 	Application/Control No. 18/470,513	Applicant(s)/Patent Under Reexamination HASSAN et al.
	Examiner CASEY L KRETZER	Art Unit 2635

INTERNATIONAL CLASSIFICATION					
CLAIMED					
G06V20/59	/	20	/	59	
G06V10/22	/	10	/	22	
G06V10/94	/	10	/	94	
G06F18/214	/	18	/	214	
G06F18/21	/	18	/	21	
NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	33	
/CASEY L KRETZER/ Primary Examiner, Art Unit 2635	12 June 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	28	2

Issue Classification 	Application/Control No. 18/470,513	Applicant(s)/Patent Under Reexamination HASSAN et al.
	Examiner CASEY L KRETZER	Art Unit 2635

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	21	15	30	24	39	28	48								
2	22	16	31	25	40	29	49								
3	23	17	32	9	41	30	50								
4	24	18	33	10	42	31	51								
5	25	19	34	11	43	32	52								
6	26	20	35	12	44	33	53								
7	27	21	36	8	45										
13	28	22	37	26	46										
14	29	23	38	27	47										

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 33	
/CASEY L KRETZER/ Primary Examiner, Art Unit 2635 (Primary Examiner) _____ (Date) 12 June 2024		O.G. Print Claim(s) 28	O.G. Print Figure 2

<i>Search Notes</i> 	Application/Control No. 18/470,513	Applicant(s)/Patent Under Reexamination HASSAN et al.
	Examiner CASEY L KRETZER	Art Unit 2635

CPC - Searched*		
Symbol	Date	Examiner
G06V20/597	06/12/2024	CLK
G06F18/2148, 2185	06/12/2024	CLK
G06V10/22, 95	06/12/2024	CLK

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
Prior art and inventor searches were performed in Search.	06/12/2024	CLK
Prior art search was performed in Dialog.	06/12/2024	CLK

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
G06V20	597	06/12/2024	CLK
G06F18	2148, 2185	06/12/2024	CLK
G06V10	22, 95	06/12/2024	CLK

/CASEY L KRETZER/ Primary Examiner, Art Unit 2635	
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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	18/470513	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:38 PM
L2	29670	(G06V20/597 OR G06F18/2148 OR G06F18/2185 OR G06V10/22 OR G06V10/95).cpc.	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:41 PM
L3	18	L2 AND prediction head	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:41 PM
L4	10238	(prediction head OR classifier OR decod\$3 OR annotator OR expert OR predict\$3) WITH (distract\$3 OR object near2 (detect\$3 OR identif\$7) OR (pose OR view)) SAME (loss OR backpropagat\$3 OR back propogat\$3 OR error)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:49 PM
L5	170	L2 AND L4	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:49 PM
L6	13	(prediction head OR classifier OR decod\$3 OR annotator OR expert OR predict\$3) WITH (distract\$3 OR object near2 (detect\$3 OR identif\$7) OR (pose OR view)) SAME (loss OR backpropagat\$3 OR back propogat\$3 OR error) same2 distraction near2 (model OR network OR module)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:50 PM
L7	1033	(prediction head OR classifier OR decod\$3 OR annotator OR expert OR predict\$3) WITH (distract\$3 OR preoccup\$5 OR attent\$3 OR object near2 (detect\$3 OR identif\$7) OR (pose OR view)) SAME (loss OR backpropagat\$3 OR back propogat\$3 OR error) same2 (distract\$3 OR preoccup\$5 OR attent\$3) near2 (model	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:51 PM

