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UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 C.F.R. 1.53(b))	Attorney Docket No.	038231-021	U.S. PTO 11/999264
	First Inventor	Taijun Liu	12/03/2007
	Title	NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS	
	Express Mail Label No.	EV 923220945 US	

APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents.	ADDRESS TO: Commissioner for Patents P.O. Box 1450 Alexandria VA 22313-1450
1. ☐ Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing) 2. ☒ Applicant claims small entity status. See 37 CFR 1.27. 3. ☒ Specification [Total Pages <u>21</u>] Both the claims and abstract must start on a new page (For information on the preferred arrangement, see MPEP 608.01(a)) 4. ☒ Drawing(s) (35 U.S.C.113) [Total Sheets <u>8</u>] 5. Oath or Declaration [Total Sheets <u> </u>] a. ☐ Newly executed (original or copy) b. ☐ A copy from a prior application (37 CFR 1.63 (d)) (for a continuation/divisional with Box 18 completed) i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b). 6. ☒ Application Data Sheet. See 37 CFR 1.76 7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix) ☐ Landscape Table on CD 8. 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 APPLICATIONS PARTS 9. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 10. ☐ 37 C.F.R. 3.73(b) Statement ☐ Power of Attorney (when there is an assignee) 11. ☐ English Translation Document (if applicable) 12. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of foreign patent documents, publications, & other information 13. ☐ Preliminary Amendment 14. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized) 15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 16. ☐ Nonpublication Request under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 17. ☐ Other: _____

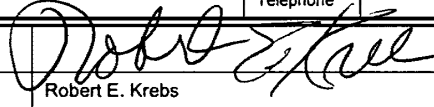
18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation	☐ Divisional	☐ Continuation-in-part (CIP)	of prior application No: <u>60 / 872,132</u>
Prior application information: Examiner _____			Art Unit: _____

19. CORRESPONDENCE ADDRESS

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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: Mail Stop Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
 If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Application Data Sheet

Application Information

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Status::	Full Capacity
Initial	1 of 3

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Representative Information

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	Provisional	60/872,132	December 1, 2006

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UNITED STATES PATENT APPLICATION

For

**NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF
IN WIRELESS RADIO SYSTEMS**

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SPECIFICATION

TITLE

**NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF
IN WIRELESS RADIO SYSTEMS**

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims benefit of Provisional Patent Application No. 60/872,132 filed on December 1, 2006, which is incorporated by reference herein in its entirety.

TECHNOLOGY FIELD

[0002] The present disclosure relates generally to field of modeling of wireless nonlinear radio systems and more specifically to the methods for user thereof in digital baseband predistortion.

BACKGROUND

[0003] Modern wireless communication systems employ spectrally efficient, digitally modulated signals with wide bandwidths and time-varying envelopes. Such systems are very sensitive to different sources of linear and nonlinear distortions that may be exhibited by the radio frequency (RF) transmitters, especially the power amplifier (PA) stage. Hence, RF transmitters have to meet strict linearity requirements in order to avoid the signal quality deterioration and adjacent channel interference. At the same time, RF transmitters must be efficient in order to comply with low power requirements of wireless communication systems.

[0004] Amplifier nonlinearities may cause several complications in the wireless digital system and significantly complicate design of such systems. For example, they may produce a dilation / spreading of the spectrum of the input signal, which may cause adjacent channel interference. In addition to such spectral regrowth, amplifier nonlinearities may produce in-band distortions which deteriorate the integrity of the transmitted signal. The minimization of the effects of such distortion sources relies primary on accurate modeling of the RF transmitters.

[0005] There are several prior art models of dynamic nonlinear systems. However, one common problem of such models is in the identification procedure of the parameters of their different modules. Furthermore, the known models and procedures encounter high complexity and/or low accuracy. Moreover, they frequently do not account for the strong memory effects exhibited by the transmitter/PA. Thus, in most cases, they are not appropriate for implementation in broadband adaptive communications systems. Accordingly, there is a need for a new dynamic nonlinear system model that overcomes limitations of the prior art behavioral models.

OVERVIEW

[0006] Disclosed is a new behavioral model for memoryless wide-band radio frequency transmitters. Also disclosed are various implementation of the behavioral model for purpose of baseband predistortion of dynamic nonlinear systems, such as wideband wireless transmitters and power amplifiers. In one example embodiment, a LBG behavioral model comprises two non-linear cascading modules: a dynamic weak nonlinear (DWNL) module, which models dynamic weak nonlinearities of the system, and a static strong nonlinear (SSNL) module, which

models static strong nonlinearities of the system. In one example embodiment, a forward LBG model includes a DWNL module followed by a SSNL module. In another example embodiment, a reverse LBG model includes a SSNL module followed by a DWNL module.

[0007] In one example embodiment, the SSNL module may be implemented as a AM/AM and AM/PM lookup table, which is configured to account for amplitude modulation / amplitude modulation (AM/AM) and amplitude modulation / phase modulation (AM/PM) characteristics of RF transmitters. At the same time, the DWNL module may be implemented as a plurality of nonlinear dynamic FIR-based filters which account for low- and high-order memory effects caused by dynamic properties of the transmitter in the presence of a modulated communication signal. In this manner, the disclosed LBG behavioral model accounts for nonlinearity and the memory effects that occur in broadband RF transmitters. Moreover, the dynamic behavioral model largely improves the model accuracy for wideband RF transmitters.

[0008] In one example embodiment, an augmented Wiener predistorter is disclosed which is implemented using a first-order forward LBG model. The augmented Wiener predistorter may be placed in a broadband wireless transmitter to compensate for nonlinearity and memory effects therein. The augmented Wiener predistorter includes a DWNL module followed by a SSNL module. The DWNL module may be implemented as a weak nonlinear dynamic FIR-based filter, including a linear term and a second-order term that compensate for dynamic memory effects of the wireless transmitter. The SSNL module may be implemented as AM/AM and AM/PM lookup tables, which smooth and model AM/AM and AM/PM characteristics of the wireless transmitter and power amplifiers therein.

[0009] In another example embodiment, an augmented Hammerstein predistorter is disclosed implemented using a first-order reverse LBG model. The augmented Hammerstein predistorter may be placed in a broadband wireless transmitter to compensate for nonlinearity and memory effects therein. In one example embodiment, the augmented Hammerstein predistorter may include a SSNL module followed by a DWNL module. The SSNL module may be implemented as AM/AM and AM/PM lookup tables, which smooth and model AM/AM and AM/PM characteristics of the wireless transmitter. The DWNL module may be implemented as a weak nonlinear dynamic FIR-based filter, including a linear term and a second-order term that compensate for dynamic memory effects of the wireless transmitter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The accompanying drawings, which are incorporated into and constitute a part of this specification, illustrate one or more examples of embodiments and, together with the description of example embodiments, serve to explain the principles and implementations of the embodiments.

[0011] In the drawings:

Fig. 1A is a block diagram of one example embodiment of a forward LBG model;

Fig. 1B is a block diagram of one example embodiment of a reverse LBG model;

Fig. 2A is a schematic diagram of one example embodiment of the DWNL module;

Fig. 2B is a schematic diagram of one example embodiment of the SSNL module;

Fig. 3A is a schematic diagram of one example embodiment of a forward LBG model;

Fig. 3B is a schematic diagram of one example embodiment of a reverse LBG model;

Fig. 4A is a schematic diagram of one example embodiment of an augmented Wiener predistorter implemented using first-order forward LBG model;

Fig. 4B is a schematic diagram of one example embodiment of an augmented Hammerstein predistorter implemented using first-order reverse LBG model;

Figs. 5A and 5B are graphs of AM/AM and AM/PM curves in accordance with one example embodiment; and

Figs. 6A and 6B are graphs of spectrum comparison of the different LBG-model-based predistorters.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

[0012] Disclosed is a new behavioral model for wide-band radio frequency transmitters. Those of ordinary skill in the art will realize that the following description is illustrative only and is not intended to be in any way limiting. Various embodiments of the disclosed nonlinear system model are applicable in a variety of settings, such as baseband system modeling, baseband predistortion, RF digital predistortion and other applications. Alternative embodiments may be applied to analog as well as digital signal predistortion. Other embodiments will readily suggest themselves to such skilled persons having the benefit of this disclosure. Reference will now be made in detail to implementations of the example embodiments as illustrated in the accompanying drawings. The same reference indicators will be used to the extent possible throughout the drawings and the following description to refer to the same or like items.

[0013] In the interest of clarity, not all of the routine features of the implementations of the nonlinear system model described herein are shown and described. It will, of course, be appreciated that in the development of any such actual implementation, numerous implementation-specific decisions must be made in order to achieve the developer's specific goals, such as compliance with application- and system-related constraints, and that these specific goals will vary from one implementation to another and from one developer to another. Moreover, it will be appreciated that such a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking of engineering for those of ordinary skill in the art having the benefit of this disclosure.

[0014] In accordance with this disclosure, the nonlinear system model described herein may be implemented in various types of nonlinear communication systems, such as radio frequency, optical and other types of communication systems. In addition, those of ordinary skill in the art will recognize that devices of a less general purpose nature, such as hardwired devices, field programmable gate arrays (FPGAs), application specific integrated circuits (ASICs), digital signal processors (DSP) or the like, may also be used without departing from the scope and spirit of the inventive concepts disclosed herein. Where a method comprising a series of process steps is implemented by a computer or a machine and those process steps can be stored as a series of instructions readable by the machine, they may be stored on a tangible medium such as a computer memory device.

[0015] **Fig. 1A** and **1B** depict two example embodiments of a LBG model for nonlinear wireless systems. **Fig. 1A** depicts one example embodiment of a forward LBG model 100A, which includes a Dynamic Weak Nonlinear (DWNL) module 105 followed by a Static Strong Nonlinear (SSNL) module 110. **Fig. 1B** depicts one example embodiment of a reverse LBG model 100B, which includes a SSNL module 110 followed by a DWNL module 105. Those of skills in the art may recognize that either model may be used to in modeling of nonlinear wireless systems or in compensation of their impairments by using pre or post compensation. Various factors may be considered in deciding whether the forward or reverse LBG model is to be used. Such factors may include, but is not limited to, type and nature of the system being modeled, e.g., RF, optical and the like, system implementation and configuration, signal modulation technique and operating frequency of the system and other factors. In one example

embodiment, the system may be modeled using both forward and reverse LBG model to determine which model more accurately characterizes communication system.

[0016] In one example embodiment, DWNL module 105 may characterize dynamic weak nonlinear distortions, which are referred to as memory effects, due to baseband frequency response, harmonic loading conditions, and trap effects that might occur in semiconductor devices of the RF transmitter, impact ionization, as well as the non-constant frequency response of the transmitter around the carrier frequency. In the context of wideband transmitters, the electrical memory effects are the dominant sources of dispersion since the thermal time constant is large compared to the inverse of the signal bandwidth.

[0017] In one example embodiment, DWNL module 105 may be implemented as a finite impulse response (FIR) filter-based multi-branch non-linear structure. **Fig. 2A** depicts one example embodiment of implementation of a DWNL module 105. DWNL module 200 includes a number of parallel branches in which the first branch includes a linear FIR filter 205₁ and, in the parallel branches, the input signal $u(n)$ is multiplied by its magnitude $|u(n)|$, in order to generate even-order and odd-order distortions that will be applied to FIR filters 205₂- 205_p. In this manner, DWNL module 200 accounts for distortions sources of the real transmitter. More specifically, DWNL module accounts for the memory effects of the transmitter. In some embodiments, a limited number of branches are enough to obtain an accurate memory effect model because only weak nonlinearities modeled. The FIR filter parameters identification may be performed using the recursive least squares (RLS) algorithm, or other known techniques.

[0018] In one example embodiment, SSNL module 110 may characterize strong static nonlinearities of the wireless transmitter. **Fig. 2B** depicts one example embodiment of implementation of SSNL module 110. The SSNL module 110 may be implemented with two memoryless look-up tables (LUTs), which depends on the magnitude of the input complex signal of the SSNL module in accordance with one example embodiment. The look-up tables may be derived from the amplitude modulation / amplitude modulation (AM/AM) and amplitude modulation / phase modulation (AM/PM) curves of the transmitter. These curves may be extracted directly from the baseband measurement data by means of a moving average procedure or other known techniques. Fig. 5A and 5B show examples of the extracted AM/AM and AM/PM curves, which are based on the measurement data when the RF transmitter is driven with a three-carrier 3GPP-FDD WCDMA signal. The extracted, smoothed AM/AM and AM/PM curves are then used to construct the LUT of the SSNL module.

[0019] **Fig. 3A** depicts a schematic diagram of one implementation of a forward LBG model in accordance with one example embodiment. System 300A includes a DWNL module 305 implemented as a FIR filter based multi-branch structure cascaded with an SSNL module 310 implemented as two memoryless LUTs. The relationship between the input and output signals of the DWNL block 305 and the SSNL block 310 is described by equations 1 and 2.

$$x(n) = \sum_{i=0}^{M_1-1} a_{i,0} u(n-i) + \sum_{i=0}^{M_2-1} a_{i,1} |u(n-i)| u(n-i) + \quad (1)$$

$$+ \cdots + \sum_{i=0}^{M_p-1} a_{i,p-1} |u(n-i)|^{p-1} u(n-i)$$

$$y(n) = [G_{lut,i}(|x(n)|) + jG_{lut,q}(|x(n)|)]x(n) = G_{lut}(|x(n)|)x(n) \quad (2)$$

where $G_{lut}(|x(n)|) = G_{lut,i}(|x(n)|) + jG_{lut,q}(|x(n)|)$ denotes the memoryless complex gain of the transmitter that depends only on the instantaneous magnitude of $x(n)$. $x(n)$ is the output signal of the weak dynamic nonlinear filter. M_k stands for the number of taps in the k^{th} FIR filter FIR_k , $k=1,2,\dots,p$; p represents the number of the branches of the memory model, and a_i is the coefficients of the FIR filters.

[0020] Fig. 3B depicts a schematic diagram of one implementation of a reverse LBG model in accordance with one example embodiment. System 300B includes an SSNL block 310 implemented as two memoryless LUTs cascaded with a DWNL block 305 implemented as a FIR filter based multi-branch structure. The relationship between the input and output signals of the SSNL block 310 and the DWNL block 305 is described by equations 3 and 4.

$$x(n) = [G_{lut,i}(|u(n)|) + jG_{lut,q}(|u(n)|)]u(n) = G_{lut}(|u(n)|)u(n) \quad (3)$$

$$y(n) = \sum_{i=0}^{M_1-1} a_{i,0}x(n-i) + \sum_{i=0}^{M_2-1} a_{i,1}|x(n-i)|x(n-i) + \dots + \sum_{i=0}^{M_p-1} a_{i,p-1}|x(n-i)|^{p-1}x(n-i) \quad (4)$$

where $G_{lut}(|u(n)|) = G_{lut,i}(|u(n)|) + jG_{lut,q}(|u(n)|)$ denotes the memoryless complex gain of the transmitter that depends only on the instantaneous magnitude of $u(n)$. M_k , p and a_i have the same meaning as in (1) and (2).

[0021] As indicated by equation 1–4, knowledge of the static strong nonlinear part of the nonlinear model can substantially reduce the required number of branches of the DWNL module required for accurately modeling the dynamic nonlinearity of the nonlinear system.

[0022] In one example embodiment, the forward LBG model and the reverse LBG model may be used to provide pre-compensation for the transmitter output spectrum regrowth caused by the dynamic nonlinearity of the transmitter. In accordance with various embodiments, the forward LBG model and the reverse LBG model can be used to effect a predistortion scheme in which different types of power amplifiers (PAs) are implemented. Such PAs may include for example, a push-pull FET PA, an LDMOS class AB PA, and a Doherty PA. The effectiveness of the forward and reverse LBG models in accordance with various embodiments has been experimentally validated for a push-pull FET PA, an LDMOS class AB PA, and two Doherty PAs, having 1 – 4 carrier WCDMA test signals, respectively.

[0023] In one example embodiment, a wireless communication system in which a predistorter in accordance with various embodiments may be used may include a wideband RF transmitter having two digital-to-analog converters (DAC), an RF vector modulator and a power amplifier. The last amplification stage of the power amplifier built for this work, in the band of 1930–1990 MHz, is based on a 60-watt PEP push-pull FET transistor (FLL600IQ-2) from Eudyna Devices USA. A driver amplifier, based on an MRF19045 LDMOS transistor and an MHL19936 gain block both from Freescale Semiconductor, is used as the driver stage. The whole line-up has 53 dB gain and 45 dBm saturated power. Furthermore, an electronic signal generator (ESG: Agilent E4438C) is utilized in this work to emulate the rest of the transmitter.

[0024] In one example embodiment, a first-order forward LBG model may be used to implement an augmented Wiener predistorter. Various embodiments of the invention may be of higher order. The augmented Wiener predistorter may be used in a broadband wireless transmitter to compensate for nonlinearity and memory effects thereof. Fig. 4A illustrates an example embodiment of the augmented Wiener predistorter. The predistorter 400A includes a DWNL module 405 followed by a SSNL module 410. The DWNL module 405 may be implemented as a weak dynamic nonlinear FIR-based filter, including a linear term and a second-order term that compensate for dynamic memory effects of the wireless transmitter. The nonlinear FIR-based filter acts as a nonlinear equalizer. The SSNL module 410 may be implemented as AM/AM and AM/PM lookup tables, which smooth AM/AM and AM/PM characteristics of the wireless transmitter and power amplifiers therein.

