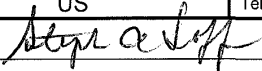


UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 CFR 1.53(b))		Attorney Docket No. 149369-00103	
		First Named Inventor Mark Catchpole	
		Title	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS
		Priority Mail Express® Label No.	
APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents.		ADDRESS TO: Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	
1. ☐ Fee Transmittal Form (PTO/SB/17 or equivalent) 2. ☒ Applicant asserts small entity status. See 37 CFR 1.27 3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent. 4. ☒ Specification [Total Pages <u>19</u>] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement) 5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>6</u>] 6. Inventor's Oath or Declaration [Total Pages <u>1</u>] (Including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e)) a. ☐ Newly executed (original or copy) b. ☒ A copy from a prior application (37 CFR 1.63(d)) 7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent) 8. CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix) ☐ Landscape Table on CD 9. Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. – c. are required) a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies		ACCOMPANYING APPLICATION PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee 11. ☐ 37 CFR 3.73(c) Statement ☒ Power of Attorney (when there is an assignee) 12. ☐ English Translation Document (if applicable) 13. ☒ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of citations attached 14. ☒ Preliminary Amendment 15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized) 16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 18. ☐ Other:	
*Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 must be included in an Application Data Sheet (ADS). (2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).			
19. CORRESPONDENCE ADDRESS			
☒ The address associated with Customer Number: <u>24998</u> OR ☐ Correspondence address below			
Name		Stephen A. Soffen BLANK ROME LLP	
Address		1825 Eye Street, NW	
City	Washington	State	DC
Country	US	Zip Code	20006-5403
Telephone	(202) 420-2200		Email
Signature			Date
Name (Print/Type)	Stephen A. Soffen		February 4, 2019
	Registration No. (Attorney/Agent)		31,063

149369.00101/117148002v.1

Application Data Sheet

Inventor Information

Inventor Number::	1
Given Name::	Mark
Family Name::	Catchpole
City of Residence::	Prickwillow
Country of Residence::	United Kingdom
Street of mailing address::	Malahax, Ely Road
City of mailing address::	Prickwillow
Country of mailing address::	United Kingdom
Postal or Zip Code of mailing address::	CB7 4UJ

Correspondence Information

Correspondence Customer Number::	24998
----------------------------------	-------

Application Information

Application Type::	Regular
Subject Matter::	Utility
CD-ROM or CD-R?::	None
Sequence submission?::	None
Computer Readable Form (CRF)?::	No
Title::	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS

Attorney Docket Number:: 149369-00103

Request for Early Publication?:: No

Request for Non-Publication?:: No

Total Drawing Sheets:: 6

Small Entity?:: Yes

Petition included?:: No

Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2:: No

Representative Information

Representative Customer Number:: 24998

Domestic Priority Information

Application::	Continuity Type::	Parent Application::	Parent Filing Date::
This Application	Continuation of	15/392,396	12/28/2016
15/392,396	Continuation of	14/309,476 (now U.S. Patent No. 9,536,516)	06/19/2014
14/309,476	Continuation of	13/253,223 (now U.S. Patent No. 8,768,696)	10/05/2011
13/253,223	Continuation of	12/554,607 (now U.S. Patent No. 8,036,890)	09/04/2009
12/554,607	Continuation of	10/503,463 (now U.S. Patent No. 7,587,319)	05/24/2005
10/503,463	371 National Stage of	PCT/GB2003/000459	02/04/2003

Foreign Priority Information

Country	Application No.::	Filing Date::	Priority Claimed::
United Kingdom	0202546.8	02/04/2002	Yes

Applicant Information

Applicant Number:: 1

Applicant Type:: Assignee

Organization Name:: Zentian Limited

Street of mailing address:: 17 Paddock Row
Elsworth

City of mailing address:: Cambridge

Country of mailing address:: United Kingdom

Postal or Zip Code of mailing address:: CB23 4JG

Authorization or Opt-Out of Authorization to Permit Access

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

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

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

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

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

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

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

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

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

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

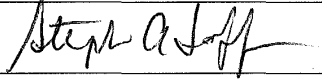
NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Signature:

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

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

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

Signature		Date (YYYY-MM-DD)	2019-02-04
Name	Stephen A. Soffen	Registration Number	31,063

Docket No.: 149369-00103
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Mark Catchpole

Application No.: Not Yet Assigned

Confirmation No.: N/A

Filed: Concurrently Herewith

Art Unit: N/A

For: SPEECH RECOGNITION CIRCUIT USING
PARALLEL PROCESSORS

Examiner: Not Yet Assigned

FIRST PRELIMINARY AMENDMENT UNDER 37 C.F.R. 1.115

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

Dear Madam:

INTRODUCTORY COMMENTS

Prior to examination on the merits, please amend the above-identified U.S. patent application as follows:

Amendments to the Specification begin on page 2 of this paper.