L8	6	OR network OR module) (prediction head) WITH (distract\$3 OR preoccup\$5 OR attent\$3 OR object near2 (detect\$3 OR identif\$7) OR (pose OR view)) SAME (loss OR backpropagat\$3 OR back propogat\$3 OR error) same2 (distract\$3 OR preoccup\$5 OR attent\$3) near2 (model OR network OR module)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:52 PM
L10	806	(prediction head OR classifier OR decod\$3 OR annotator OR expert OR predict\$3) WITH (distract\$3 OR preoccup\$5 OR attent\$3 OR object near2 (detect\$3 OR identif\$7) OR (pose OR view)) SAME (loss OR backpropagat\$3 OR back propogat\$3) same2 (distract\$3 OR preoccup\$5 OR attent\$3) near2 (model OR network OR module)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:53 PM
L11	36	L2 AND L10	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 10:53 PM
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L13	1	("2021/0117728").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	ADJ	ON	ON	2024/06/11 11:00 PM
L14	5	("20190147245"	(US-PGPUB; USPAT;	ADJ	ON	ON	2024/06/11

		"20190205761" "20200074269" "20200167943" "20200272888").pn. OR ("11295171").urpn. AND (PGPB USPT USOC).dbnm.	USOCR)				11:00 PM
L15	43	(prediction head) same2 (distract\$3 OR preoccup\$5 OR attention) WITH (model OR network OR module)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 11:01 PM
L16	39	(prediction head) same2 (driver OR vehicle) WITH (model OR network OR module)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 11:02 PM
L17	372	prediction WITH (distract\$3 OR preoccup\$5 OR attention OR object near2 (detect\$3 OR identif\$7) OR (pose OR view)) SAME (loss OR backpropagat\$3 OR back propogat\$3) same2 (distract\$3 OR preoccup\$5 OR attention) near2 (model OR network OR module)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 11:03 PM
L18	29	prediction WITH (distract\$3 OR preoccup\$5 OR attention OR object near2 (detect\$3 OR identif\$7) OR (pose OR view)) SAME (loss OR backpropagat\$3 OR back propogat\$3) same2 (distract\$3 OR preoccup\$5 OR attention) near2 (model OR network OR module) same2 (driver OR vehicle OR car OR automobile)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/11 11:03 PM
L19	294	prediction SAME (distract\$3 OR preoccup\$5 OR attention) near2 (model OR network OR module) same2 (driver OR vehicle OR car OR automobile)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/12 11:51 AM

L20	1999	prediction near3 (model OR network OR module OR head) SAME (distract\$3 OR preoccup\$5 OR attention OR tired OR gaze OR view OR viewpoint OR emotion OR angry OR sad OR mad OR sleepy) same2 (driver OR vehicle OR car OR automobile)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/12 11:57 AM
L22	21	prediction head SAME (distract\$3 OR preoccup\$5 OR attention OR tired OR gaze OR view OR viewpoint OR emotion OR angry OR sad OR mad OR sleepy) same2 (driver OR vehicle OR car OR automobile)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/12 11:57 AM
L23	11	2017/0357866	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/12 10:28 PM
L24	9	"20170357866"	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/12 10:29 PM
L25	339	(prediction head OR classifier OR decoder OR annotator OR expert OR predictor) WITH (distract\$3 OR preoccup\$5 OR attention OR object near2 (detect\$3 OR identif\$7) OR (pose OR view)) SAME (loss OR backpropagat\$3 OR back propogat\$3) same2 (distract\$3 OR preoccup\$5 OR attention) near2 (model OR network OR module)	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/12 10:31 PM
L26	12	L25 NOT L12	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/12 10:32 PM
L27	1240	((("HASSAN") near3 ("Ali")) OR (("AKHTER") near3 ("Ijaz")) OR (("FAISAL") near3 ("Muhammad")) OR (("ALI") near3 ("Afsheen")) OR (("ALI") near3 ("Ahmed"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	ADJ	ON	ON	2024/06/12 10:42 PM
L28	9	(prediction head).clm. AND L27	(US-PGPUB; USPAT; FPRS)	ADJ	ON	ON	2024/06/12 10:42 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N4	66	(prediction head OR classifier OR annotator OR expert OR predictor).clm. AND driver.clm. AND L2	(US-PGPUB)	ADJ	ON	ON	2024/06/12 10:46 PM

Bibliographic Data

Application No: 18/470,513

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged: /CASEY L KRETZER/

Examiner's Signature

Initials

Title:

DISTRACTED DRIVING DETECTION USING A MULTI-TASK
TRAINING PROCESS

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/20/2023	382	2635	189908.000253
RULE			

APPLICANTS

MOTIVE TECHNOLOGIES, INC., San Francisco, CA, UNITED STATES

INVENTORS

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Muhammad FAISAL, Jhawarian, PAKISTAN

Afsheen Razaqat ALI, Gujranwala, PAKISTAN

Ahmed ALI, Lahore, PAKISTAN

CONTINUING DATA

This application is a CON of 18068322 12/19/2022 PAT 11798298

18068322 is a CON of 17347682 06/15/2021 PAT 11532169

FOREIGN APPLICATIONS

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09/28/2023

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June 12 2024 22:36

Search Strategy

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Set#	Searched for	Results
S1	(prediction pre/1 head near/40 ((distract[*3] or preoccup[*5] or attention or tired or gaze or view or viewpoint or emotion or angry or sad or mad or sleep[*5]) near/80 (driver or vehicle or car or automobile))) and (pd(<20210615))	13°
S2	((((prediction near/15 (decoder or classifier or annotator or expert)) near/40 (distract[*3] or preoccup[*5] or attention or tired or gaze or view or viewpoint or emotion or angry or sad or mad or sleep[*5])) near/40 (driver or vehicle or car or automobile)) and (pd(<20210615))	165°

° Duplicates are removed from the search and from the result count.

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NOTICE OF ALLOWANCE AND FEE(S) DUE

32361 7590 07/03/2024
GREENBERG TRAURIG (NY)
One Vanderbilt Avenue
NEW YORK, NY 10017

EXAMINER
KRETZER, CASEY L

ART UNIT PAPER NUMBER

2635

DATE MAILED: 07/03/2024

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/470,513	09/20/2023	Ali HASSAN	189908.000253	7970

TITLE OF INVENTION: DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	10/03/2024

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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32361 7590 07/03/2024
GREENBERG TRAUIG (NY)
One Vanderbilt Avenue
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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/470,513	09/20/2023	Ali HASSAN	189908.000253	7970

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EXAMINER	ART UNIT	CLASS-SUBCLASS
KRETZER, CASEY L	2635	382-103000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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www.uspto.gov

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Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 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, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. 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.

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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).

<https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf>

Routine uses of the information in this record may include disclosure to:

- 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
- 2) a federal, state, local, or international agency, in response to its request;
- 3) a contractor of the USPTO having need for the information in order to perform a contract;
- 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
- 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
- 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
- 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
- 8) 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));
- 9) the Office of Personnel Management (OPM) for personnel research purposes; and
- 10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/470,513	Applicant(s) HASSAN et al.	
	Examiner CASEY L KRETZER	Art Unit 2635	AIA (FITF) Status Yes

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Interview on 06/12/2024.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

2. ☐ 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.

3. ☒ The allowed claim(s) is/are 21-53. As a result of the allowed claim(s), 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.

4. ☐ 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. ____.

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)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date ____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material ____. 4. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____.	5. ☒ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/CASEY L KRETZER/ Primary Examiner, Art Unit 2635	
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DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Terminal Disclaimer

The terminal disclaimer filed on 06/12/2024 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of **U.S. Patent Nos. 11,532,169 and 11,798,298** has been reviewed and is accepted. The terminal disclaimer has been recorded.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with George Zalepa on 06/12/2024.