[0025] The relationship between the input and output signals of the DWNL module 405 and the SSNL module 410 in Fig. 4A may be described with equations 5 and 6.

$$x(n) = \sum_{i=0}^{M_1-1} a_{i,0}u(n-i) + \sum_{i=0}^{M_2-1} a_{i,1}|u(n-i)|u(n-i) \quad (5)$$

$$y(n) = [G_{lut,i}(|x(n)|) + jG_{lut,q}(|x(n)|)]x(n) = G_{lut}(|x(n)|)x(n) \quad (6)$$

where $G_{lut}(|u(n)|) = G_{lut,i}(|u(n)|) + jG_{lut,q}(|u(n)|)$ denotes the memoryless complex gain of the transmitter that depends only on the instantaneous magnitude of $u(n)$. M_j , p and a_i have the same meaning as in (1) and (2). Fig. 6A illustrates spectrum comparison of the forward LBG-

model-based predistorter and the transmitter: (a) measured spectrum of the transmitter (without predistorter); (b) memoryless predistorter; (c) Wiener predistorter with a 64-tap FIR filter; (d) first order forward LBG-model-based predistorter (augmented Wiener predistorter) with two 3-tap FIR filters.

[0026] In another example embodiment, a first-order reverse LBG model may be used to implement an augmented Hammerstein predistorter. The augmented Hammerstein predistorter may be placed in a broadband wireless transmitter to compensate for nonlinearity and memory effects thereof. **Fig. 4B** illustrates one example embodiment of the augmented Hammerstein predistorter. Predistorter 400B includes a SSNL module 410 followed by a DWNL module 405. The SSNL module 410 may be implemented as AM/AM and AM/PM lookup tables, which smooth AM/AM and AM/PM characteristics of the wireless transmitter. The DWNL module 405 may be implemented as a weak nonlinear dynamic FIR-based filter, including a linear term and a second-order term that compensate for memory effects of the wireless transmitter. The nonlinear FIR-based filter acts as a nonlinear equalizer.

[0027] The relationship between the input and output signals of the SSNL module 410 and the DWNL module 405 in Fig. 4B may be described with equations 7 and 8.

$$x(n) = [G_{lut,i}(|u(n)|) + jG_{lut,q}(|u(n)|)]u(n) = G_{lut}(|u(n)|)u(n) \quad (7)$$

$$y(n) = \sum_{i=0}^{M_1-1} a_{i,0}x(n-i) + \sum_{i=0}^{M_2-1} a_{i,1}|x(n-i)|x(n-i) + \quad (8)$$

where $G_{lut}(|u(n)|) = G_{lut,i}(|u(n)|) + jG_{lut,q}(|u(n)|)$ denotes the memoryless complex gain of the transmitter that depends only on the instantaneous magnitude of $u(n)$. M_k , p and a_i have the same meaning as in (1) and (2). **Fig. 6B** illustrates spectrum comparison of the reverse LBG-

model-based predistorter and the transmitter: (a) measured spectrum of the transmitter (without predistorter); (b) memoryless predistorter; (c) Hammerstein predistorter with a 64-tap FIR filter; (d) first order reverse LBG-model-based predistorter (augmented Hammerstein predistorter) with two 3-tap FIR filter.

[0028] Although various embodiments are described as implementing a -finite impulse response (FIR) linear filter, alternative embodiments may implement other types of linear filters (e.g., an infinite impulse response (IIR) filter or an auto-regressive moving average (ARMA) filter). Moreover, although described in the context of digital predistortion, the predistortion techniques described are equally applicable to analog predistortion. In various embodiments, the disclosed forward and reversed LBG-model-based predistorters may be used for modeling of wireless wide-band RF transmitters in a 3G systems.

[0029] While the invention has been described in terms of several embodiments, those skilled in the art will recognize that the invention is not limited to the embodiments described, but can be practiced with modification and alteration within the spirit and scope of the appended claims. The description is thus to be regarded as illustrative instead of limiting.

CLAIMS

What is claimed is:

1. A behavioral model of a nonlinear dynamic system, the model comprising:
a first module characterizing dynamic nonlinear characteristics of the system, wherein the first module includes an input and an output; and
a second module characterizing static nonlinear characteristics of the nonlinear system, wherein the second module includes an input and an output;
wherein the first module is coupled to the second module.
2. The model of claim 1, wherein the first module is coupled to the second module such that an output of the first module is input to the second module.
3. The method of claim 1, wherein the second module is coupled to the first module such that an output of the second module is input to the first module.
4. The model of claim 1 wherein the first module comprises a nonlinear finite impulse response-based memory effect system and the second module comprises a look-up table-based nonlinear memoryless system.
5. The model of claim 1 wherein the first module is a dynamic weak nonlinear model and the second module is a static strong nonlinear model.

6. The model of claim 1 wherein the first module comprises a finite impulse response filter-based multi-branch nonlinear system and the second module comprises two look-up tables, each look-up table dependent on the magnitude of the input signal.

7. A predistorter for nonlinear wireless system, the predistorter comprising:
a dynamic nonlinear predistorter module; and
a static nonlinear predistorter module coupled to the dynamic nonlinear predistorter module such that an output of the dynamic nonlinear predistorter module is input to the static nonlinear predistorter module.

8. The predistorter of claim 7 wherein the dynamic nonlinear predistorter is a finite impulse response-based memory effect predistorter and the static nonlinear predistorter is a look-up table-based memoryless predistorter.

9. The predistorter of claim 7 wherein the dynamic nonlinear predistorter is a dynamic weak nonlinear predistorter and the static nonlinear predistorter is a static strong nonlinear predistorter.

10. The predistorter of claim 9 wherein the dynamic weak nonlinear predistorter is implemented as a finite impulse response filter-based multi-branch nonlinear structure embedded within a polynomial like series and the static strong nonlinear predistorter includes two look-up tables, each look-up table depends on the magnitude of a current input signal.

11. A predistorter for nonlinear wireless system, the predistorter comprising:
a static nonlinear predistorter module; and
dynamic nonlinear predistorter module coupled to the static nonlinear predistorter module
such that an output of the static nonlinear predistorter module is input to the dynamic nonlinear
predistorter module.
12. The predistorter of claim 11 wherein the dynamic nonlinear predistorter module is a finite
impulse response-based memory effect predistorter module and the static nonlinear predistorter
is a look-up table-based memoryless predistorter module.
13. The predistorter of claim 11 wherein the dynamic nonlinear predistorter module is a
dynamic weak nonlinear predistorter module and the static nonlinear predistorter is a static
strong nonlinear predistorter module.
14. The predistorter of claim 12 wherein the dynamic weak nonlinear predistorter is
implemented as a finite impulse response filter-based multi-branch nonlinear structure and the
static strong nonlinear predistorter includes two look-up tables, each look-up table depends on
the magnitude of a current input signal.
15. An augmented Wiener predistorter, the predistorter comprising:
a dynamic nonlinear first order predistorter module; and

a static nonlinear predistorter module coupled to the dynamic nonlinear predistorter module such that an output of the dynamic nonlinear predistorter module is input to the static nonlinear predistorter module.

16. The predistorter of claim 15 wherein the dynamic nonlinear predistorter is a finite impulse response-based memory effect predistorter and the static nonlinear predistorter is a look-up table-based memoryless predistorter.

17. The predistorter of claim 15 wherein the dynamic nonlinear predistorter is a dynamic weak nonlinear predistorter and the static nonlinear predistorter is a static strong nonlinear predistorter.

18. The predistorter of claim 17 wherein the dynamic weak nonlinear predistorter is implemented as a finite impulse response filter-based multi-branch nonlinear structure and the static strong nonlinear predistorter includes two look-up tables, each look-up table depends on the magnitude of a current input signal.

19. An augmented Hammerstein predistorter, the predistorter comprising:
a static nonlinear predistorter module; and
a dynamic nonlinear first order predistorter module coupled to the static nonlinear predistorter module such that an output of the static nonlinear predistorter module is input to the dynamic nonlinear predistorter module.

20. The predistorter of claim 19 wherein the dynamic nonlinear predistorter module is a finite impulse response-based memory effect predistorter module and the static nonlinear predistorter is a look-up table-based memoryless predistorter module.

21. The predistorter of claim 19 wherein the dynamic nonlinear predistorter module is a dynamic weak nonlinear predistorter module and the static nonlinear predistorter is a static strong nonlinear predistorter module.

22. The predistorter of claim 21 wherein the dynamic weak nonlinear predistorter is implemented as a finite impulse response filter-based multi-branch nonlinear structure and the static strong nonlinear predistorter includes two look-up tables, each look-up table depends on the magnitude of a current input signal.

ABSTRACT

Disclosed is a behavioral model for wide-band radio frequency transmitters. Also disclosed are various implementation of the behavioral model for purpose of baseband predistortion of dynamic nonlinear systems, such as wideband wireless transmitters and power amplifiers. In one example embodiment, a LBG behavioral model comprises two non-linear cascading modules: a dynamic weak nonlinear (DWNL) module, which models dynamic weak nonlinearities of the system, and a static strong nonlinear (SSNL) module, which models static strong nonlinearities of the system. In one example embodiment, a forward LBG model includes DWNL module followed by the SSNL module. In another example embodiment, a reverse LBG model includes SSNL module followed by DWNL module.