Remarks/Arguments begin on page 3 of this paper.

149369.00101/117148204v.1

AMENDMENTS TO THE SPECIFICATION

Page 1, after the title, please insert the following:

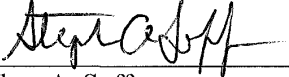
This is a continuation of Application No. 15,392,396, filed December 28, 2016, which is a continuation of Application No. 14/309,476, filed June 19, 2014, now U.S. Pat. No. 9,536,516, which is a continuation of Application No. 13/253,223, now U.S. Pat. No. 8,768,696, filed October 5, 2011, which is a continuation of Application No. 12/554,607, now U.S. Pat. No. 8,036,890, filed September 4, 2009, which is continuation of Application No. 10/503,463, now U.S. Pat. No. 7,587,319, filed May 24, 2005, which is a 371 of International Application No. PCT/GB2003/000459, filed February 4, 2003, which claims foreign priority to United Kingdom Application No. 0202546.8 filed February 4, 2002, the disclosures of which are incorporated herein by reference in their entireties.

REMARKS

This application, which is a continuation, has been amended to add a reference to the parent applications in accordance with 35 U.S.C. 120.

Dated: February 4, 2019

Respectfully submitted,

By 

Stephen A. Soffen

Registration No.: 31,063
DICKSTEIN SHAPIRO LLP
1825 Eye Street, NW
Washington, DC 20006-5403
(202) 420-2200
Attorney for Applicant

SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS

The present invention generally relates to a speech recognition circuit which uses parallel processors for processing the input speech data in parallel.

Conventional large vocabulary speech recognition can be divided into two processes: front end processing to generate processed speech parameters such as feature vectors, followed by a search process which attempts to find the most likely set of words spoken from a given vocabulary (lexicon).

The front end processing generally represents no problem for current processing systems. However, for large vocabulary, speaker independent speech recognition, it is the search process that presents the biggest challenge. An article by Deshmukh et al entitled "Hierarchical Search for Large-Vocabulary Conversational Speech Recognition" (IEEE Signal Processing Magazine, September 1999, pages 84 to 107), the content of which is hereby incorporated by reference, discusses the general concepts of large vocabulary speech recognition. As discussed in this paper, one algorithm for performing the search is the Viterbi algorithm. The Viterbi algorithm is a parallel or breadth first search through a transition network of states of Hidden Markov Models. An acoustic model for words in a lexicon are represented as states of Hidden Markov Models. These states represent phones or n phones in a phone model of the words. The search requires the evaluation of possible word matches. It is known that such a search is computationally intensive.

In order to speed up the processing performed during such a search in a speech recognition system, parallel processing has been explored. In an article by M K Ravishankar entitled "Parallel Implementation of Fast Beam Search for Speaker-Independent Continuous Speech Recognition" (Indian Institute of Science, Bangalore, India, July 16, 1993) a multi-threaded implementation of a fast beam search algorithm is disclosed. The multi-threading implementation requires a significant amount of communication and synchronization among threads. In an MSC project report by

R Dujari entitled "Parallel Viterbi Search Algorithm for Speech Recognition" (MIT, February 1992) the parallel processing of input speech parameters is disclosed in which a lexical network is split statically among processors.

It is an object of the present invention to provide an improved circuit which can perform parallel processing of speech parameters.

In accordance with a first embodiment of the present invention, a speech recognition circuit comprises an input port such as input buffer for receiving parameterized speech data such as feature vectors. A lexical memory arrangement is provided which contains lexicon data for word recognition. The lexical data comprises a plurality of lexical tree data structures representing a plurality of lexical trees. Each lexical tree data structure comprises a model of words having common prefix components and an initial component which is unique as an initial component for lexical trees. A plurality of lexical tree processors are connected in parallel to the input port and perform parallel lexical tree processing for word recognition by accessing the lexical data in the lexical memory arrangement. A results memory arrangement is connected to the lexical tree processors for storing processing results from the lexical tree processors and lexical tree identifiers to identify lexical trees to be processed by the lexical tree processors. A controller controls the lexical tree processors to process lexical trees identified in the results memory arrangement by performing parallel processing of a plurality of lexical tree data structures.