The application has been amended as follows:

Claim 24. (Currently Amended) The method of claim 23, wherein each of the bounding box regression network and the object class prediction network comprising

comprise deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

Claim 28. (Currently Amended) A non-transitory computer-readable storage medium for tangibly storing computer program instructions capable of being executed by a computer processor, the computer program instructions defining steps of:

inputting labeled examples into a neural network, the neural network comprising: a backbone network, and one or more prediction heads~~coupled~~, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;

minimizing a loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network; and

storing a distraction classification model after minimizing the loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

Claim 31. (Currently Amended) The non-transitory computer-readable storage medium of claim 30, wherein each of the bounding box regression network and the object class prediction network ~~comprising~~ comprise deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

Claim 35. (Currently Amended) A device comprising:

a processor; and

a storage medium for tangibly storing thereon program logic for execution by the processor, the program logic comprising:

logic, executed by the processor, for inputting labeled examples into a neural network, the neural network comprising: a backbone network, and one or more prediction heads ~~coupled~~, the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head,

logic, executed by the processor, for minimizing a loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network, and

logic, executed by the processor, for storing a distraction classification model after minimizing the loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

Claim 37. (Currently Amended) The device of claim 36, wherein each of the bounding box regression network and the object class prediction network ~~comprising~~ comprise deep neural networks having a plurality of hidden layers, each hidden layer in the plurality of hidden layers comprising a convolutional layer, a batch normalization layer, and a batch activation layer.

Allowable Subject Matter

Claims 21-53 are allowed.

Regarding **independent claim 28**, the prior art made of record fails to teach a non-transitory computer-readable storage medium for tangibly storing computer program instructions capable of being executed by a computer processor, the computer program instructions defining steps of:

inputting labeled examples into a neural network, the neural network comprising: a backbone network, and one or more prediction heads, **the one or more prediction heads selected from a group consisting of a distraction classification prediction head, object detection prediction head, and a pose estimation prediction head;**

minimizing a loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network; and

storing a **distraction classification model** after minimizing the loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads.

Lee et al, U.S. Publication No. 2021/0117728 generally teaches a non-transitory computer-readable storage medium for tangibly storing computer program instructions capable of being executed by a computer processor (**see Lee paragraph [0011]**), the computer program instructions defining steps of: inputting labeled examples (**see Figure 1, data input 22 and paragraph [0115]**) into a neural network (**see Figure 1, machine-learned model 18 and**

paragraph [0040]), the neural network comprising: a backbone network (**see Figure 1, shared feature extraction portion 20**), and one or more prediction heads (**see Figure 1, prediction heads 30-34**);

minimizing a loss based on outputs of the one or more prediction heads causing a change in parameters of the backbone network (**see Figure 6, steps 604-608 and paragraph [0098]**); and

storing a model after minimizing the loss, the distraction classification model comprising the parameters of the backbone network and parameters of at least one of the one or more prediction heads (**see paragraph [0127]**).

However, Lee does not teach the specific prediction heads and the specific output model as required in independent claim 28.

Welland et al, U.S. Publication No. 2017/0357866 generally teaches a system for training a distraction classification model (**see Welland paragraph [0045]**).

However, Welland does not teach the specifics of training such a model highlighted above.

Independent claims 21, 35, 46, and 50 recite similar allowable features as claim 28, and are similarly allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CASEY L KRETZER whose telephone number is (571)272-5639. The examiner can normally be reached M-F 10:00-7:00 PM PDT.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on (571)272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/CASEY L KRETZER/
Primary Examiner, Art Unit 2635



UNITED STATES
PATENT AND TRADEMARK OFFICE

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Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #
18/470,513

RECEIPT DATE / TIME
07/05/2024 03:52:18 PM Z ET

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY Judi Cordo

PATENT CENTER # 66251820

AUTHORIZED BY George Zalepa

CUSTOMER # 32361

FILING DATE 09/20/2023

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Ali HASSAN

Payment Information

PAYMENT METHOD
DA / 501561

PAYMENT TRANSACTION ID
E202475F54057465

PAYMENT AUTHORIZED BY
Judi Cordo

PRE-AUTHORIZED ACCOUNT
501561

PRE-AUTHORIZED CATEGORY
37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.21 (Miscellaneous fees and charges)

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1501	UTILITY ISSUE FEE	1200.00	1	1200.00
TOTAL AMOUNT:				\$1,200.00

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 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.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

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P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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32361 7590 07/03/2024

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NEW YORK, NY 10017

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Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

Judi Cordo	(Typed or printed name)
/Judi Cordo/	(Signature)
July 5, 2024	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/470,513	09/20/2023	Ali HASSAN	189908.000253	7970

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EXAMINER	ART UNIT	CLASS-SUBCLASS
KRETZER, CASEY L	2635	382-103000

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☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 George David Zalepa

2 Greenberg Traurig, LLP

3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

MOTIVE TECHNOLOGIES, INC.