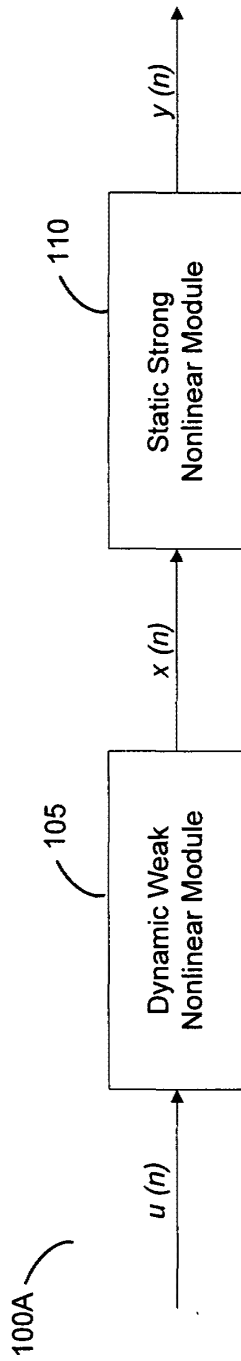


Fig 1A

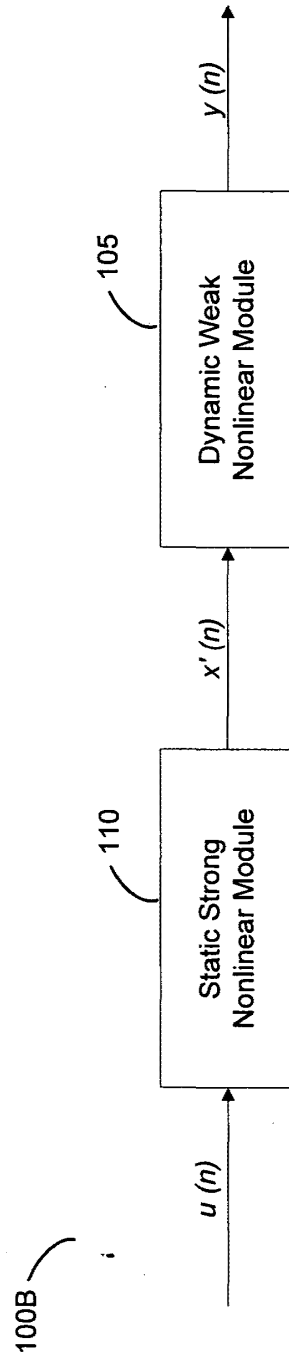


Fig 1B

2 of 8

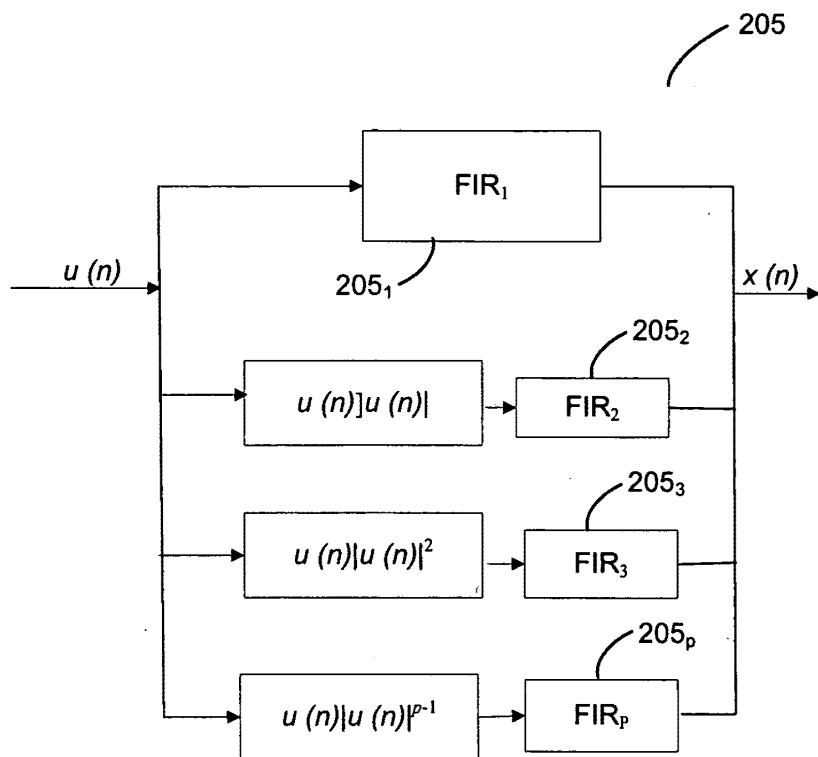


Fig. 2A

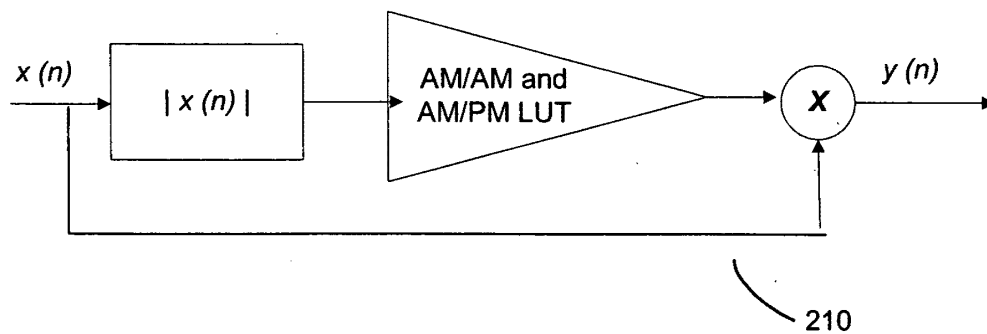


Fig. 2B

3 of 8

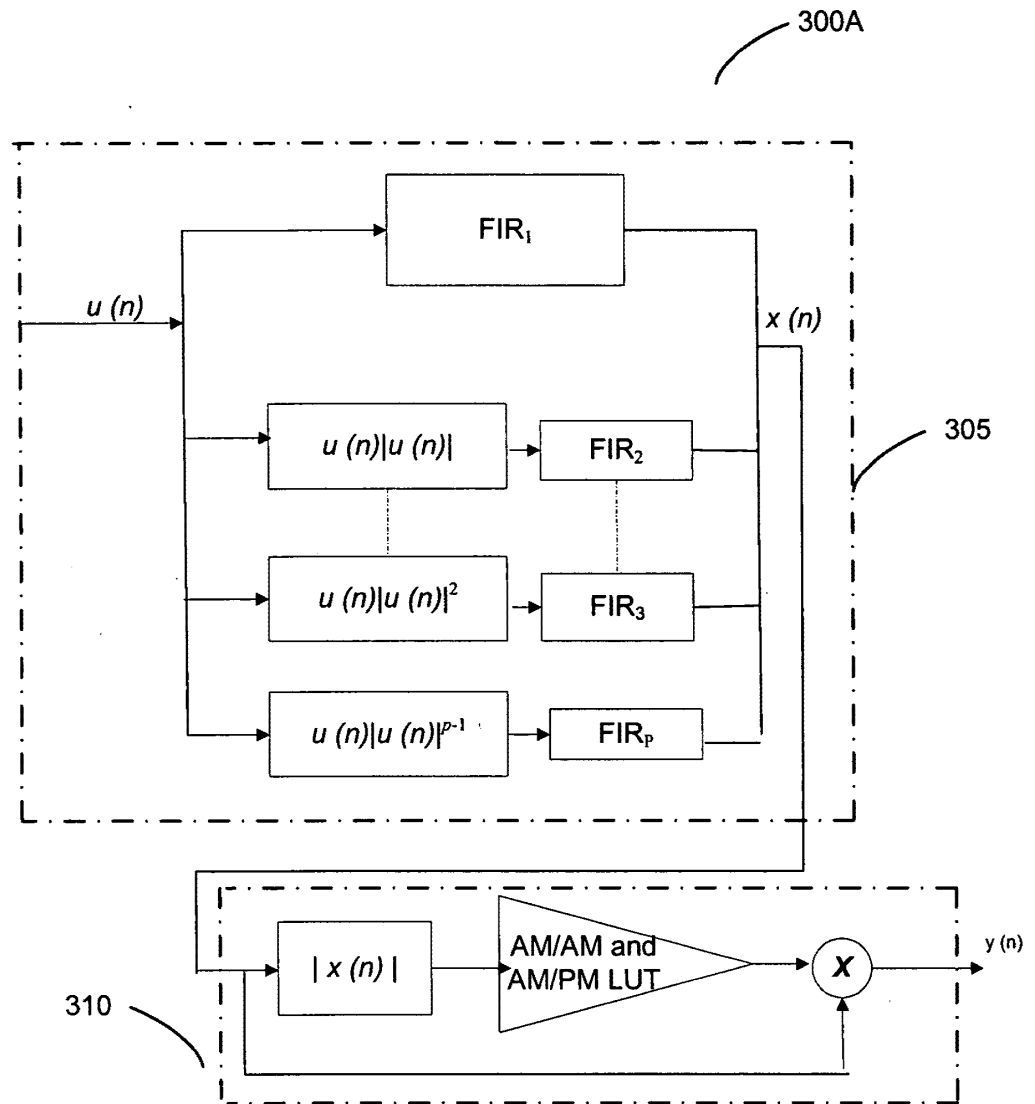


Fig. 3A

4 of 8

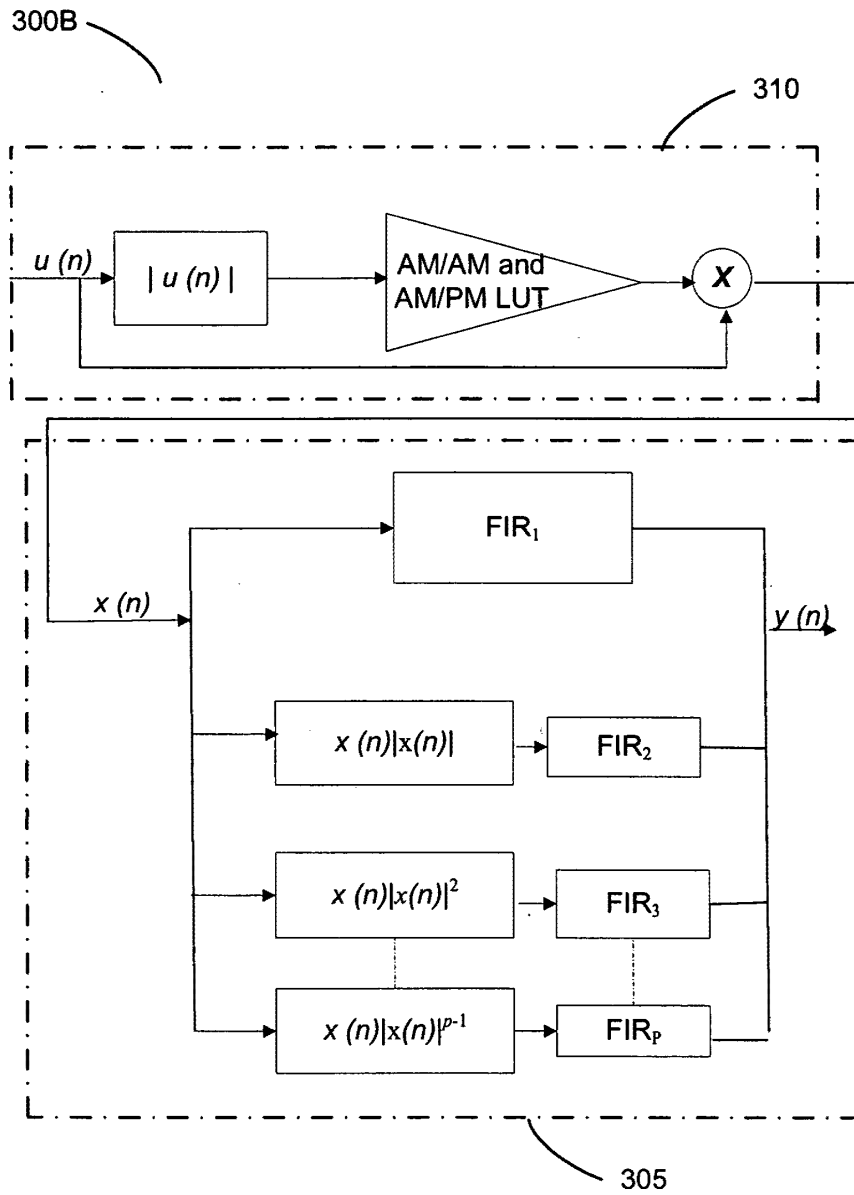


Fig. 3B

5 of 8

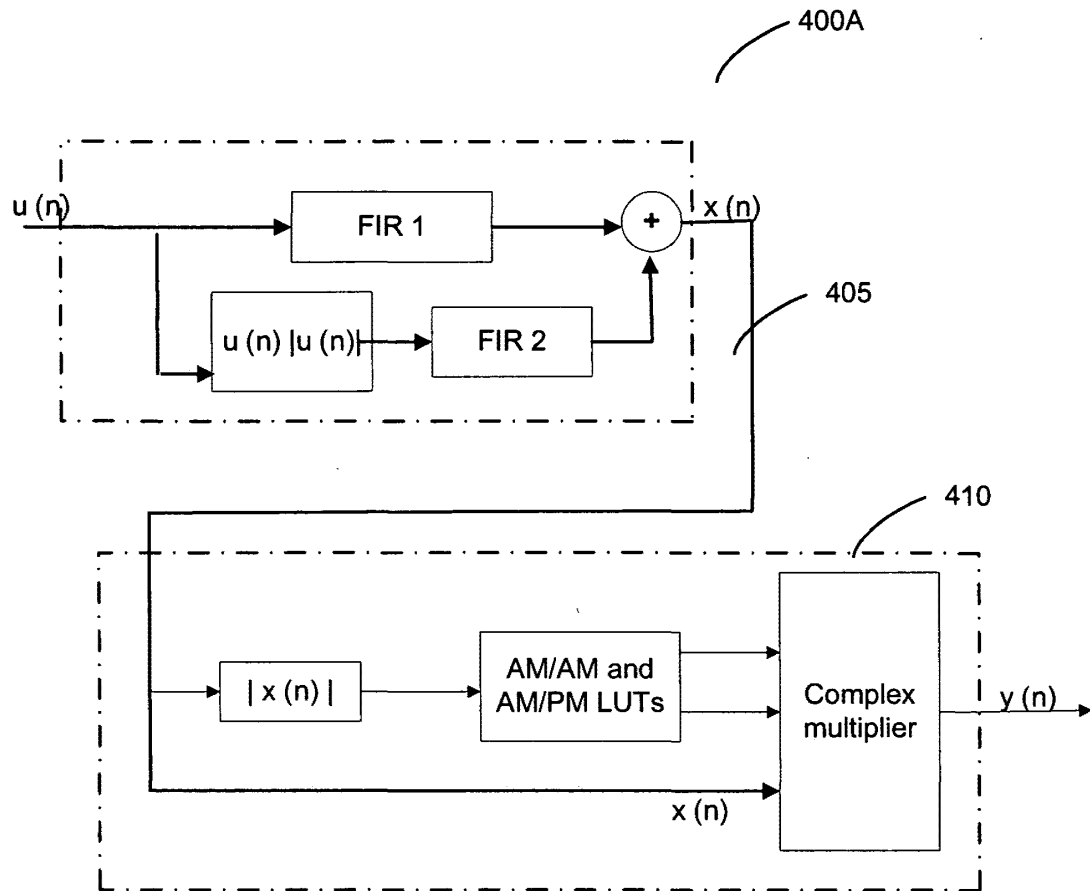


Fig. 4A

6 of 8

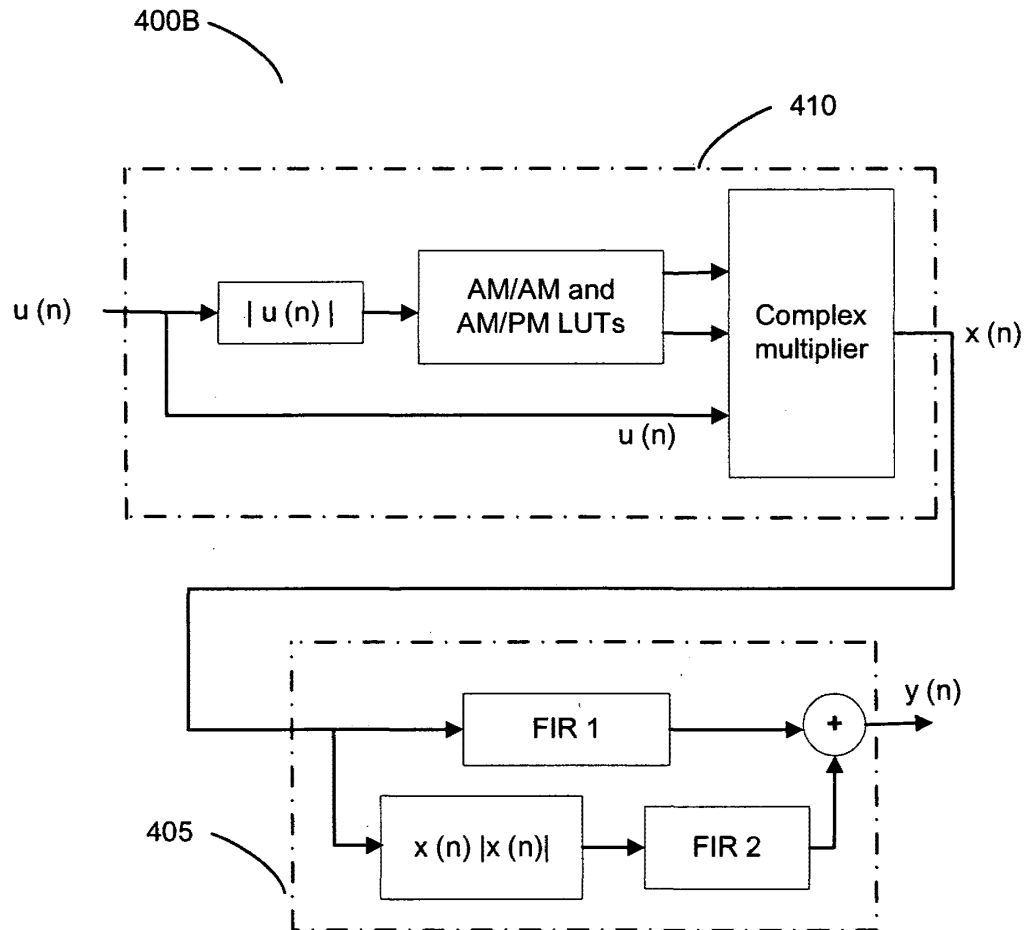


Fig. 4B

7 of 8

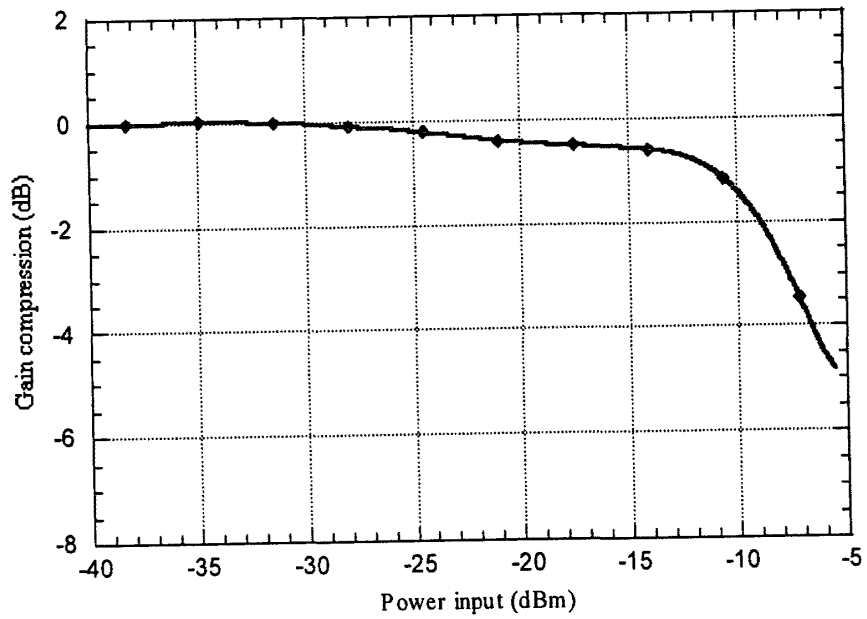


Fig. 5A

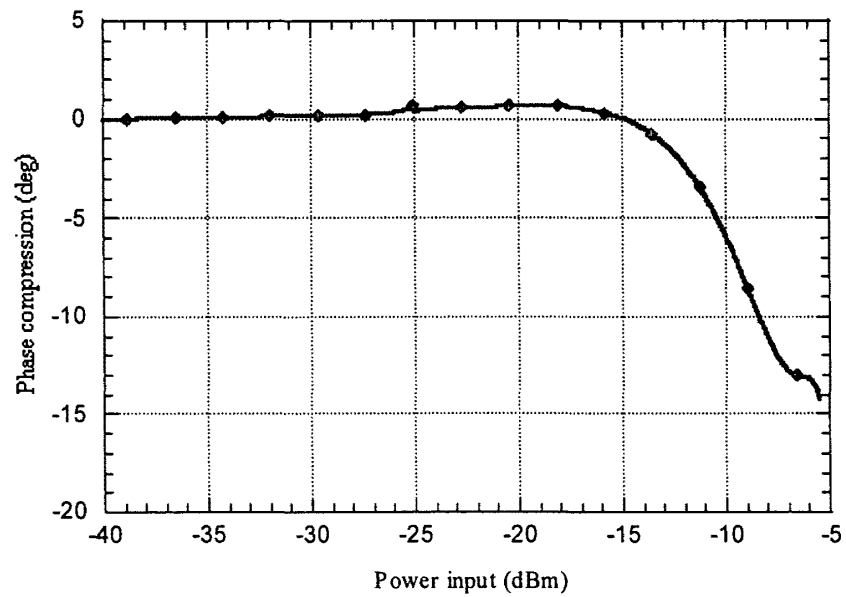


Fig. 5B

8 of 8

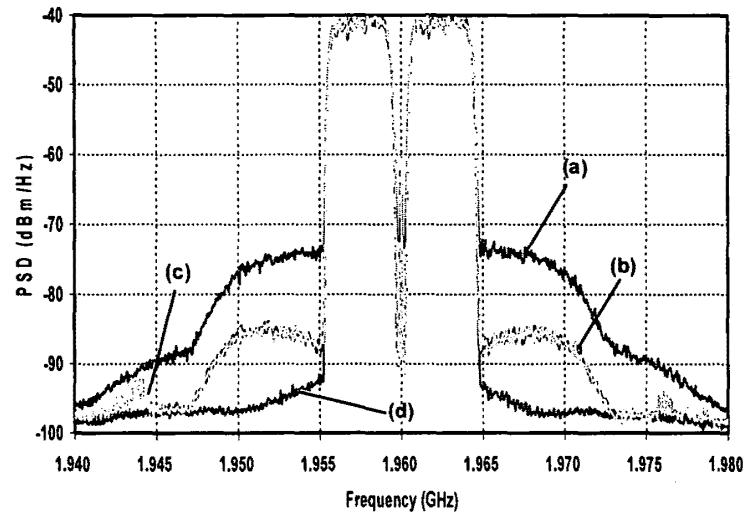


Fig. 6A

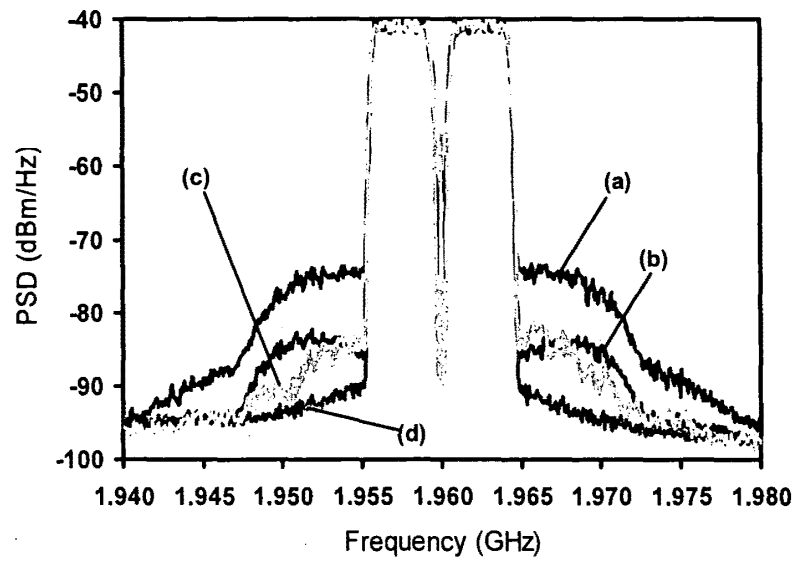


Fig. 6B

12/03/07

Approved for use through 7/31/2006. OMB 0651-0032

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

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PATENT APPLICATION FEE DETERMINATION RECORD				Application or Docket Number	
Substitute for Form PTO-875				11/999,264	
APPLICATION AS FILED – PART I					
(Column 1)		(Column 2)		SMALL ENTITY OR OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	RATE (\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	155	N/A
SEARCH FEE (37 CFR 1.16(k), (j), or (m))	N/A	N/A	N/A	255	N/A
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	105	N/A
TOTAL CLAIMS (37 CFR 1.16(i))	22	minus 20 = *	X 25=	50	X 50=
INDEPENDENT CLAIMS (37 CFR 1.16(h))	5	minus 3 = *	X 105=	210	X 210=
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR		N/A		N/A
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			TOTAL	775	TOTAL
* If the difference in column 1 is less than zero, enter "0" in column 2.					
APPLICATION AS AMENDED – PART II					
(Column 1)		(Column 2)		(Column 3)	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total (37 CFR 1.16(i))	Minus **	=		
	Independent (37 CFR 1.16(h))	Minus ***	=		
	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)	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total (37 CFR 1.16(i))	Minus **	=		
	Independent (37 CFR 1.16(h))	Minus ***	=		
	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)	
RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)	RATE (\$)	ADDITIONAL FEE (\$)
X =		X =		X =	
X =		X =		X =	
N/A		N/A		N/A	
TOTAL ADD'T FEE		TOTAL ADD'T FEE		TOTAL ADD'T FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.					