Thus in accordance with this embodiment of the present invention, the processing in order to perform word recognition is distributed across the processors by controlling the processors to perform processing on different lexical trees. The controller controls the processor by the processes to provide for efficient process management by distributing lexical processing to appropriate processors.

The lexical tree data structure can comprise a phone model of words, wherein the components comprise phones. For reduced storage, the lexical tree data structure can comprise a mono phone lexical tree. The mono phone lexical tree can be used to generate context dependent phone models dynamically. This enables the use of context dependent phone models for matching and hence increased accuracy whilst not

increasing memory requirements. Alternatively, the lexical tree data structure can comprise context dependent phone models.

The processing performed by each processor in one embodiment comprises the comparison of the speech parameters with the lexical data, e.g. phone models or data derived from the lexical data (e.g. dynamically generated context dependent phone models) to identify words as a word recognition event and to send information identifying the identified words to the results memory as the processing results. In this embodiment a language model processor arrangement can be provided for providing a language model output for modifying the processing results at a word recognition event by a lexical tree processor. The modification can either take place at each lexical tree processor, or at the language model processing arrangement.

In one embodiment each lexical tree processor determines an output score for words in the processing results at word recognition events. Thus in this embodiment the language model processing arrangement can modify the score using a score for a language model for n preceding words, where n is an integer.

In one embodiment the controller instructs a lexical tree processor to process a lexical tree by passing a lexical tree identifier for the lexical tree and history data for a recognition path associated with the lexical tree from the results memory. The history data preferably includes an accumulated score for the recognition path. This enables a score to be determined based on the score for the recognition path to accumulate a new score during recognition carried out using the lexical tree data structure. The scores can be output in the processing results to the results memory during the processing of the speech parameters so that the scores can be used for pruning.

In one embodiment of the present invention, each lexical tree processor operates on more than one lexical tree at the same time, e.g. two lexical trees represented by two different lexical tree data structures, or two lexical trees represented by the same data structure but displaced in time (which can be termed to instances of the same lexical tree).

At word recognition events, the controller determines new lexical tree identifiers for storing in the results memory for words identified in the results memory for respective word events. In order to reduce the processing, the controller can prune the new lexical tree identifiers to reduce the number of lexical trees which are required to be processed. This pruning can be achieved using context dependant n phones to reduce the number of possible next phones. The number can be further reduced by using a language model look ahead technique.

In one embodiment of the present invention, the lexical tree processors are arranged in groups or clusters. The lexical memory arrangement comprises a plurality of partial lexical memories. Each partial lexical memory is connected to one of the groups of lexical tree processors and contains part of the lexical data. Thus a group of lexical tree processors and a partial lexical memory form a cluster. Each lexical tree processor is operative to process the speech parameters using a partial lexical memory and the controller controls each lexical tree processor to process a lexical tree corresponding to partial lexical data in a corresponding partial lexical memory.

In another embodiment of the present invention the lexical memory arrangement comprises a plurality of partial lexical memories. Each partial lexical memory being connected to one of the lexical tree processors and containing part of the lexical data. Each lexical tree processor processes the speech parameters using a corresponding partial lexical memory and the controller is operative to control each lexical tree processor to process a lexical tree corresponding to partial lexical data in a corresponding partial lexical memory.

In one embodiment of the present invention the lexical memory arrangement stores the lexical tree data structures as Hidden Markov Models and the lexical tree processors are operative to perform the Viterbi search algorithm using each respective lexical tree data structure. Thus in this way, this embodiment of the present invention provides a parallel Viterbi lexical tree search process for speech recognition.

The first aspect of the present invention is a special purpose circuit built for performing the speech recognition search process in which there are a plurality of processors for performing parallel lexical tree processing on individual lexical tree processors.