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

San Francisco, CA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☒ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-1561

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29☐ Applicant asserting small entity status. See 37 CFR 1.27☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /George Zalepa/

Date July 5, 2024

Typed or printed name George Zalepa

Registration No. 72,706



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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
18/470,513

RECEIPT DATE / TIME
07/05/2024 03:52:18 PM Z ET

ATTORNEY DOCKET #
189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7970

FILED BY Judi Cordo

PATENT CENTER # 66251820

FILING DATE 09/20/2023

CUSTOMER # 32361

FIRST NAMED
INVENTOR Ali HASSAN

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY George Zalepa

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
189908__000253__issue__fee__tr ansmittal.pdf	1	Issue Fee Payment (PTO-85B)	1222 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
189908__000253__issue__fee__tran smittal.pdf	58E6FEF59915099BFB2C8D43546B19F541489655C5DCC00154 B83A7AF5F470303DDC9E8543E53C09CFFE65F47076830528C C6CD06793DF00A3E0F41780DCE6EA

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New Applications Under 35 U.S.C. 111

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New International Application Filed with the USPTO as a Receiving Office

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/470,513	08/13/2024	12062243	189908.000253	7970

32361 7590 07/24/2024

GREENBERG TRAURIG (NY)
One Vanderbilt Avenue
NEW YORK, NY 10017

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at <https://patentcenter.uspto.gov/>. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at <https://certifiedcopycenter.uspto.gov/index.html>. The Certified Copy Center may be reached at (800)972-6382.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Center (<https://patentcenter.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site <https://patentcenter.uspto.gov> for additional inventors):

Ali HASSAN, Lahore, PAKISTAN;
Ijaz AKHTER, Lahore, PAKISTAN;
Muhammad FAISAL, Jhawarian, PAKISTAN;
Afsheen Rafaqat ALI, Gujranwala, PAKISTAN;
Ahmed ALI, Lahore, PAKISTAN;

APPLICANT(s) (Please see PATENT CENTER site <https://patentcenter.uspto.gov> for additional applicants):

MOTIVE TECHNOLOGIES, INC., San Francisco, CA;

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/470,513	09/20/2023	Ali HASSAN	189908.000253	7970
32361	7590	08/13/2024		
GREENBERG TRAURIG (NY) One Vanderbilt Avenue NEW YORK, NY 10017			EXAMINER KRETZER, CASEY L	
			ART UNIT	PAPER NUMBER
			2635	
			NOTIFICATION DATE	DELIVERY MODE
			08/13/2024	ELECTRONIC

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

cordesp@gtlaw.com
mendozae@gtlaw.com
njdocket@gtlaw.com

APPLICATION NO.	ISSUE DATE	PATENT NO.
18/470,513	13-Aug-2024	12062243

GREENBERG TRAURIG (NY)
One Vanderbilt Avenue
NEW YORK, NY 10017

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at <https://patentcenter.uspto.gov>

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit <https://www.uspto.gov/electronicgrants>



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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/470,513	10/07/2025 11:41:49 AM Z ET	189908.000253

Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	12062243
CONFIRMATION #	7970	FILED BY	Judi Cordo
PATENT CENTER #	72607363	AUTHORIZED BY	George Zalepa
CUSTOMER #	32361	FILING DATE	09/20/2023
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Ali HASSAN

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 501561	E202507B43025203	Judi Cordo
PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY	
501561	37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.21 (Miscellaneous fees and charges)	

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1811	CERTIFICATE OF CORRECTION	172.00	1	172.00
TOTAL AMOUNT:				≈172.00

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New Applications Under 35 U.S.C. 111