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

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
11/999,264	12/03/2007	2817	0.00	038231-021	22	5

CONFIRMATION NO. 8000

FILING RECEIPT



OC000000027573803

46188
THELEN REID BROWN RAYSMAN & STEINER LLP
P. O. BOX 640640
SAN JOSE, CA 95164-0640

Date Mailed: 01/09/2008

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

Applicant(s)

Taijun Liu, Calgary, CANADA;
Slim Boumaize, Calgary, CANADA;
Fadhel Ghannouchi, Calgary, CANADA;

Assignment For Published Patent Application

University Technologies International, Limited Partnership, Calgary, CANADA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 60/872,132 12/01/2006

Foreign Applications

If Required, Foreign Filing License Granted: 01/04/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 11/999,264**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

Nonlinear behavior models and methods for use thereof in wireless radio systems

Preliminary Class

330

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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page 2 of 3

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/999,264	12/03/2007	Taijun Liu	038231-021

CONFIRMATION NO. 8000

FORMALITIES LETTER



OC00000002/573804

46188
THELEN REID BROWN RAYSMAN & STEINER LLP
P. O. BOX 640640
SAN JOSE, CA 95164-0640

Date Mailed: 01/09/2008

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

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Items Required To Avoid Abandonment:

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

- The statutory basic filing fee is missing.

Applicant must submit \$155 to complete the basic filing fee for a small entity.

- The oath or declaration is missing.

A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of **\$260** as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of **\$65** for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **\$840** for a small entity

- **\$155** Statutory basic filing fee.
- **\$65** Surcharge.
- The application search fee has not been paid. Applicant must submit **\$255** to complete the search fee.

- The application examination fee has not been paid. Applicant must submit **\$105** to complete the examination fee for a small entity in compliance with 37 CFR 1.27.
- Total additional claim fee(s) for this application is **\$260**
 - **\$210** for **2** independent claims over 3.
 - **\$50** for **2** total claims over 20.

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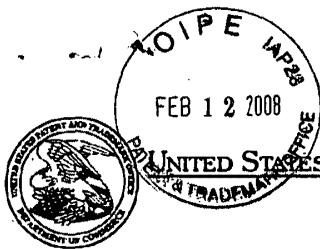
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/999,264	12/03/2007	Taijun Liu	038231-021

CONFIRMATION NO. 8000

FORMALITIES LETTER

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SAN JOSE, CA 95164-0640

02/13/2008 HDESTA1 00000012 501698 11999264

01 FC:2011 155.00 DA
02 FC:2051 65.00 DA
03 FC:2111 255.00 DA
04 FC:2311 105.00 DA
05 FC:2201 210.00 DA
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An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.

Applicant must submit \$155 to complete the basic filing fee for a small entity.

- The oath or declaration is missing.

A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of **\$260** as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of **\$65** for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **\$840** for a small entity

- **\$155** Statutory basic filing fee.
- **\$65** Surcharge.
- The application search fee has not been paid. Applicant must submit **\$255** to complete the search fee.

ACTION DUE:

Missing Parts Due

page **DUE/RMR DATE:**

3/9/08

DEADLINE DATE:

8/9/08

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- The application examination fee has not been paid. Applicant must submit **\$105** to complete the examination fee for a small entity in compliance with 37 CFR 1.27.
- Total additional claim fee(s) for this application is **\$260**
 - **\$210** for 2 independent claims over 3.
 - **\$50** for 2 total claims over 20.

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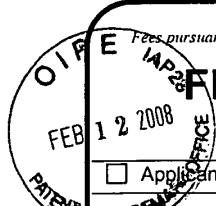
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Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL for FY 2008

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 840.00

Complete If Known

Application Number	11/999,264
Filing Date	December 3, 2007
First Named Inventor	Taijun Liu
Examiner Name	Not Yet Assigned
Art Unit	2817
Attorney Docket No.	038231-021

METHOD OF PAYMENT (check all that apply)

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee(\$)	Fee(\$)	Small Entity Fee(\$)	Fee(\$)	Small Entity Fee(\$)	
Utility	310	155	510	255	210	105	515
Design	210	105	100	50	130	65	_____
Plant	210	105	310	155	160	80	_____
Reissue	310	155	510	255	620	310	_____
Provisional	210	105	0	0	0	0	_____

2. EXCESS CLAIM FEES

Fee Description	Fee (\$)	Small Entity Fee (\$)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	210	105
Multiple dependent claims	370	185
Total Claims	Extra Claims	Fee(\$)
22	-20 or HP= 2	x 25 = 50
HP = highest number of total claims paid for, if greater than 20.		
Indep. Claims	Extra Claims	Fee(\$)
5	-3 or HP= 2	x 105 = 210
HP = highest number of independent claims paid for, if greater than 3.		

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$250 (\$125 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).

Total Sheets **Extra Sheets** **Number of each additional 50 or fraction thereof** **Fee (\$)** **Fee Paid (\$)**
 _____ - 100 = _____ / 50 = _____ (round up to a whole number) x _____ = _____

4. OTHER FEE(S)

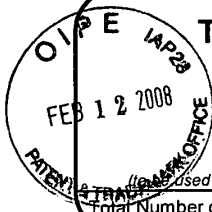
Non-English Specification, \$130 fee (no small entity discount) _____
 Other (e.g., late filing surcharge): Notification of Missing Requirements 65

SUBMITTED BY

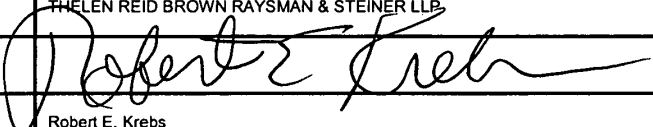
Signature		Registration No. (Attorney/Agent)	25,885	Telephone	408-292-5800
Name (Print/Type)	Robert E. Krebs	Date	Feb 2008		

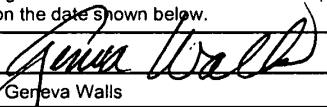
This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes 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, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing this form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

 TRANSMITTAL FORM (used for all correspondence after initial filing)	Application Number	11/999,264	
	Filing Date	December 3, 2007	
	First Named Inventor	Taijun Liu	
	Art Unit	2817	
	Examiner Name	Not Yet Assigned	
Total Number of Pages in This Submission	9	Attorney Docket Number	038231-021

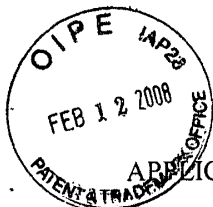
ENCLOSURES (check all that apply)		
☒ Fee Transmittal Form ☐ Fee Attached ☐ Amendment / Reply ☐ After Final ☐ Affidavits/declaration(s) ☐ Extension of Time Request ☐ Express Abandonment Request ☐ Information Disclosure Statement ☐ Certified Copy of Priority Document(s) ☒ Reply to Missing Parts/ Incomplete Application ☐ Reply to Missing Parts under 37 CFR1.52 or 1.53	☐ Drawing(s) ☐ Licensing-related Papers ☐ Petition ☐ Petition to Convert to a Provisional Application ☐ Power of Attorney, Revocation Change of Correspondence Address ☐ Terminal Disclaimer ☐ Request for Refund ☐ CD, Number of CD(s) ____ ☐ Landscape Table on CD	☐ After Allowance Communication to TC ☐ Appeal Communication to Board of Appeals and Interferences ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) ☐ Proprietary Information ☐ Status Letter ☒ Other Enclosure(s) (please identify below): Copy of Executed Declaration/POA & Petition; filing/Supplemental fees included; Copy of Notification of Missing Requirements; Postcard.
Remarks		

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT			
Firm Name	THELEN REID BROWN RAYSMAN & STEINER LLP		
Signature			
Printed Name	Robert E. Krebs		
Date	7 Feb. 2008	Reg. No.	25,885

CERTIFICATE OF TRANSMISSION/MAILING			
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.			
Signature			
Typed or printed name	Geneva Walls	Date	2-8-08

This collection of information is required by 37 CFR 1.5. 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 2 hours 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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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Taijun Liu et al. CONFIRMATION NO.: 8000
SERIAL NO.: 11/999,264
FILING DATE: December 3, 2007
TITLE: Nonlinear Behavior Models And Methods For Use Thereof In Wireless
Radio Systems
EXAMINER: Not Yet Assigned
ART UNIT: 2817

CERTIFICATE OF MAILING

I hereby certify that this paper is being deposited with the United States Postal Service as First Class
Mail in an envelope addressed to: Mail Stop Missing Parts Commissioner for Patents, P.O. Box
1450 Alexandria, VA 22313-1450, on the date printed below:

Date:

2-8-08

Signature:

Geneva Walls

Mail Stop: MISSING PARTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**RESPONSE TO THE NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL
APPLICATION**

Responsive to the Notice to File Missing Parts of Nonprovisional Application dated
January 9, 2008, please find the following:

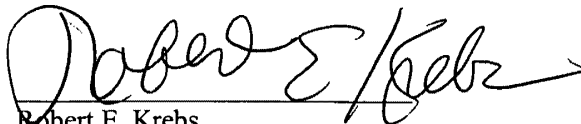
1. Declaration & Power of Attorney executed by the inventors.
2. The statutory basic filing fee for a small entity; including search fees; examination
fees and additional claim fees are included with this response.
3. Copy of the Notice to File Missing Parts of Nonprovisional Application.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account No. 50-1698.

Respectfully submitted,

THELEN REID BROWN
RAYSMAN & STEINER LLP

Dated: February 7, 2008


Robert E. Krebs
Reg. No. 25,885

THELEN REID BROWN
RAYSMAN & STEINER LLP
P.O. Box 640640
San Jose, CA 95164-0640
(408) 292-5800 direct dial
(408) 287-8040 direct fax



PTO/SB/01 (10-05)
 Approved for use through 07/31/2008. OMB 0651-0032
 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
 Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

DECLARATION — Utility or Design Patent Application

Direct all correspondence to:		☒ The address associated with Customer Number:	29858		OR	☐ Correspondence address below
Name						
Address						
City			State		ZIP	
Country		Telephone			Email	
WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. Was filed on December 3, 2007 as US Appln No.: 11/999,264 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 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.						
NAME OF SOLE OR FIRST INVENTOR:				☐ A petition has been filed for this unsigned inventor		
Given Name (first and middle (if any))				Family Name or Surname		
TAIJUN				LIU		
Inventor's Signature					Date	
<i>Taijun Liu</i>					Dec. 3, 2007	
Residence: City		State		Country		Citizenship
CALGARY, ALBERTA				CANADA		CANADIAN
Mailing Address						
29 SHERWOOD PARADE, NW						
City		State		Zip		Country
CALGARY, ALBERTA				T3R 1R1		CANADA
☐ Additional inventors or a legal representative are being named on the supplemental sheet(s) PTO/SB/02A or 02LR attached hereto.						

[Page 2 of 2]

PTO/SB/02A (09-04)

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

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DECLARATION	ADDITIONAL INVENTOR(S) Supplemental Sheet
Page <u>3</u> of <u>3</u>	

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
SLIM		BOUMAIZA	
Inventor's Signature		Date	
		Dec 31, 2007	
WATERLOO, ONTARIO Residence: City	State	CANADA Country	CANADIAN Citizenship
703 BEECHWOOD DRIVE Mailing Address			
WATERLOO, ONTARIO City	State	N2T 2M7 Zip	CANADA Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
FADHEL		GHANNOUCHI	
Inventor's Signature		Date	
CALGARY, ALBERTA Residence: City		State	CANADA Country
38 ROYAL OAK DR. NW Mailing Address			
CALGARY, ALBERTA City	State	T3G 5P2 Zip	CANADA Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Inventor's Signature		Date	
Residence: City		State	Country
Mailing Address		Citizenship	
City	State	Zip	Country

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 21 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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TOTAL P.02

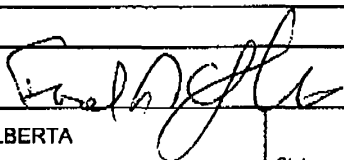
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DECLARATION	ADDITIONAL INVENTOR(S) Supplemental Sheet
Page <u>3</u> of <u>3</u>	

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
SLIM		BOUMAIZA	
Inventor's Signature		Date	
WATERLOO, ONTARIO Residence: City	State	CANADA Country	CANADIAN Citizenship
703 BEECHWOOD DRIVE Mailing Address			
WATERLOO, ONTARIO City	State	N2T 2M7 Zip	CANADA Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
FADHEL		GHANNOUCHI	
Inventor's Signature 		2007-11-3 Date	
CALGARY, ALBERTA Residence: City	State	CANADA Country	CANADIAN Citizenship
38 ROYAL OAK DR. NW Mailing Address			
CALGARY, ALBERTA City	State	T3G 5P2 Zip	CANADA Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address			
City	State	Zip	Country

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.83. 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 21 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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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
11/999,264	12/03/2007	2817	840	038231-021	22	5

CONFIRMATION NO. 8000

UPDATED FILING RECEIPT



OC000000028562938

46188
THELEN REID BROWN RAYSMAN & STEINER LLP
P. O. BOX 640640
SAN JOSE, CA 95164-0640

Date Mailed: 02/29/2008

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

Applicant(s)

Taijun Liu, Calgary, CANADA;
Slim Boumaiza, Waterloo, CANADA;
Fadhel Ghannouchi, Calgary, CANADA;

Assignment For Published Patent Application

University Technologies International, Limited Partnership, Calgary, CANADA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 60/872,132 12/01/2006

Foreign Applications

If Required, Foreign Filing License Granted: 01/04/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 11/999,264**

Projected Publication Date: 06/05/2008

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

Nonlinear behavior models and methods for use thereof in wireless radio systems

Preliminary Class

330

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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page 2 of 3

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APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/999,264	12/03/2007	Taijun Liu	038231-021

CONFIRMATION NO. 8000

46188
THELEN REID BROWN RAYSMAN & STEINER LLP
P. O. BOX 640640
SAN JOSE, CA 95164-0640

Title: Nonlinear behavior models and methods for use thereof in wireless radio systems

Publication No. US-2008-0133204-A1

Publication Date: 06/05/2008

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 publicly 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 Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, 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 <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Pre-Grant Publication Division, 703-605-4283

PLUS Search Results for S/N 11999264, Searched Wed Sep 22 08:28:08 EDT 2010
The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/999,264	12/03/2007	Taijun Liu	038231-021	8000
46188	7590	03/28/2011		
Nixon Peabody LLP P.O. Box 60610 Palo Alto, CA 94306			EXAMINER HOLMES, MICHAEL B	
			ART UNIT 2129	PAPER NUMBER
			MAIL DATE 03/28/2011	DELIVERY MODE PAPER

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

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

Office Action Summary	Application No.		Applicant(s)		
	11/999,264		LIU ET AL.		
	Examiner		Art Unit		
MICHAEL HOLMES		2129			

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1) ☒ Responsive to communication(s) filed on 12/03/2011.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-22 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☒ Claim(s) 7-22 is/are allowed.

6) ☐ Claim(s) 1-3 and 5 is/are rejected.

7) ☒ Claim(s) 4 and 6 is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on 12/03/2011 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 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)).