In another aspect of the present invention a speech recognition circuit comprises an input port such as an input buffer for receiving parameterized speech data such as feature vectors. A plurality of lexical memories are provided which contain in combination complete lexical data for word recognition. Each lexical memory contains part of the complete lexical data. A plurality of processors are provided connected in parallel to the input port for processing the speech parameters in parallel. The processors are arranged in groups in which each group is connected to a corresponding lexical memory to form a cluster. A controller controls each processor to process the speech parameters using partial lexical data read from a corresponding lexical memory. The results of processing the speech parameters are output from the processors as recognition data.

Thus this aspect of the present invention provides a circuit in which speech recognition processing is performed in parallel by groups of processors operating in parallel in which each group accesses a common memory of lexical data. This aspect of the present invention provides the advantage of parallel processing of speech parameters and benefits from a limited segmentation of the lexical data. By providing a plurality of processors in a group with a common memory, flexibility in the processing is provided without being bandwidth limited by the interface to the memory that would occur if only a single memory were used for all processors. The arrangement is more flexible than the parallel processing arrangement in which each processor only has access to its own local memory and requires fewer memory interfaces (i.e. chip pins). Each processor within a group can access the same lexical data as any other processor in the group. The controller can thus control the parallel processing of input speech parameters in a more flexible manner. For example, it allows more than one processor to process input speech parameters using the same lexical data in a lexical memory. This is because the lexical data is segmented into domains which are accessible by multiple processors.

In a preferred embodiment this aspect of the present invention is used in combination with the first aspect of the present invention. In such an arrangement each processor performs lexical tree processing and the lexical data stored in each lexical memory

comprises lexical tree data structures which each comprise a model of words having common prefix components and an initial component that is unique.

In preferred embodiments of the second aspect of the present invention, the preferred embodiments of the first aspect of the present invention are incorporated.

Embodiments of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a diagram of a speech data processing circuit for generating parameterized speech data (feature vectors);

Figure 2 is a diagram of a speech recognition circuit in accordance with an embodiment of the present invention;

Figures 3a and 3b are schematic diagrams illustrating lexical tree structures;

Figure 4 is a flow diagram illustrating the process performed by a lexical tree processor to determine a temporary lexical tree score in accordance with an embodiment of the present invention;

Figure 5 is a flow diagram illustrating the process performed by the lexical tree processor for processing the input feature vectors in accordance with an embodiment of the present invention; and

Figure 6 is a flow diagram illustrating the process performed by the controller in accordance with an embodiment of the present invention.

Figure 1 illustrates a typical circuit for the parameterization of input speech data. In this embodiment the parameters generated are speech vectors.

A microphone 1 records speech in an analogue form and this is input through an anti-aliasing filter 2 to an analogue-to-digital converter 3 which samples the speech at 48 kHz at 20 bits per sample. The digitized output signal is normalized (4) to generated

a 10 millisecond data frame every 5 milliseconds with 5 milliseconds overlap (5). A pre-emphasis operation 6 is applied to the data followed by a hamming window 7. The data is then fast Fourier transformed (FFT) using a 512 point fast Fourier transform (8) before being filtered by filter bank 9 into 12 frequencies. The energy in the data frame 5 is also recorded (13) as an additional feature and together with the 12 frequency outputs of the filter bank 9, 13 feature vectors (10) are thus produced and these are output as part of the 39 feature vectors 14. First and second derivatives (11 and 12) are taken of the 13 feature vectors 10 to complete the generation of the 39 feature vectors 14.

The arrangement illustrated in Figure 1 is purely given for illustration. The present invention encompasses any means by which speech and data can be parameterized to a suitable form for input to the search process as will be described in more detail hereinafter.

Figure 2 is a schematic diagram of a speech recognition circuit in accordance with an embodiment of the present invention for performing the search process. The parameterized speech data, which in this embodiment comprise feature vectors, are input to a feature vector buffer 20. The feature vector buffer 20 is provided to buffer the incoming feature vectors to allow lexical tree processors 21 to read and process the feature vectors in the buffer 20 via a feature vector bus 24. A plurality k of lexical tree processors 21 are arranged in a respective lexical tree processor cluster 22. Each lexical tree processor cluster 22 has an acoustic model memory 23 in which is stored lexical data for use by the lexical tree processors 21 within the lexical tree processor cluster 22. Each lexical tree processor 21 in the lexical tree processor cluster 22 is connected to the acoustic model memory 23 within the lexical tree processor 22. There are N lexical tree processor clusters and thus there are Nk lexical tree processors 21 connected by the feature vector bus 24 to the feature vector buffer 20. Each lexical tree processor 21 is capable of processing a different lexical tree and thus Nk lexical trees can be processed in parallel. The acoustic model memories 23 store as a whole a complete set of lexical data, i.e. lexical tree data structures for use in the lexical tree processing by the lexical tree processors 21. Each acoustic model memory 23 contains part or a segment of the lexical tree data. Since lexical tree processors 21 in a lexical tree processor cluster 22 access the same acoustic model memory 23, it is possible for more than one lexical tree