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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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Pat. No. 12,062,243 of Ali
HASSAN *et al.*
Serial No.: 18/470,513
Confirmation No.: 7970
Filed: Sept. 20, 2023
For: DISTRACTED DRIVING
DETECTION USING A MULTI-TASK
TRAINING PROCESS

Group Art Unit: 2635
Examiner: Casey L. Kretzer

REQUEST FOR CERTIFICATE OF CORRECTION PURSUANT TO 37 C.F.R. § 1.323

Commissioner for Patents
Office of Patent Publication
Attn: Certificate of Correction Branch
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Transmitted herewith is a Certificate of Correction for U.S. Patent No. 12,062,243 issued on August 13, 2024. Upon reviewing the patent, the undersigned attorney noted the following typographical errors, which should be corrected as follows:

**Column 17, Claim 4, Line 36, replace "batch activation layer" with
--activation layer--**

**Column 18, Claim 16, Line 33, replace "batch activation layer"
with --activation layer--**

**Column 19, Claim 22, Line 16, replace "batch activation layer"
with --activation layer--**

For your reference, enclosed is a Certificate of Correction PTO SB/44 showing the requested corrections.

Since the above error was not the fault of the Patent Office, the Commissioner is hereby authorized to charge the fee, under 1.20(a) for the Certificate of Correction to Deposit Account No. 50-1561. If there are any additional fees due in connection with this matter, the Commissioner is authorized to charge them to Deposit Account No. 50-1561, referencing docket number 189908- 000253.

Respectfully submitted,
/George Zalepa/
George Zalepa
Reg. No. 72,706

GREENBERG TRAURIG, LLP
Customer No. 129853
Phone: (973) 443-3241

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 12,062,243

APPLICATION NO.: 18/470,513

ISSUE DATE : 08/13/2024

INVENTOR(S) : Ali HASSAN, Ijaz AKHTER, Muhammad FAISAL, Afsheen Rafaqat ALI, Ahmed ALI

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

Column 17, Claim 4, Line 36, replace "batch activation layer" with --activation layer--

Column 18, Claim 16, Line 33, replace "batch activation layer" with --activation layer--

Column 19, Claim 22, Line 16, replace "batch activation layer" with --activation layer--

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

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If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.



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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION # 18/470,513	RECEIPT DATE / TIME 10/07/2025 11:41:49 AM Z ET	ATTORNEY DOCKET # 189908.000253
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Title of Invention

DISTRACTED DRIVING DETECTION USING A MULTI-TASK TRAINING PROCESS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	12062243
CONFIRMATION #	7970	FILED BY	Judi Cordo
PATENT CENTER #	72607363	FILING DATE	09/20/2023
CUSTOMER #	32361	FIRST NAMED INVENTOR	Ali HASSAN
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	George Zalepa

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
189908_000253_request_for_certificate_of_correction.pdf	2	Request for Certificate of Correction	133 KB
189908_000253_certificate_of_correction.pdf	2	Request for Certificate of Correction	272 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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189908_000253_certificate_of_	246B6101EBAF774EFA31EC270EFE7F81A0E0C5C96C742773

correction.pdf

DBCB7F6E46B6266B9AC832E3F95A88D94B6B6A9CDF269D55
4F3E3E1CC611748233E87187AF0A2BD9

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/470,513	09/20/2023	Ali HASSAN	189908.000253	7970
32361	7590	11/04/2025		
GREENBERG TRAURIG (NY) One Vanderbilt Avenue NEW YORK, NY 10017			EXAMINER KRETZER, CASEY L	
			ART UNIT	PAPER NUMBER
			2635	
			NOTIFICATION DATE	DELIVERY MODE
			11/04/2025	ELECTRONIC

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APPLICATION NO.	ISSUE DATE	PATENT NO.
18/470,513	04-Nov-2025	12062243

GREENBERG TRAURIG (NY)
NEW YORK, NY 10017

ELECTRONIC CERTIFICATE OF CORRECTION NOTIFICATION

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