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

Attachment(s)

1) ☒ Notice of References Cited (PTO-892) 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.	4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____. 5) ☐ Notice of Informal Patent Application 6) ☐ Other: _____.
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UNITED STATES PATENT AND TRADEMARK OFFICE

P.O. Box 1450, Alexandria, Virginia 22313-1450 – www.USPTO.GOV

Examiner's Detailed Office Action

1. This Office Action is responsive to communication, filed 12/03/2007.

Information Disclosure Statement

2. Applicant is respectfully remind of the Duty to disclose 37 C.F.R. 1.56 all pertinent information and material pertaining to the patentability of applicant's claimed invention, by continuing to submitting in a timely manner PTO-1449, Information Disclosure Statement (IDS) with the filing of applicant's of application or thereafter.

Drawings

3. The formal drawings submitted have been reviewed by the Office of Initial Patent Examination (OIPE) and/or the USPTO Office of Draftperson's Patent Drawings Review.

Specification

4. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-3 & 5 is/are rejected under 35 U.S.C. 102(b) as being anticipated by Korenberg (USPAP Pub. No.: US 2003/0195706 A1).

Regarding claim 1.

Korenberg describes a behavioral model of a nonlinear dynamic system, [see Abstract, [0025], [0167] – [0169], [0298] – [0302] the model comprising: a first module characterizing dynamic nonlinear characteristics of the system, wherein the first module includes an input and an output; [see Abstract, [0025], [0167] – [0169], [0298] – [0302] and a second module characterizing static nonlinear characteristics of the nonlinear system, wherein the second module includes an input and an output; [see Abstract, [0025], [0167] – [0169], [0298] – [0302] wherein the first module is coupled to the second module; [see Abstract, [0025], [0167] – [0169], [0298] – [0302] wherein the first module is coupled to the second module such that an output of the first module is input to the second module; [see Abstract, [0025], [0167] – [0169], [0298] – [0302] wherein the second module is coupled to the first module such that an output of the second module is input to the first module; [see Abstract, [0025], [0167] – [0169], [0298] – [0302] wherein the first module is a dynamic weak nonlinear model and the second module is a static strong nonlinear model. [see Abstract, [0025], [0167] – [0169], [0298] – [0302]

Claim Objection(s)

7. Claims 4 & 6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Allowable Subject Matter

8. Claims 7-22 are allowed.

Claim Interpretation

9. The claims and only the claims form the metes and bounds of the invention. “Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. In re Morris, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Moreover, limitations appearing in the specification but not recited in the claim are not read into the claim. In re Prater, 415 F.2d, 1393, 1404-05, 162 USPQ 541,550-551 (CCPA 1969)” (MPEP p 2100-8, c 2,145-48; p 2100-9, c 1,1 1-4).
10. The Examiner has full latitude to interpret each claim in the broadest reasonable sense. The Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.
11. Examiner’s Notes are/if provided with the cited references to prior art to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such

comments are entirely consistent with the intent and spirit of compact prosecution. However, and unless otherwise stated, the citations are self-explanatory to one skilled in the art and do not need any further explanation. Moreover, the Examiner's Notes are not prior art but a link to prior art that one of ordinary skill in the art would find inherently or obviously appropriate.

12. Unless otherwise annotated, as aforementioned, Examiner's statements are to be interpreted in reference to that of one of ordinary skill in the art. Statements made in reference to the condition of the disclosure constitute, on the face of it, the basis and such would be obvious to one of ordinary skill in the art, establishing thereby an inherent or obviousness prima facie case or statement(s).

Correspondence Information

13. Any inquiries concerning this communication or earlier communications from the examiner should be directed to Michael B. Holmes, who may be reached Monday through Friday, between 8:00 a.m. and 5:00 p.m. EST. or via telephone at (571) 272-3686 or facsimile transmission (571) 273-3686 or email michael.holmesb@uspto.gov.

If you need to send an Official facsimile transmission, please send it to (571) 273-8300.

If attempts to reach the examiner are unsuccessful the Examiner's Supervisor (SPE), Jeffrey Gaffin, may be reached at (571) 272-4146.

Hand-delivered responses should be delivered to the Receptionist @ (Customer Service Window Randolph Building 401 Dulany Street Alexandria, VA 22313), located on the first floor of the south side of the Randolph Building.

Finally, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Moreover, status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have any questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) toll-free @ 1-866-217-9197.

Michael B. Holmes
Primary Examiner
Artificial Intelligence
Art Unit 2129
United States Department of Commerce
Patent & Trademark Office

Friday, March 25, 2011
MBH

/Michael B. Holmes/
Primary Examiner, Art Unit 2129

Notice of References Cited	Application/Control No. 11/999,264		Applicant(s)/Patent Under Reexamination LIU ET AL.	
	Examiner MICHAEL HOLMES		Art Unit 2129	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0195706 A1	10-2003	Korenberg, Michael	702/19
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	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	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 8000

SERIAL NUMBER 11/999,264	FILING or 371(c) DATE 12/03/2007	CLASS 706	GROUP ART UNIT 2129	ATTORNEY DOCKET NO. 038231-021	
APPLICANTS Taijun Liu, Calgary, CANADA; Slim Boumaiza, Waterloo, CANADA; Fadhel Ghannouchi, Calgary, CANADA; ** CONTINUING DATA ***** This appln claims benefit of 60/872,132 12/01/2006 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED *** SMALL ENTITY ** 01/04/2008					
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /MICHAEL B HOLMES/ Acknowledged Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY CANADA	SHEETS DRAWINGS 8	TOTAL CLAIMS 22	INDEPENDENT CLAIMS 5
ADDRESS Nixon Peabody LLP P.O. Box 60610 Palo Alto, CA 94306 UNITED STATES					
TITLE Nonlinear behavior models and methods for use thereof in wireless radio systems					
FILING FEE RECEIVED 840	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

<i>Index of Claims</i> 	Application/Control No. 11999264	Applicant(s)/Patent Under Reexamination LIU ET AL.
	Examiner MICHAEL HOLMES	Art Unit 2129

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

☐ Claims renumbered in the same order as presented by applicant			☐ CPA			☐ T.D.			☐ R.1.47		
CLAIM			DATE								
Final	Original	03/25/2011									
	1	✓									
	2	✓									
	3	✓									
	4	O									
	5	✓									
	6	O									
	7	=									
	8	=									
	9	=									
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	16	=									
	17	=									
	18	=									
	19	=									
	20	=									
	21	=									
	22	=									

Search Notes 	Application/Control No. 11999264	Applicant(s)/Patent Under Reexamination LIU ET AL.
	Examiner MICHAEL HOLMES	Art Unit 2129

SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
WEST/global database search all patent databases all classes & subclasses	03/25/2011	MBH

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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Refine Search

Search Results

Terms	Documents
dynamic adj nonlinear with static adj nonlinear and (@ad<"20071203" or @rlad<"20071203" or @prad<"20071203")	15

Database:

US Pre-Grant Publication Full-Text Database
 US Patents Full-Text Database
 US Patents OCR Backfile
 EPO Abstracts Database
 JPO Abstracts Database
 Derwent World Patents Index
 IBM Technical Disclosure Bulletin Database

Search Type: ☒ Prior Art ☐ Interference

Search:

L7

Refine Search

Recall Text

Clear

Interrupt

Search History

DATE: Friday, March 25, 2011 [Purge Queries](#) [Printable Copy](#) [Create Case](#)

<u>Set Name</u> Side by Side	<u>Query</u>	<u>Hit Count</u>	<u>Set Name</u> Result Set	<u>Set Name</u> Grid
<i>Prior Art Searches</i>				
<i>DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR</i>				
L7	dynamic adj nonlinear with static adj nonlinear and (@ad<"20071203" or @rlad<"20071203" or @prad<"20071203")	15	L7	L7
L6	dynamic adj nonlinear with static adj nonlinear	16	L6	L6
L5	dynamic adj nonlinear same static adj nonlinear	18	L5	L5
L4	dynamic adj nonlinear and static adj nonlinear	21	L4	L4
L3	behavioral adj model and nonlinear adj dynamic adj system	6	L3	L3
L2	behavioral adj model same nonlinear adj dynamic adj system	1	L2	L2

L1 behavioral adj model with nonlinear adj dynamic adj system 1 L1 L1

END OF SEARCH HISTORY

Form PTO-1449 (modified)		Atty. Docket No.: UNTI:057US	Serial No.: 11/999,264
List of Patents and Publications for Applicant's INFORMATION DISCLOSURE STATEMENT (Use several sheets if necessary)		Applicant: Taijun LIU <i>et al.</i>	
		Filing Date: December 3, 2007	Group: 2129
U.S. Patent Documents <i>See Page 1</i>	Foreign Patent Documents <i>None</i>	Other Art <i>See Page 1</i>	

U.S. Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
	A1	2003/0058959	03/27/03	Rafie <i>et al.</i>	375	296	09/25/01
	A2	2005/0157814	07/21/05	Cova <i>et al.</i>	375	297	01/14/05
	A3	2005/0195919	09/08/05	Cova	375	297	02/22/05
	A4	6,801,086	10/05/04	Chandrasekaran	330	140	09/17/02

Foreign Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Country	Language

Other Art (Including Author, Title, Date Pertinent Pages, Etc.)

Exam. Init.	Ref. Des.	Citation
	C1	International Search Report issued in PCT/CA2007/002187 dated March 19, 2008.

76986723.1

EXAMINER:

DATE CONSIDERED:

EXAMINER: INITIAL IF REFERENCE CONSIDERED, WHETHER OR NOT CITATION IS IN CONFORMANCE WITH MPEP609; DRAW LINE THROUGH CITATION IF NOT IN CONFORMANCE AND NOT CONSIDERED. INCLUDE COPY OF THIS FORM WITH NEXT COMMUNICATION TO APPLICANT.

INFORMATION DISCLOSURE STATEMENT — PTO-1449 (MODIFIED)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2007/002187

A. CLASSIFICATION OF SUBJECT MATTER IPC: H04B 7/00 (2006.01) , H04B 15/00 (2006.01) , H04B 17/00 (2006.01) According to International Patent Classification (IPC) or to both national classification and IPC																	
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC: H04B 7/00 (2006.01) , H04B 15/00 (2006.01) , H04B 17/00 (2006.01) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used) West, Qweb, IEEEExplore, Canadian Patents Database Keywords: static, dynamic, pre-distortion, AM/AM, AM/PM, FIR, finite impulse response, nonlinear																	
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US20050157814 (Cova et al.) 21 July 2005 (21-07-2005) * paragraphs 0006, 0008, 0009, Abstract, Figure 1B *</td> <td>7-22</td> </tr> <tr> <td>X</td> <td>US20050195919 (Cova) 08 September 2005 (08-09-2005) * paragraphs 0006, 0008, 0009, Abstract, Figure 1B *</td> <td>7-22</td> </tr> <tr> <td>A</td> <td>US6801086 (Chandrasekaran) 05 October 2004 (05-10-2004) * whole document *</td> <td>7-22</td> </tr> <tr> <td>A</td> <td>US20030058959 (Rafie et al.) 27 March 2003 (27-03-2003) * whole document *</td> <td>7-22</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US20050157814 (Cova et al.) 21 July 2005 (21-07-2005) * paragraphs 0006, 0008, 0009, Abstract, Figure 1B *	7-22	X	US20050195919 (Cova) 08 September 2005 (08-09-2005) * paragraphs 0006, 0008, 0009, Abstract, Figure 1B *	7-22	A	US6801086 (Chandrasekaran) 05 October 2004 (05-10-2004) * whole document *	7-22	A	US20030058959 (Rafie et al.) 27 March 2003 (27-03-2003) * whole document *	7-22
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.															
X	US20050157814 (Cova et al.) 21 July 2005 (21-07-2005) * paragraphs 0006, 0008, 0009, Abstract, Figure 1B *	7-22															
X	US20050195919 (Cova) 08 September 2005 (08-09-2005) * paragraphs 0006, 0008, 0009, Abstract, Figure 1B *	7-22															
A	US6801086 (Chandrasekaran) 05 October 2004 (05-10-2004) * whole document *	7-22															
A	US20030058959 (Rafie et al.) 27 March 2003 (27-03-2003) * whole document *	7-22															
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.																	
<table border="0"> <tr> <td>* Special categories of cited documents :</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"&" document member of the same patent family</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td></td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			* Special categories of cited documents :	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	"O" document referring to an oral disclosure, use, exhibition or other means		"P" document published prior to the international filing date but later than the priority date claimed				
* Special categories of cited documents :	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention																
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone																
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art																
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family																
"O" document referring to an oral disclosure, use, exhibition or other means																	
"P" document published prior to the international filing date but later than the priority date claimed																	
Date of the actual completion of the international search 11 February 2008 (11-02-2008)		Date of mailing of the international search report 19 March 2008 (19-03-2008)															
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476		Authorized officer Mark J. Stephens 819- 934-3472															

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/CA2007/002187**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of the first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons :

1. ☒ Claim Nos. : 1-6
because they relate to subject matter not required to be searched by this Authority, namely :

A behavioural model is considered to be the mere presentation or storage of information as it currently relates to the characteristics of a transmitter amplifier.
2. ☐ Claim Nos. :
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically :
3. ☐ Claim Nos. :
because they are dependant claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows :

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claim Nos. :
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim Nos. :

- Remark on Protest** ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2007/002187

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US 2005157814A1	21-07-2005	CN 101040502A	19-09-2007
		EP 1738511A2	03-01-2007
		KR 20060109997A	23-10-2006
		WO 2005069897A2	04-08-2005
		WO 2005069897A3	18-01-2007
US 2005195919A1	08-09-2005	CA 2557334A1	06-10-2005
		EP 1749359A2	07-02-2007
		KR 20060116252A	14-11-2006
		WO 2005091865A2	06-10-2005
		WO 2005091865A3	14-06-2007
US 6801086B1	05-10-2004	AU 2003223229A1	20-10-2003
		CN 1643783A	20-07-2005
		DE 10392496T5	24-02-2005
		GB 0420816D0	20-10-2004
		GB 2402566A	08-12-2004
		GB 2402566B	07-06-2006
		WO 03085822A1	16-10-2003
US 2003058959A1	27-03-2003	None	

Electronic Patent Application Fee Transmittal				
Application Number:		11999264		
Filing Date:		03-Dec-2007		
Title of Invention:		Nonlinear behavior models and methods for use thereof in wireless radio systems		
First Named Inventor/Applicant Name:		Taijun Liu		
Filer:		Steven Scott Gordon/Tressie Bates		
Attorney Docket Number:		038231-021		
Filed as Large Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
Total in USD (\$)				180

Electronic Acknowledgement Receipt	
EFS ID:	10188844
Application Number:	11999264
International Application Number:	
Confirmation Number:	8000
Title of Invention:	Nonlinear behavior models and methods for use thereof in wireless radio systems
First Named Inventor/Applicant Name:	Taijun Liu
Customer Number:	46188
Filer:	Steven Scott Gordon/Tressie Bates
Filer Authorized By:	Steven Scott Gordon
Attorney Docket Number:	038231-021
Receipt Date:	27-MAY-2011
Filing Date:	03-DEC-2007
Time Stamp:	18:16:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$ 180
RAM confirmation Number	4519
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1		UNTI057US-IDS.pdf	1077123 55f0fbb2407d9cbeb097dc9dcefdcdf72ef9b25	yes	3
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Filed (SB/08)		3	3	
Warnings:					
Information:					
2	NPL Documents	UNTI057US-C1.pdf	121004 332fe47820f89fe5f5c50dc12da93f73f245aa8e	no	3
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	29911 9a1065cef5e324e519d632158ce66227cb2a92bc	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			1228038		
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Taijun LIU et al.

Serial No.: 11/999,264

Filed: December 3, 2007

For: NONLINEAR BEHAVIOR MODELS
AND METHODS FOR USE THEREOF IN
WIRELESS RADIO SYSTEMS

Group Art Unit: 2129

Examiner: HOLMES, MICHAEL B

Atty. Dkt. No.: UNTI:057US

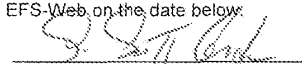
Confirmation No.: 8000

CERTIFICATE OF ELECTRONIC TRANSMISSION

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electronically filed with the United States Patent and
Trademark Office via EFS-Web on the date below:

May 27, 2011

Date


S. Scott Gordon

INFORMATION DISCLOSURE STATEMENT

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

Sir:

In compliance with the duty of disclosure under 37 C.F.R. § 1.56, it is respectfully requested that this Information Disclosure Statement be entered and the documents listed on attached Form PTO-1449 be considered by the Examiner and made of record. Copies of the listed documents required by 37 C.F.R. § 1.98(a)(2) are enclosed for the convenience of the Examiner.

In accordance with 37 C.F.R. §§ 1.97(g), (h), this Information Disclosure Statement is not to be construed as a representation that a search has been made, and is not to be construed to be

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an admission that the information cited is, or is considered to be, material to patentability as defined in 37 C.F.R. § 1.56(b).

A fee as set forth in 37 C.F.R. § 1.17(p) in the amount of \$180.00 is enclosed. If an appropriate payment has not been enclosed, or if it is insufficient, the Commissioner is authorized to deduct the appropriate fee from Fulbright & Jaworski Account No.: 50-1212/UNTI:057US.

Applicant respectfully requests that the listed documents be made of record in the present case.