processor 21 to process the same lexical data. This provides for some degree of flexibility in the controlling of the processing by the lexical tree processors 21. Further, the acoustic model memories 23 need not contain only one copy of the lexical data. It is possible to build in a redundancy in the data to further enhance the flexibility. This avoids any bottleneck in the processing due to the search processing focusing on a small number of lexical trees.

A results memory 25 is provided for storing processing results from the lexical tree processors 21 which are received over the path score and history bus 26. The results memory 25 also stores information on lexical trees to identify which lexical trees are to be processed. A search controller 27 is provided to control the processing performed by the lexical tree processors 21 in dependence upon a program and data stored in program and data memory 28. The search controller reads the path scores and lexical tree identifiers from the results memory and controls the lexical tree processors accordingly. A language model processor 29 is provided which is connected to each lexical tree processor 21 by a language model bus 30. The language model processor 29 accesses a language model memory 31 to read language model data for provision to lexical tree processors 21 in response to language model data requests. External control of the language model memory 31 is provided by a word constraints input. The language model processor 29 determines a score for a word occurring following N previous words using N grams. When a lexical tree processor requires a language model score a request is sent to the language model processor 29 over the language model bus 30 identifying the current word and the N-1 previous words. A language model score for the N gram can be returned to the lexical tree processor 21 for the modification of the score at the end of a branch of lexical tree processing. The lexical tree processor can modify the score in accordance with the language model and output a score to the results memory 25 for a word at the end of a branch of the lexical tree processing. Thus the results memory stores the results as an ordered list of scores for words together with their histories.

The results memory 25 stores the following data:

1. Initial lexical tree data. This comprises pointers to an initial set of lexical trees. No history data is associated with the initial set of lexical trees. The initial set of lexical

trees is predetermined and stored in the results memory 25 based on the most likely initial phones of an utterance. This initial lexical tree data is required to initialize the search process.

2. History data for search results. This comprises a record of a recognition path through the lexical tree recognition process performed by the lexical tree processors 21. The history data includes the current word, the previous N-1 words, the current accumulated score, the phone history (for use in the determination of likely next lexical trees using cross word context dependent tri-phones), and an identifier or pointer to the lexical tree used for identifying the word.
3. Best scores for best paths being processed by each lexical tree processor 21. This information enables the search controller 27 to monitor the processing being performed by lexical tree processors 21 to determine whether a global pruning strategy should be applied in order to reassign processing performed by a lexical tree processor if its best score for its best path is below a threshold or well below the best scores for the paths being processed by other lexical tree processors 21.
4. Temporary lexical tree scores. These comprise tree scores which are determined as temporary scores to prune the next lexical trees to be processed at word ends. The temporary lexical tree scores include lexical tree identifiers or pointers to identify the next lexical trees to be processed. The scores enable the pruning of this list.
5. Pruning threshold. This can be a global threshold value for use in the pruning of the lexical trees globally, or a local threshold value for use by a lexical processor for locally pruning the processing performed by the lexical processor 21.

The acoustic model memory 23 stores a Hidden Markov Model for acoustically modelling words as lexical trees. The acoustic model memory 23 stores a plurality of lexical tree data structures. Each lexical tree data structure comprises an n phone model of a number of words having common prefix phones. The first node of the lexical tree (the root) comprises a common n phone to all words in the lexical tree and uniquely identifies the lexical tree.

Each lexical tree processor 21 includes on-board memory (or local memory) to be used during the lexical tree processing. This working memory has to store all of the parameters currently working on including current scores for all paths being processed within the lexical tree, and previous N-1 words for the lexical tree. The local storage of the previous N-1 words enables the lexical tree processor 21, when a word end is reached along a branch of the lexical tree, to send a request for the language model score for an N gram by sending the identity of the N-1 previous words together with the word identified at the end of the branch.