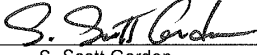
Respectfully submitted,



S. Scott Gordon
Reg. No. 57,294
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FULBRIGHT & JAWORSKI L.L.P.
600 Congress Avenue, Suite 2400
Austin, Texas 78701
(512) 474-5201

Date: May 27, 2011

CERTIFICATE OF ELECTRONIC TRANSMISSION 37 C.F.R. § 1.8	
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June 28, 2011 Date	 S. Scott Gordon

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Taijun LIU et al.

Serial No.: 11/999,264

Filed: 12/03/2007

For: NONLINEAR BEHAVIOR MODELS AND
METHODS FOR USE THEREOF IN
WIRELESS RADIO SYSTEMS

Confirmation No.: 8000

Examiner: Holmes, Michael B.

Group Art Unit: 2129

Atty. Dkt. No.: UNTI:057US/10902745

RESPONSE TO OFFICE ACTION DATED MARCH 28, 2011

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

Commissioner:

Applicant submits this paper in response to the Office Action dated March 28, 2011 (the "Action"), for which the three month date to respond is June 28, 2011. It is believed that no fees under 37 C.F.R. §§ 1.16 to 1.21 are occasioned by the filing of this paper; however, should the Commissioner determine otherwise, the Commissioner is hereby authorized to deduct said fees from Fulbright & Jaworski Deposit Account No. 50-1212/UNTI:057US/10902745.

Applicants respectfully request reconsideration of the present application in view of the following amendments and remarks.

A Listing of the Claims begins on page 3 of this paper.

Remarks begin on page 6 of this paper.

86064153.1

Listing of Claims

The following listing of claims replaces all prior versions and listings in the application:

1. (Original) A behavioral model of a nonlinear dynamic system, the model comprising:
a first module characterizing dynamic nonlinear characteristics of the system, wherein the
first module includes an input and an output; and
a second module characterizing static nonlinear characteristics of the nonlinear system,
wherein the second module includes an input and an output;
wherein the first module is coupled to the second module.
2. (Original) The model of claim 1, wherein the first module is coupled to the second
module such that an output of the first module is input to the second module.
3. (Original) The method of claim 1, wherein the second module is coupled to the first
module such that an output of the second module is input to the first module.
4. (Original) The model of claim 1 wherein the first module comprises a nonlinear finite
impulse response-based memory effect system and the second module comprises a look-up table-
based nonlinear memoryless system.
5. (Original) The model of claim 1 wherein the first module is a dynamic weak nonlinear
model and the second module is a static strong nonlinear model.
6. (Original) The model of claim 1 wherein the first module comprises a finite impulse
response filter-based multi-branch nonlinear system and the second module comprises two look-
up tables, each look-up table dependent on the magnitude of the input signal.
7. (Original) A predistorter for nonlinear wireless system, the predistorter comprising:
a dynamic nonlinear predistorter module; and
a static nonlinear predistorter module coupled to the dynamic nonlinear predistorter
module such that an output of the dynamic nonlinear predistorter module is input

to the static nonlinear predistorter module.

8. (Original) The predistorter of claim 7 wherein the dynamic nonlinear predistorter is a finite impulse response-based memory effect predistorter and the static nonlinear predistorter is a look-up table-based memoryless predistorter.
9. (Original) The predistorter of claim 7 wherein the dynamic nonlinear predistorter is a dynamic weak nonlinear predistorter and the static nonlinear predistorter is a static strong nonlinear predistorter.
10. (Original) The predistorter of claim 9 wherein the dynamic weak nonlinear predistorter is implemented as a finite impulse response filter-based multi-branch nonlinear structure embedded within a polynomial like series and the static strong nonlinear predistorter includes two look-up tables, each look-up table depends on the magnitude of a current input signal.
11. (Original) A predistorter for nonlinear wireless system, the predistorter comprising:
a static nonlinear predistorter module; and
dynamic nonlinear predistorter module coupled to the static nonlinear predistorter module
such that an output of the static nonlinear predistorter module is input to the
dynamic nonlinear predistorter module.
12. (Original) The predistorter of claim 11 wherein the dynamic nonlinear predistorter module is a finite impulse response-based memory effect predistorter module and the static nonlinear predistorter is a look-up table-based memoryless predistorter module.
13. (Original) The predistorter of claim 11 wherein the dynamic nonlinear predistorter module is a dynamic weak nonlinear predistorter module and the static nonlinear predistorter is a static strong nonlinear predistorter module.
14. (Original) The predistorter of claim 12 wherein the dynamic weak nonlinear predistorter is implemented as a finite impulse response filter-based multi-branch nonlinear structure and the

static strong nonlinear predistorter includes two look-up tables, each look-up table depends on the magnitude of a current input signal.

15. (Original) An augmented Wiener predistorter, the predistorter comprising:
a dynamic nonlinear first order predistorter module; and
a static nonlinear predistorter module coupled to the dynamic nonlinear predistorter module such that an output of the dynamic nonlinear predistorter module is input to the static nonlinear predistorter module.
16. (Original) The predistorter of claim 15 wherein the dynamic nonlinear predistorter is a finite impulse response-based memory effect predistorter and the static nonlinear predistorter is a look-up table-based memoryless predistorter.
17. (Original) The predistorter of claim 15 wherein the dynamic nonlinear predistorter is a dynamic weak nonlinear predistorter and the static nonlinear predistorter is a static strong nonlinear predistorter.
18. (Original) The predistorter of claim 17 wherein the dynamic weak nonlinear predistorter is implemented as a finite impulse response filter-based multi-branch nonlinear structure and the static strong nonlinear predistorter includes two look-up tables, each look-up table depends on the magnitude of a current input signal.
19. (Original) An augmented Hammerstein predistorter, the predistorter comprising:
a static nonlinear predistorter module; and
a dynamic nonlinear first order predistorter module coupled to the static nonlinear predistorter module such that an output of the static nonlinear predistorter module is input to the dynamic nonlinear predistorter module.
20. (Original) The predistorter of claim 19 wherein the dynamic nonlinear predistorter module is a finite impulse response-based memory effect predistorter module and the static nonlinear predistorter is a look-up table-based memoryless predistorter module.

21. (Original) The predistorter of claim 19 wherein the dynamic nonlinear predistorter module is a dynamic weak nonlinear predistorter module and the static nonlinear predistorter is a static strong nonlinear predistorter module.

22. (Original) The predistorter of claim 21 wherein the dynamic weak nonlinear predistorter is implemented as a finite impulse response filter-based multi-branch nonlinear structure and the static strong nonlinear predistorter includes two look-up tables, each look-up table depends on the magnitude of a current input signal.

Remarks

A. Status of Application

Claims 1-22 were pending at the time of the Action. No claim has been amended. No new matter has been added. Claims 1-22 will be pending upon entry of this paper.

Claims 1-3 and 5 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent Publication No. 2003/0195706 to Korenberg (hereinafter "Korenberg"). Claims 7-22 were indicated as allowed, and claims 4 and 6 were objected to as being dependent on a rejected base claim.

B. Information Disclosure Statement

Applicants appreciate the Examiner's reminder regarding the Information Disclosure Statement. Applicants would note that an Information Disclosure Statement was filed on May 27, 2011.

C. Allowable Subject Matter

Applicants thank the Examiner for the indication that claims 7-22 are allowed. Applicants thank the Examiner for the review of these claims and appreciate the indication of allowance. The Applicants agree with the Examiner that at least claims 7-22 are patentable over the cited reference.

D. Claim Rejections Under 35 U.S.C. §102 are Overcome

Claims 1-3 and 5 were rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Korenberg. Applicants respectfully traverse this rejection.

Applicants respectfully disagree with characterizations of claims 1-3 and 5 and of the reference as found in the Office Action mailed March 28, 2011. Specifically, Applicants assert that Korenberg fails to disclose every limitation of Claim 1.

1. Korenberg Fails to Anticipate Claim 1

“Anticipation under 35 U.S.C. §102 requires the disclosure in a single piece of prior art of each and every limitation of a claimed invention.” *Apple Computer, Inc. v. Articulate Systems, Inc.* 234 F.3d 14, 20, 57 USPQ2d 1057, 1061 (Fed. Cir. 2000). An anticipation under section 102 is proper only if the reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

As a preliminary note, Korenberg is directed to an entirely different field of art. Specifically, Korenberg deals with linear and nonlinear models to embody biological data, however the present application concerns a model to describe an actual hardware ‘Wireless transmitter.’ Korenberg appears to limit the application of his patent to genetic data classification and biological information (bioinformatics). This reference does not appear to anticipate use or adaptation of any such method for dynamic nonlinear wireless systems.

The cited portions of Korenberg appear to disclose a nonlinear dynamic system to approximate the input/output relation for classification of genetic data, wherein the system is a “parallel cascade model” which “comprises a sum of cascades of *dynamic linear* and static nonlinear elements” and “each cascade comprises a *dynamic linear* elements followed by a static nonlinearity” (see Abstract, [0025], [0167]-[169], [0298]-[0302]) (emphasis added).

By contrast, Korenberg does not appear to disclose any system or method having “a first module characterizing *dynamic nonlinear* characteristics of the system” and “a second module characterizing *static nonlinear* characteristics of the nonlinear system; wherein the first module is coupled to the second module.” See claim 1 (emphasis added).

In light of these deficiencies, Applicants assert that the rejection under 35 U.S.C. § 102(b) over Korenberg is overcome, because Korenberg fails to disclose each and every limitation of claim 1.

Applicants respectfully assert that independent claims 7, 11, 15, and 19 are also patentable over Korenberg for at least the same reasons as independent claim 1. Applicants further assert that dependent claims 2-6, 8-10, 12-14, 16-18, and 20-22 are also allowable because of their dependence on allowable independent claims 1, 7, 11, 15, and 19 respectively. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

2. Korenberg Fails to Anticipate Claim 2

Korenberg discloses “For generality of approximation, it suffices if each cascade comprises a dynamic linear element followed by a static nonlinearity.” (Korenberg at [0025]). Additionally, Korenberg discloses “...a sum of cascades of alternating dynamic **linear** (L) and static **nonlinear** (N) elements.” (Korenberg at [0168]; *see also* [0302]).

By contrast, Korenberg does not appear to disclose a nonlinear dynamic system having “a first module characterizing **dynamic nonlinear** characteristics of the system and “a second module characterizing **static nonlinear** characteristics of the nonlinear system; wherein the first module is coupled to the second module” and “wherein the first module is coupled to the second module such that an output of the first module is input to the second module.” Therefore, Applicants assert that at least claim 2 is patentable over Korenberg.

3. Korenberg Fails to Anticipate Claim 3

Korenberg discloses “For generality of approximation, it suffices if each cascade comprises a dynamic linear element followed by a static nonlinearity.” (Korenberg at [0025]). Additionally, Korenberg discloses “...a sum of cascades of alternating dynamic **linear** (L) and static **nonlinear** (N) elements.” (Korenberg at [0168]; *see also* [0302]).

By contrast, Korenberg does not appear to disclose a nonlinear dynamic system having “a first module characterizing **dynamic nonlinear** characteristics of the system and “a second module characterizing **static nonlinear** characteristics of the nonlinear system; wherein the first module is coupled to the second module” and “wherein the second module is coupled to the first module such that an output of the second module is input to the first module.” Therefore, Applicants assert that at least claim 3 is patentable over Korenberg.

4. Korenberg Fails to Anticipate Claim 5

Korenberg discloses “For generality of approximation, it suffices if each cascade comprises a dynamic linear element followed by a static nonlinearity.” (Korenberg at [0025]). Additionally, Korenberg discloses “...a sum of cascades of alternating dynamic **linear** (L) and static **nonlinear** (N) elements.” (Korenberg at [0168]; *see also* [0302]).

By contrast, Korenberg does not appear to disclose a nonlinear dynamic system, “wherein the first module is a dynamic weak nonlinear model and the second module is a static strong nonlinear model.” Indeed, Korenberg does not appear to make any mention of a “dynamic **weak** nonlinear model” or a “static **strong** nonlinear model.” Therefore, Applicants assert that at least claim 5 is patentable over Korenberg.

Conclusion

In light of the presented remarks, Applicants assert that claims 1-22 are patentable and in condition for prompt allowance. Should additional information be required, the Examiner is respectfully asked to notify Applicants of such need. If any impediments to the prompt allowance of the claims can be resolved by a telephone interview, the Examiner is respectfully requested to contact the undersigned.

Respectfully submitted,



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Attorney for Applicant

FULBRIGHT & JAWORSKI L.L.P.
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Date: June 28, 2011

Electronic Acknowledgement Receipt	
EFS ID:	10407685
Application Number:	11999264
International Application Number:	
Confirmation Number:	8000
Title of Invention:	Nonlinear behavior models and methods for use thereof in wireless radio systems
First Named Inventor/Applicant Name:	Taijun Liu
Customer Number:	46188
Filer:	Steven Scott Gordon/Melissa Centeno
Filer Authorized By:	Steven Scott Gordon
Attorney Docket Number:	038231-021
Receipt Date:	28-JUN-2011
Filing Date:	03-DEC-2007
Time Stamp:	17:26:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		UNT1057US_OARESP.pdf	118130 791abb5c1b7ea2a6df8342e5395d526bf96a8292a	yes	9

Multipart Description/PDF files in .zip description			
	Document Description	Start	End
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	9
Warnings:			
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 11/999,264		Filing Date 12/03/2007		☐ To be Mailed	
APPLICATION AS FILED – PART I										
(Column 1)			(Column 2)			SMALL ENTITY ☒ OR		OTHER THAN SMALL ENTITY		
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)		RATE (\$)	FEE (\$)			
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A				
☐ SEARCH FEE (37 CFR 1.16(k), (j), or (m))	N/A	N/A	N/A			N/A				
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A				
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$	=		X \$	=			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$	=		X \$	=			
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 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		TOTAL			
APPLICATION AS AMENDED – PART II										
(Column 1)			(Column 2)			SMALL ENTITY OR		OTHER THAN SMALL ENTITY		
AMENDMENT	06/28/2011	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 22	Minus	** 22	= 0	X \$26 =	0		X \$ =	
	Independent (37 CFR 1.16(h))	* 5	Minus	***5	= 0	X \$110 =	0		X \$ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
					TOTAL ADD'L FEE	0		TOTAL ADD'L FEE		
(Column 1)			(Column 2)			SMALL ENTITY OR		OTHER THAN SMALL ENTITY		
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =			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))									
					TOTAL ADD'L FEE			TOTAL ADD'L FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.										

Legal Instrument Examiner:
/FELICIA R. FARMER/

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46188 7590 08/12/2011
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

EXAMINER

HOLMES, MICHAEL B

ART UNIT

PAPER NUMBER

2129

DATE MAILED: 08/12/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/999,264	12/03/2007	Taijun Liu	038231-021	8000

TITLE OF INVENTION: NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	11/14/2011

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.

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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: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

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46188 7590 08/12/2011
Nixon Peabody LLP
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Palo Alto, CA 94306

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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 facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/999,264	12/03/2007	Taijun Liu	038231-021	8000

TITLE OF INVENTION: NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	11/14/2011

EXAMINER	ART UNIT	CLASS-SUBCLASS
HOLMES, MICHAEL B	2129	706-046000

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/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form 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, 1 _____
- (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. 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 has been filed for recordation as set forth in 37 CFR 3.11. 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. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

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

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

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

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information 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 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, 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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/999,264	12/03/2007	Taijun Liu	038231-021	8000
46188	7590	08/12/2011	EXAMINER	
Nixon Peabody LLP P.O. Box 60610 Palo Alto, CA 94306			HOLMES, MICHAEL B	
			ART UNIT	PAPER NUMBER
			2129	

DATE MAILED: 08/12/2011

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

The Patent Term Adjustment to date is 783 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 783 day(s).

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 Application Information Retrieval (PAIR) WEB site (<http://pair.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 Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

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

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

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

Notice of Allowability	Application No.	Applicant(s)
	11/999,264	LIU ET AL.
	Examiner	Art Unit
	MICHAEL B. HOLMES	2129

-- 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 06/28/2011.

2. ☒ The allowed claim(s) is/are 1-22.

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

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 (b) ☐ 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)	5. ☐ Notice of Informal Patent Application
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)	6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>05/27/2011</u>	7. ☐ Examiner's Amendment/Comment
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material	8. ☒ Examiner's Statement of Reasons for Allowance
	9. ☐ Other _____.



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Examiner's Detailed Office Action

1. Claims 1-22 are allowed.

REASONS FOR ALLOWANCE

2. The following is an Examiner's statement for reasons for allowance:
3. Claims 1-22 are considered allowable since when reading the claims in light of the specification, as per, MPEP §2111.01 or *Toro Co. v. White Consolidated Industries Inc.*, 199 F.3d 1295, 1301, 53 USPQ2d 1065, 1069 (Fed. Cir. 1999), none of the references of record alone or in combination disclose or suggest the combination of limitations specified in the independent claim(s).
4. The limitations recited in independent claim 1 "A behavioral model of a nonlinear dynamic system, the model comprising: a first module characterizing dynamic nonlinear characteristics of the system, wherein the first module includes an input and an output; and a second module characterizing static nonlinear characteristics of the nonlinear system, wherein the second module includes an input and an output; wherein the first module is coupled to the second module."

5. The limitations recited in independent claim 7 “A predistorter for nonlinear wireless system, the predistorter comprising: a dynamic nonlinear predistorter module; and a static nonlinear predistorter module coupled to the dynamic nonlinear predistorter module such that an output of the dynamic nonlinear predistorter module is input to the static nonlinear predistorter module.”
6. The limitations recited in independent claim 11 “A predistorter for nonlinear wireless system, the predistorter comprising: a static nonlinear predistorter module; and dynamic nonlinear predistorter module coupled to the static nonlinear predistorter module such that an output of the static nonlinear predistorter module is input to the dynamic nonlinear predistorter module.”
7. The limitations recited in independent claim 15 “An augmented Wiener predistorter, the predistorter comprising: a dynamic nonlinear first order predistorter module; and a static nonlinear predistorter module coupled to the dynamic nonlinear predistorter module such that an output of the dynamic nonlinear predistorter module is input to the static nonlinear predistorter module.”
8. The limitations recited in independent claim 19 “An augmented Hammerstein predistorter, the predistorter comprising: a static nonlinear predistorter module; and a dynamic nonlinear first order predistorter module coupled to the static nonlinear predistorter module such that an output of the static nonlinear predistorter module is input to the dynamic nonlinear predistorter module.”
9. When taken in context the claim(s) as a whole was/were not uncovered in the prior art i.e., the dependent claims are allowed as they depend upon an allowable independent claim.

Art Unit: 2129

10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments regarding Statement of Reasons for Allowance."

Correspondence Information

11. Any inquiries concerning this communication or earlier communications from the examiner should be directed to Michael B. Holmes, who may be reached Monday through Friday, between 5:00 a.m. and 6:00 p.m. EST. or via telephone at (571) 272-3686 or facsimile transmission (571) 273-3686 or email michael.holmesb@uspto.gov.

If you need to send an Official facsimile transmission, please send it to (571) 273-8300.

If attempts to reach the examiner are unsuccessful the Examiner's Supervisor (SPE), Jeffrey Gaffin, may be reached at (571) 272-4146.

Hand-delivered responses should be delivered to the Receptionist @ (Customer Service Window Randolph Building 401 Dulany Street, Alexandria, VA 22313), located on the first floor of the south side of the Randolph Building.

Finally, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Moreover, status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have any questions on access to the Private PAIR system, contact the Electronic Business Center (EBC)

Application/Control Number: 11/999,264

Page 5

Art Unit: 2129

toll-free @ 1-866-217-9197.

Michael B. Holmes

Primary Examiner

Artificial Intelligence

Art Unit 2129

United States Department of Commerce

Patent & Trademark Office

Wednesday, August 10, 2011

MBH

/Michael B. Holmes/

Primary Examiner, Art Unit 2129

Search Notes 	Application/Control No. 11999264	Applicant(s)/Patent Under Reexamination LIU ET AL.
	Examiner MICHAEL HOLMES	Art Unit 2129

SEARCHED			
Class	Subclass	Date	Examiner
706	46	08/10/2011	MBH
706	global class search all subclasses	08/10/2011	MBH

SEARCH NOTES		
Search Notes	Date	Examiner
WEST/global database search all patent databases all classes & subclasses	03/25/2011	MBH
inventor name search	08/10/2011	MBH
WEST/global database search all patent databases all classes & subclasses	08/10/2011	MBH
NPL - IEEE	08/10/2011	MBH
NPL - google	08/10/2011	MBH

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
USPGPUB	independent claim keyword search.clm.	08/10/2011	MBH

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<i>Index of Claims</i> 	Application/Control No. 11999264	Applicant(s)/Patent Under Reexamination LIU ET AL.
	Examiner MICHAEL HOLMES	Art Unit 2129

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

☒ Claims renumbered in the same order as presented by applicant				☐ CPA		☐ T.D.		☐ R.1.47	
CLAIM		DATE							
Final	Original	03/25/2011	08/10/2011						
1	1	✓	=						
2	2	✓	=						
3	3	✓	=						
4	4	O	=						
5	5	✓	=						
6	6	O	=						
7	7	=	=						
8	8	=	=						
9	9	=	=						
10	10	=	=						
11	11	=	=						
12	12	=	=						
13	13	=	=						
14	14	=	=						
15	15	=	=						
16	16	=	=						
17	17	=	=						
18	18	=	=						
19	19	=	=						
20	20	=	=						
21	21	=	=						
22	22	=	=						

Notice of References Cited	Application/Control No. 11/999,264		Applicant(s)/Patent Under Reexamination LIU ET AL.	
	Examiner MICHAEL B. HOLMES		Art Unit 2129	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,536,277	05-2009	Pattipatti et al.	702/183
*	B	US-7,260,501	08-2007	Pattipatti et al.	702/183
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
*	U	Improving generalizing capability of connectionist model through emergent dynamic behavior, Wang Hong-Qi; Chen Zong-Zhi; Su Shi-Wei; Neural Networks, 1992. IJCNN., International Joint Conference on Volume: 1 Digital Object Identifier: 10.1109/IJCNN.1992.287186 Publication Year: 1992 , Page(s): 353 - 358 vol.1
*	V	Dynamic Item Recommendation by Topic Modeling for Social Networks, Sang Su Lee; Tagyoung Chung; McLeod, D.; Information Technology: New Generations (ITNG), 2011 Eighth International Conference on Digital Object Identifier: 10.1109/ITNG.2011.153 Publication Year: 2011 , Page(s): 884 - 889
*	W	Generative grammars and dynamic programming in speech recognition with learning, Vintsiuk, T.; Acoustics, Speech, and Signal Processing, IEEE International Conference on ICASSP '76. Volume: 1 Digital Object Identifier: 10.1109/ICASSP.1976.1170022 Publication Year: 1976 , Page(s): 446 - 449
*	X	Relative coupled dynamics and control using dual number, Jianying Wang; HaiZhao Liang; Zhaowei Sun; Systems and Control in Aeronautics and Astronautics (ISSCAA), 2010 3rd International Symposium on Digital Object Identifier: 10.1109/ISSCAA.2010.5632324 Publication Year: 2010 , Page(s): 277 - 282

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Issue Classification 	Application/Control No. 11999264	Applicant(s)/Patent Under Reexamination LIU ET AL.
	Examiner MICHAEL B HOLMES	Art Unit 2129

ORIGINAL						INTERNATIONAL CLASSIFICATION														
CLASS			SUBCLASS			CLAIMED					NON-CLAIMED									
706			46			G	0	6	F	17 / 00 (2006.01.01)										
CROSS REFERENCE(S)						G	0	6	N	5 / 02 (2006.01.01)										
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)																			

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	17	17												
2	2	18	18												
3	3	19	19												
4	4	20	20												
5	5	21	21												
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14	14														
15	15														
16	16														

NONE		Total Claims Allowed:	
		22	
(Assistant Examiner)	(Date)		
/MICHAEL B HOLMES/ Primary Examiner. Art Unit 2129	08/10/2011	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1A

Exer
WES
2.5.

Refine Search

Search Results

Terms	Documents
behavioral adj model and nonlinear adj dynamic adj system	6

Database:

US Pre-Grant Publication Full-Text Database
 US Patents Full-Text Database
 US Patents OCR Backfile
 EPO Abstracts Database
 JPO Abstracts Database
 Derwent World Patents Index

Search Type: ☒ Prior Art ☐ Interference**Search:**

L14

Refine Search

Recall Text

Clear

Interrupt

Search History

DATE: Wednesday, August 10, 2011 [Purge Queries](#) [Printable Copy](#) [Create Case](#)

Set
Name
 Side
 by
 Side

Query

Hit
Count
Set
Name
 Result
 Set

Set Name
 Grid

*Prior Art Searches**DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=OR*

<u>L14</u>	behavioral adj model and nonlinear adj dynamic adj system	6	<u>L14</u>	<u>L14</u>
<u>L13</u>	behavioral adj model same nonlinear adj dynamic adj system	1	<u>L13</u>	<u>L13</u>
<u>L12</u>	nonlinear adj dynamic adj system	185	<u>L12</u>	<u>L12</u>
<u>L11</u>	behavioral with nonlinear adj dynamic adj system	1	<u>L11</u>	<u>L11</u>
<u>L10</u>	behavioral adj model with nonlinear adj dynamic adj system	1	<u>L10</u>	<u>L10</u>
<u>L9</u>	behavioral adj model with nonlinear adj dynamic adj system and first adj module with input with output	1	<u>L9</u>	<u>L9</u>
<u>L8</u>	behavioral adj model with nonlinear adj dynamic adj system and first adj module with input with output and second adj module	1	<u>L8</u>	<u>L8</u>
	behavioral adj model with nonlinear adj dynamic adj system and first adj			

WEST

<u>L7</u>	module with input with output and second adj module with static adj nonlinear adj characteristics	1	<u>L7</u>	<u>L7</u>
<u>L6</u>	(liu-taijun.in. or boumaiza-slim.in. or ghannouchi-fadhel.in.) behavioral adj model with nonlinear adj dynamic adj system and first adj module with input with output and second adj module with static adj nonlinear adj characteristics and first adj module with coupled with second adj module	5	<u>L6</u>	<u>L6</u>
<u>L5</u>	(706.clas.) and behavioral adj model with nonlinear adj dynamic adj system and first adj module with input with output and second adj module with static adj nonlinear adj characteristics and first adj module with coupled with second adj module	1	<u>L5</u>	<u>L5</u>
<u>L4</u>	(706/46) and behavioral adj model with nonlinear adj dynamic adj system and first adj module with input with output and second adj module with static adj nonlinear adj characteristics and first adj module with coupled with second adj module	0	<u>L4</u>	<u>L4</u>
<u>L3</u>	(706/46) and behavioral adj model with nonlinear adj dynamic adj system and first adj module with input with output and second adj module with static adj nonlinear adj characteristics and first adj module with coupled with second adj module	0	<u>L3</u>	<u>L3</u>

Interference Searches

DB=PGPB,USPT,UPAD; PLUR=YES; OP=OR

<u>L2</u>	behavioral adj model with nonlinear adj dynamic adj system and first adj module with input with output and second adj module with static adj nonlinear adj characteristics and first adj module with coupled with second adj module.clm.	1	<u>L2</u>	<u>L2</u>
<u>L1</u>	behavioral adj model with nonlinear adj dynamic adj system and first adj module with input and output and second adj module with static adj nonlinear adj characteristics and first adj module coupled with second adj module.clm.	1020	<u>L1</u>	<u>L1</u>

END OF SEARCH HISTORY

Form PTO-1449 (modified)		Atty. Docket No.: UNTI:057US	Serial No.: 11/999,264
List of Patents and Publications for Applicant's INFORMATION DISCLOSURE STATEMENT (Use several sheets if necessary)		Applicant: Taijun LIU <i>et al.</i>	
		Filing Date: December 3, 2007	Group: 2129
U.S. Patent Documents <i>See Page 1</i>	Foreign Patent Documents <i>None</i>	Other Art <i>See Page 1</i>	

U.S. Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
	A1	2003/0058959	03/27/03	Rafie <i>et al.</i>	375	296	09/25/01
	A2	2005/0157814	07/21/05	Cova <i>et al.</i>	375	297	01/14/05
	A3	2005/0195919	09/08/05	Cova	375	297	02/22/05
	A4	6,801,086	10/05/04	Chandrasekaran	330	140	09/17/02

Foreign Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Country	Language

Other Art (Including Author, Title, Date Pertinent Pages, Etc.)

Exam. Init.	Ref. Des.	Citation
	C1	International Search Report issued in PCT/CA2007/002187 dated March 19, 2008.

76986723.1

EXAMINER: /Michael Holmes/	DATE CONSIDERED: 08/10/2011
----------------------------	-----------------------------

EXAMINER: INITIAL IF REFERENCE CONSIDERED, WHETHER OR NOT CITATION IS IN CONFORMANCE WITH MPEP609; DRAW LINE THROUGH CITATION IF NOT IN CONFORMANCE AND NOT CONSIDERED. INCLUDE COPY OF THIS FORM WITH NEXT COMMUNICATION TO APPLICANT.

INFORMATION DISCLOSURE STATEMENT — PTO-1449 (MODIFIED)

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.H./

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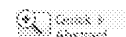


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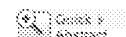
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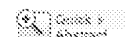


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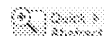
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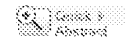


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Jiaying Wang; HaiZhao Liang; Zhaowei Sun;
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- ☐ Decision and Control, 1990., Proceedings of the 29th IEEE Conference on (2)
- ☐ Spoken Language, 1996. ICSLP 96. Proceedings., Fourth International Conference on (2)
- ☐ Communications Magazine, IEEE (1)
- ☐ Circuits and Systems, IEEE Transactions on (1)
- ☐ Pattern Analysis and Machine Intelligence, IEEE Transactions on (1)
- ☐ Robotics and Automation, IEEE

Subject

- ☐ Computing & Processing (Hardware/Software) (33)
- ☐ Components, Circuits, Devices & Systems (23)
- ☐ Signal Processing & Analysis (21)
- ☐ Robotics & Control Systems (13)
- ☐ Communication, Networking & Broadcasting (12)
- ☐ Power, Energy, & Industry Applications (7)
- ☐ Engineered Materials, Dielectrics & Plasmas (6)
- ☐ Bioengineering (5)

☐ **Realizability Condition for Nonlinear Feedback Systems**


Zames, G.;
Circuit Theory, IEEE Transactions on.
 Volume: 11 , Issue: 2.
 Digital Object Identifier: [10.1109/TCT.1964.1082262](https://doi.org/10.1109/TCT.1964.1082262).
 Publication Year: 1964 , Page(s): 186 - 194

IEEE JOURNALS

☐ AbstractPlus | Full Text: PDF (1072 KB)

☐ **Chaotic Behavior of Digital Control Systems and Its Continuous Dependence on Parameters**


English, R. Scott; Delchamps, David F.;
American Control Conference, 1991.
 Publication Year: 1991 , Page(s): 200 - 205

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☐ AbstractPlus | Full Text: PDF (662 KB)

☐ **Visual speech recognition with loosely synchronized feature streams**


Saenko, K.; Livescu, K.; Siacusa, M.; Wilson, K.; Glass, J.; Darrell, T.;
Computer Vision, 2005. ICCV 2005. Tenth IEEE International Conference on.

Volume: 2
 Digital Object Identifier: [10.1109/ICCV.2005.251](https://doi.org/10.1109/ICCV.2005.251)
 Publication Year: 2005 , Page(s): 1424 - 1431 Vol. 2
 Cited by: 1

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☐ AbstractPlus | Full Text: PDF (193 KB)

☐ **Music Synthesis with Reconstructive Phrase Modeling**


Lindemann, E.;
Signal Processing Magazine, IEEE.
 Volume: 24 , Issue: 2.
 Digital Object Identifier: [10.1109/MSP.2007.323262](https://doi.org/10.1109/MSP.2007.323262).
 Publication Year: 2007 , Page(s): 80 - 91
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IEEE JOURNALS

☐ AbstractPlus | Full Text: PDF (5004 KB)

☐ **Learning action dictionaries from video**


Turaga, P.; Chellappa, R.;
Image Processing, 2008. ICIP 2008. 15th IEEE International Conference on.
 Digital Object Identifier: [10.1109/ICIP.2008.4712102](https://doi.org/10.1109/ICIP.2008.4712102)
 Publication Year: 2008 , Page(s): 1704 - 1707

- ☐ General Topics for Engineers (Math, Science & Engineering) (4)
- ☐ Fields, Waves &

Conference Country

- ☐ USA (13)
- ☐ Australia (1)

Conference Location

Search for Conference Location

- ☐ Hunan (3)
- ☐ Washington, DC (2)
- ☐ Honolulu, HI (2)
- ☐ Philadelphia, PA (2)
- ☐ Beijing (2)
- ☐ Orlando, FL (1)
- ☐ Santa Clara, CA (1)
- ☐ Seattle, WA (1)
- ☐ Las Vegas, NV (1)
- ☐ San Diego, CA (1)
- ☐ Baltimore, MD (1)
- ☐ Arlington, VA (1)
- ☐ Austin, TX (1)
- ☐ Guangzhou (1)
- ☐ Taipei (1)
- ☐ Salt Lake City, UT (1)

IEEE CONFERENCES

 [AbstractPlus](#) | Full Text: PDF (295 KB)

☐ **Tracking Topic Evolution in News Environments**



Viermetz, M.; Skubacz, M.; Ziegler, C.-N.; Selpel, D.;
[E-Commerce Technology and the Fifth IEEE Conference on Enterprise Computing, E-Commerce and E-Services, 2008. 10th IEEE Conference on.](#)

Digital Object Identifier: [10.1109/CECandEEE.2008.112](#)

Publication Year: 2008 , Page(s): 215 - 220

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 [AbstractPlus](#) | Full Text: PDF (840 KB)

☐ **Intelligent control of the lift model**



Cernys, P.; Kubilus, V.; Macerauskas, V.; Ratkevicius, K.;
[Intelligent Data Acquisition and Advanced Computing Systems, Technology and Applications, 2003. Proceedings of the Second IEEE International Workshop on.](#)

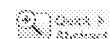
Digital Object Identifier: [10.1109/IDAACS.2003.1249600](#)

Publication Year: 2003 , Page(s): 428 - 431

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☐ **A model of flexible exception handling facilitated by policies and contracts**



Yan-Bin Peng; Gao Ji; Bei-Shui Liao; Gun-Hao Wang; Hang Guo;

[Machine Learning and Cybernetics, 2003 International Conference on.](#)

Volume: 2

Digital Object Identifier: [10.1109/ICMLC.2003.4620564](#)

Publication Year: 2003 , Page(s): 1075 - 1081

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☐ **Dynamic Item Recommendation by Topic Modeling for Social Networks**



Sang Su Lee; Tagyoung Chung; McLeod, D.;
[Information Technology, New Generations \(ITNG\), 2011. Eighth International Conference on.](#)

Digital Object Identifier: [10.1109/ITNG.2011.163](#)

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 [AbstractPlus...](#) | Full Text: PDF (342 KB)

■ **Speaker identification using supra-segmental pitch pattern dynamics**



Farahani, F.; Georgiou, P.G.; Narayanan, S.S.;
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(ICASSP'04). IEEE International Conference on.