Figure 3a and 3b schematically illustrate lexical trees which can be processed by the lexical tree processor 21 during the recognition of the two words HARD ROCK. In Figure 3a a previous lexical tree terminated at a branch recognizing the word YOU and terminating with the mono phone uw which is associated with two context dependent tri-phones y-uw+k and y-uw+h. Thus the context dependent tri-phone associated with the last phone in the lexical tree word model for YOU indicates two possible next lexical trees, i.e. the lexical trees beginning with the mono phone k and h and having a left context phone of uw. As can be see in Figure 3a this word end YOU therefore leads to two possible next lexical trees. These two lexical trees are traversed in parallel by two different lexical tree processors accumulating scores for matching of input feature vectors into Hidden Markov Models of the context dependent tri-phones associated with each node in the tree. When the end of the branch is reached, a word end event is reached and a word is recognized. As can be seen in Figure 3a, in this example since four words are of similar phone length, it is possible for the search strategy based on inputting feature vectors in parallel to simultaneously reach a number of possible word ends. These possible word ends are sent as processing results to the results memory. The results memory stores the accumulated score at the word end together with phone history to identify the last phone and its associated context dependent tri-phones. In this example, considering the branch where the word HARD is recognized, the last phone is d which has associated with it two context dependent tri-phones r-d+l and r-d+r. Thus the search controller 27 can identify next possible lexical trees using the next phone in the context dependent tri-phone. In this case, as can be seen in Figure 3b, the next possible lexical trees begin with the phones r and l and have associated with them context dependent tri-phones d-r+ao and d-l+ao respectively. Thus these are the next lexical trees that require processing following the end node or word event detected in

the processing lexical tree 2. Figure 3b thus represents the processing that is required at the end of Figure 3a at the word node for HARD in processing the second lexical tree.

As can be seen in Figure 3b, the two lexical trees are processed in parallel by traversing through the branches to reach word ends by sequentially entering in feature vectors in parallel to lexical tree processors processing the respective lexical trees. When the word end is reached, the accumulated score is output to the results memory as described before. In this case since it is the last word, the important context dependent tri-phone associated with the final phone has silence (sil) as the following phone. The final phone can in fact have 50 context dependent tri-phones associated with it if there are 50 possible next phones (including silence). Figure 3b only illustrates the relevant one for the end of the utterance.

Figure 4 is a flow diagram illustrating the processing performed by a lexical tree processor 21 in order to determine a temporary lexical tree score for a lexical tree. When a word end is identified by a lexical tree processor, the processing results are sent to the results memory 25. The results memory identifies the last phone of the recognized words and thus enables the search controller 27 to identify possible next lexical trees using context dependent tri-phones as illustrated in Figure 3b. Although in theory if there are 50 phones there are 50^2 possible lexical trees, due to the use of the context dependant triphones, only 100-200 lexical trees are likely to be identified as possible lexical trees. The search controller needs to further prune out the lexical trees which are unlikely to generate likely paths with high scores. In order to do this, instructions are sent to the lexical tree processors to determine a temporary lexical tree score which can be used to prune out lexical trees from the processing which have a low score.

The processing by the lexical tree processor to generate the temporary lexical tree score is shown in Figure 4 and for this process, following initialization, a lexical tree processor 21 awaits receipt of data for a new lexical tree from the search controller 27 (step S2). The data comprises a lexical tree pointer on an identifier to lexical tree data stored in the acoustic model memory 23, i.e. the lexical tree data structure, previous N-1 words (for use in language model score determination by the language model processor

29), and the current path score. The previous N-1 words include the previously recognized word for which a score has been accumulated.