Volume: 1

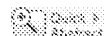
Digital Object Identifier: 10.1109/ICASSP.2004.1325929

Publication Year: 2004 , Page(s): 1 - 69-92 vol.1

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■ **Speaker verification based on a vector quantization approach that incorporates speaker cohort models and a linear discriminator**



Bellfield, W.R.; Mikkilineni, R.P.;
Systems, Man, and Cybernetics, 1997. Computational
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Volume: 5

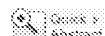
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 [AbstractPlus...](#) | Full Text: PDF (456 KB)

■ **Generative grammars and dynamic programming in speech recognition with learning**



Vintsyuk, T.;
Acoustics, Speech, and Signal Processing, IEEE International
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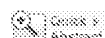
Digital Object Identifier: 10.1109/ICASSP.1976.1170022

Publication Year: 1976 , Page(s): 446 - 449

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■ **Study on the Application of Dynamic Balanced Scorecard in the Service Industry**



Tiezhu Zhang; Le Gao;
Intelligent Computation Technology and Automation (ICICTA).
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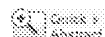
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■ **An analysis of data fusion methods for speaker verification**



Fairrell, K.R.; Ramachandran, R.P.; Mammone, R.J.;
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Yong Sun; Ruiye Liu; Yu Zhang; Xiaodong Wu;
[Electric Utility Deregulation and Restructuring and Power Technologies, 2008. DRPT 2008. Third International Conference on.](#)

Digital Object Identifier: [10.1109/DRPT.2008.4523774](#)

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■ **Board level thermal analysis via Large Eddy Simulation (LES) tool**

Roknaldin, F.; Panigrahy, A.;
[Thermal and Thermomechanical Phenomena in Electronic Systems, 2004. THERM '04. The Ninth Interagency Conference on.](#)

Digital Object Identifier: [10.1109/THERM.2004.1319218](#)

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■ **Notice of Violation of IEEE Publication Principles Efficient Collision Detection for Arbitrary Polyhedral Model Based on GPU and Swept Volume**

Shujuan Peng; Yuanxiang Li; Hui Zeng;
[Computing, Communication, Control, and Management, 2008. CCCM '08. ISECS International Colloquium on.](#)
 Volume: 2

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■ **Optically activated charge domain model for high-gain GaAs photoconductive switches**

Zhen-Xian Liang; Wei Shi; Jun Feng; Chuan-Xiang Xu;
[Electrical Insulation and Dielectric Phenomena, 1996. IEEE 1996 Annual Report of the Conference on.](#)

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Digital Object Identifier: [10.1109/CEIDP.1996.564584](#)

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■ **Speaker-independent features extracted by a neural network**

Kato, Y.; Sugiyama, M.;
[Acoustics, Speech, and Signal Processing, 1993. ICASSP-93. 1993. IEEE International Conference on.](#)

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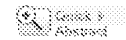
■ **Efficacy of a constantly adaptive language modeling technique for web-scale applications**

Kuansan Wang; Xiaolong Li;
[Acoustics, Speech and Signal Processing, 2009. ICASSP 2009.](#)

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Digital Object Identifier: 10.1109/ICASSP.2009.4960686
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☒ **Relative coupled dynamics and control using dual number**



Jiaying Wang; HaiZhao Liang; Zhaowei Sun;
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Publication Year: 2010 , Page(s): 277 - 282
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 AbstractPlus | Full Text: PDF (721 KB)

[1](#) [2](#)

POWER OF ATTORNEY AND CORRESPONDENCE ADDRESS INDICATION FORM	Application Number:		11/999,264	
	Filing Date:		December 3, 2007	
	First Named Inventor:		Taijun LIU	
	Art Unit:		2129	
	Examiner Name:		Mai T. Tran	
	Attorney Docket Number:		UNT1:057US	
I hereby revoke all previous powers of attorney given in the above-identified application.				
☐ A Power of Attorney is submitted herewith. OR ☒ I hereby appoint the practitioners associated with the Customer Number: 32425 as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.				
Please recognize or change the correspondence address for the above-identified application to: ☒ The address associated with Customer Number: 32425 OR				
☐ Firm or Individual Name				
Address				
City		State		Zip
Country				
Telephone		Email		
I am the: ☐ Applicant/Inventor. ☒ Assignee of record of the entire interest. See 37 CFR 3.71. <i>Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)</i>				
SIGNATURE OF APPLICANT OR ASSIGNEE OF RECORD				
Signature				
Name	David Reese			
Title and Company	Acting Director, Licensing & Business Development UTI LIMITED PARTNERSHIP		Telephone	
Date	September 19, 2011			
NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.				
☐ *Total of _____ forms are submitted.				

85049006.1

Electronic Acknowledgement Receipt	
EFS ID:	10986822
Application Number:	11999264
International Application Number:	
Confirmation Number:	8000
Title of Invention:	NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS
First Named Inventor/Applicant Name:	Taijun Liu
Customer Number:	46188
Filer:	Steven Scott Gordon/Tressie Bates
Filer Authorized By:	Steven Scott Gordon
Attorney Docket Number:	038231-021
Receipt Date:	20-SEP-2011
Filing Date:	03-DEC-2007
Time Stamp:	12:04:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		UNTI_057US-POA.pdf	725360	yes	2
			f8c6773968537bf77f123473fca7b963d191797e		

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Assignee showing of ownership per 37 CFR 3.73(b).	1	1
	Power of Attorney	2	2
Warnings:			
Information:			
Total Files Size (in bytes):		725360	
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. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.			

STATEMENT UNDER 37 CFR 3.73(b)Applicant/Patent Owner: Taijun LIU, Slim BOUMAIZA, and Fadhel GHANNOUCHIApplication No./Patent No. 11/999,264Filed/Issue Date: December 3, 2007Entitled: NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMSUTI LIMITED PARTNERSHIP, a company

(Name of Assignee)

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

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title and interest.
The extent (by percentage) of its ownership interest is _____ %

in the patent application/patent identified above by virtue of either:

- 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 026932, Frame 0397, or for which a copy thereof is attached.

OR

- B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

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

- ☐ As required by 37 CFR 3.73(b)(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, if the assignment is to be recorded 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.

/S. Scott Gordon/

Signature

September 20, 2011

Date

S. Scott Gordon, Reg. No. 57,294

Printed or Typed Name

(512) 474-5201

Telephone Number

Attorney

Title

UNTI:057US

File Code



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/999,264	12/03/2007	Taijun Liu	038231-021

46188
Nixon Peabody LLP
P.O. Box 60610
Palo Alto, CA 94306

CONFIRMATION NO. 8000
POWER OF ATTORNEY NOTICE



Date Mailed: 09/28/2011

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 09/20/2011.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/nhorne/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/999,264	12/03/2007	Taijun Liu	UNT1:057US

CONFIRMATION NO. 8000

POA ACCEPTANCE LETTER



OC000000050072063*

32425
FULBRIGHT & JAWORSKI L.L.P.
98 SAN JACINTO BOULEVARD
SUITE 1100
AUSTIN, TX 78701-4255

Date Mailed: 09/28/2011

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 09/20/2011.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/nhorne/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
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 Alexandria, Virginia 22313-1450
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Bib Data Sheet

CONFIRMATION NO. 8000

SERIAL NUMBER 11/999,264	FILING OR 371(c) DATE 12/03/2007 RULE	CLASS 706	GROUP ART UNIT 2129	ATTORNEY DOCKET NO. UNT1:057US	
APPLICANTS Taijun Liu, Calgary, CANADA; Slim Boumaiza, Waterloo, CANADA; Fadhel Ghannouchi, Calgary, CANADA;					
** CONTINUING DATA ***** This appln claims benefit of 60/872,132 12/01/2006					
** FOREIGN APPLICATIONS *****					
IF REQUIRED, FOREIGN FILING LICENSE GRANTED** SMALL ENTITY ** ** 01/04/2008					
Foreign Priority claimed ☐ yes ☐ no 35 USC 119 (a-d) conditions ☐ yes ☐ no ☐ Met after met Allowance Verified and Acknowledged _____ Examiner's Signature Initials		STATE OR COUNTRY CANADA	SHEETS DRAWING 8	TOTAL CLAIMS 22	INDEPENDENT CLAIMS 5
ADDRESS 32425					
TITLE NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS					
FILING FEE RECEIVED 840	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
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S. Scott Gordon	(Depositor's name)
/S. Scott Gordon/	(Signature)
November 10, 2011	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/999,264	12/03/2007	Taijun Liu	UNTI:057US/10902745	8000

TITLE OF INVENTION: NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	11/14/2011

EXAMINER	ART UNIT	CLASS-SUBCLASS
HOLMES, MICHAEL B	2129	706-046000

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/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form 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,

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1 Fulbright & Jaworski L.L.P.

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 has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

UTI LIMITED PARTNERSHIP

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

CALGARY, CANADA

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

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☒ Publication Fee (No small entity discount permitted)

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☐ A check is enclosed.

☒ Payment by credit card. Form PTO-2038 is attached.

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 56-1212 (enclose an extra copy of this form).

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

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /S. Scott Gordon/

Date November 10, 2011

Typed or printed name S. Scott Gordon

Registration No. 57,294

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Electronic Patent Application Fee Transmittal				
Application Number:		11999264		
Filing Date:		03-Dec-2007		
Title of Invention:		NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS		
First Named Inventor/Applicant Name:		Taijun Liu		
Filer:		Steven Scott Gordon/Pamela Lawrence		
Attorney Docket Number:		UNTI:057US/10902745		
Filed as Small Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	2501	1	870	870
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1170

Electronic Acknowledgement Receipt	
EFS ID:	11383562
Application Number:	11999264
International Application Number:	
Confirmation Number:	8000
Title of Invention:	NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS
First Named Inventor/Applicant Name:	Taijun Liu
Customer Number:	32425
Filer:	Steven Scott Gordon/Pamela Lawrence
Filer Authorized By:	Steven Scott Gordon
Attorney Docket Number:	UNTI:057US/10902745
Receipt Date:	10-NOV-2011
Filing Date:	03-DEC-2007
Time Stamp:	17:28:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$ 1170
RAM confirmation Number	4640
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1	Issue Fee Payment (PTO-85B)	UNTI057US_IssueFeeTransmittal.pdf	185734 da62d0b25b0c25e1c8463338fc7378c5f699c50b	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32149 79687b3e41628cd9b9f4718a6faa87be950bdfc	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			217883		
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. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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 NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/999,264	12/13/2011	8078561	UNTI:057US/10902745	8000

32425 7590 11/22/2011
FULBRIGHT & JAWORSKI L.L.P.
98 SAN JACINTO BOULEVARD
SUITE 1100
AUSTIN, TX 78701-4255

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

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 1043 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 Application Information Retrieval (PAIR) WEB site (<http://pair.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 Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Taijun Liu, Calgary, CANADA;
Slim Boumaiza, Waterloo, CANADA;
Fadhel Ghannouchi, Calgary, CANADA;



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Page 1 of 2
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #
11/999,264

RECEIPT DATE / TIME
03/05/2024 03:45:09 AM Z ET

ATTORNEY DOCKET #
UNTI:057US/10902745

Title of Invention

NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	8078561
CONFIRMATION #	8000	FILED BY	Kevin Pillay
PATENT CENTER #	64512320	AUTHORIZED BY	-
CUSTOMER #	32425	FILING DATE	12/03/2007
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Taijun Liu

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 2616	E202435447268000	Kevin Pillay

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
2553	MAINTENANCE FEE DUE AT 11.5 YEARS	3080.00	1	3080.00
2558	PETITION FOR THE DELAYED PAYMENT OF THE FEE FOR MAINTAINING A PATENT IN FORCE	840.00	1	840.00
TOTAL AMOUNT:				\$3,920.00

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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

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GRANT LETTER

APPLICATION #
11/999,264

DECISION DATE
03/05/2024

DECISION ON PETITION #
UNDER CFR 1.378(b)

ATTORNEY DOCKET NUMBER
UNTI:057US/10902745

Title of Invention

NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS

In re Patent # **8078561**

Issue date: **12/13/2011**

Filing date: **12/03/2007**

This is an electronic decision on the petition under 37 CFR 1.378(b), filed March 05, 2024 to accept unintentional delayed payment of the 11.5 year maintenance fee for the above-identified patent.

The petition is **GRANTED**.

The maintenance fee is accepted, and the above-identified patent reinstated as of March 05, 2024. This decision also constitutes notice that the fee has been accepted. An electronic copy of the petition and this decision has been created as an entry in the Image File Wrapper. Nevertheless, petitions should print and retain an independent copy.

Telephone inquiries concerning this decision should be directed to the Patent Electronic Business Center (EBC) at 866-217-9197.

Office of Petitions



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Alexandria, VA 22313 - 1450
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PETITION TO ACCEPT UNINTENTIONAL DELAYED PAYMENT OF MAINTENANCE FEE (37 CFR 1.378(b))

APPLICATION #
11999264

FIRST NAMED INVENTOR
Taijun Liu

ATTORNEY DOCKET #
UNT1:057US/10902745

FILING DATE
12/03/2007

Title of Invention

NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO
SYSTEMS

In re Patent #: 8078561
Issue date: 12/13/2011}

The delay in the payment of the maintenance fee to the above-identified patent was unintentional.

PETITIONER(S) REQUEST THAT THE DELAYED PAYMENT OF THE MAINTENANCE FEE BE ACCEPTED AND THE PATENT REINSTATED

(1) Petition fee under 37 CFR 1.17(m) is attached

Applicant claims the following entity status

Small

(2) Statement

The delay in the payment of the maintenance fee to this patent was unintentional

- Petitioner(s) is reminded that a delay resulting from a deliberately chosen course of action or a change in circumstance is not an unintentional delay.
- Petitioner(s) is further reminded that a person seeking reinstatement of an expired patent should not make a statement that the delay in payment of the maintenance fee was unintentional unless the entire delay was unintentional, including the period from discovery that the maintenance fee was not timely paid until payment of the maintenance fee. For example, a statement that the delay in payment of the maintenance fee was unintentional would not be proper when the patentee becomes aware of an unintentional failure to timely pay the maintenance fee and then intentionally delays filing a petition for reinstatement of the patent under 37 CFR 1.378. See MPEP 2590.

NOTE: Where the petition under 37 CFR 1.378 is filed more than two years after the date the patent expired for nonpayment of

the maintenance fee, the United States Patent and Trademark Office requires an additional explanation of the circumstances surrounding the delay that establishes the entire delay was unintentional. This requirement is in addition to the requirement to provide a statement that the entire delay was unintentional. See Clarification of the Practice for Requiring Additional Information in Petitions Filed in Patent Applications and Patents Based on Unintentional Delay, 85 FR 12222 (March 2, 2020). See MPEP 711.03(c)(II)(C)-(F) for additional guidance on the information required to establish that the entire delay was unintentional.

Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

Signature	Name	Registration #
/Kevin Pillay/	Kevin Pillay	41559

PETAUTO SB64.0



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Page 1 of 2
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
11/999,264

RECEIPT DATE / TIME
03/05/2024 03:45:09 AM Z ET

ATTORNEY DOCKET #
UNTI:057US/10902745

Title of Invention

NONLINEAR BEHAVIOR MODELS AND METHODS FOR USE THEREOF IN WIRELESS RADIO SYSTEMS

Application Information

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

PATENT # 8078561

CONFIRMATION # 8000

FILED BY Kevin Pillay

PATENT CENTER # 64512320

FILING DATE 12/03/2007

CUSTOMER # 32425

FIRST NAMED
INVENTOR Tajjun Liu

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY -

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
petition-request.pdf	2	ePetition Request Form	27 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
petition-request.pdf	8AA4E37F4CFD60A6E6712D925AB4D69DCF06D11E89E632EE 7F72E42C0D1A6C9058B6DE3C3308437947EA2B0C73914402C 337A5F1C471DF46BCA5A83FB9EACBBC

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New International Application Filed with the USPTO as a Receiving Office

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