The lexical tree processor 21 then attempts to read the next feature vector from the feature vector buffer 20 (step S3) and if this is not available, an error occurs (step S4). If the feature vector is available in the feature vector buffer 20, the lexical tree processor 21 reads the feature vector from the buffer 20 (step S5) and evaluates the state transitions for the first lexical tree node using the acoustic model data in the acoustic model memory 23 (step S6). Since the state transitions for the first node will require several feature vectors to complete, a score is determined for a state transition of the first node in the lexical tree (step S7). The lexical tree processor 21 then sends a request to the language model processor 29 for a language model score. The request includes the previous N-1 words and all of the possible words represented by the lexical tree data structure in the acoustic model memory 23 (step S8). The language model processor returns scores for each of the N grams ending in the words represented by the lexical tree. The lexical tree processor thus receives language model scores for the words in the lexical tree and picks the highest score (step S9). Alternatively, the language model processor 29 can select the highest n gram score and return this to the lexical tree processor for the determination of the temporary lexical tree score. The temporary lexical tree score for the lexical tree is then generated using the score determined for the first state transition of the first lexical tree node and the highest language model score (step S10). The temporary lexical tree score is then sent by the lexical tree processor 21 to the results memory 25 over the bus 26 (step S11). In this mode of processing, the processor then awaits the next data of the new lexical tree from the search controller (step S2).

This process is just one of the processes performed by the lexical tree processor. The main processing performed by the lexical tree processor is the lexical tree evaluation. This process will now be described with reference to the flow diagram of Figure 5.

After the start of the process (step S20) a lexical tree processor awaits receipt of data for a lexical tree from the search controller (step S21). The data comprises a lexical tree pointer to a lexical tree data structure stored in the acoustic model memory 23, the previous N-1 words in the recognition path, and the current accumulated score.

The lexical tree processor then attempts to read the next feature vector from the feature vector buffer 20 (step S22). If this is not available, an error occurs (step S23). If the feature vector is available in the feature vector buffer 20, the feature vector is read from the feature vector buffer 20 by the lexical tree processor 21 (step S24) and the lexical tree processor 21 evaluates the state transitions for each path using the acoustic model data in the acoustic model memory 23 (step S25). Scores for the paths are determined in accordance with the conventional Viterbi search technique and the best score for the best path is sent to the results memory 25 while the path histories are stored locally in the on-board memory of the lexical tree processor 21 (step S26). Pruning is applied to the lexical tree by the lexical tree processor to delete paths in order to keep the breadth of the search manageable (step S27). The pruning applied locally by the lexical tree processor can be purely on the basis of a local threshold, which can be provided by the search controller 27, or it can be determined on a relative basis dependent upon the range of scores for paths being processed within the lexical tree processor 21. If the path has not reached a word end (step S28) the lexical tree processor 21 attempts to read the next feature vector from the feature vector buffer 20 (step S22). If the path reaches a word end (step S28) the score must be modified by the language model score (step S29). There are two ways in which this can be done, in this embodiment the lexical tree processor 21 sends a request to the language model processor 29 for a language model score. The request includes the current word and the N-1 previous words. The language model processor thus returns the language model score and the language model score is used to modify the current accumulated score at the word end. Alternatively, the lexical tree processor can send the language model processor 29 not just the current word and the N-1 previous words, but also the current accumulated score. The language model processor then determines the language model score using the language model memory 31 and modifies the accumulated score using the language model score. The language model processor 29 can then return the modified score to the lexical tree processor 21 which can then pass it to the results memory 25, or a connection between the language model processor 29 and the results memory 25 (not shown) can enable the language model processor 29 to send the score directly to the results memory 25 for the lexical tree processor 21. In this latter case, the language model processor 29 must also receive a lexical tree pointer to identify the lexical tree for which the score applies.

Assuming in this embodiment that the lexical tree processor calculates the modified score (step S29), the score and history is then sent by the lexical tree processor 21 to the results memory 25 (step S30). The history data sent to the results memory 25 comprises the lexical tree pointer identifying the lexical tree, the modified score at the word end, the phone history identifying at least the last phone to allow for context dependent tri-phone determination of next lexical trees, and the identity of the word identified in the evaluation process.

The lexical tree processor then deletes the path and history data in its on-board memory (step S31) and determines if there are any paths still left to be processed (step S32). If so, the lexical tree processor 21 tries to access the next feature vector available in the feature vector buffer 20 (step S22). If there are no paths left to be processed, a message is sent by the lexical tree processor to the search controller 27 to indicate that the lexical tree has been processed (step S33). In this level of processing the lexical tree processor will then await the next data for a lexical tree from the search controller 27.

The flow diagram of Figure 5 illustrates the processing of a single instance of a lexical tree. The single point in time a lexical tree can start to be processed from a feature vector, i.e. lexical tree processing starts at a time frame. However, due to a word end returned from lexical tree processing in another lexical tree processor, the lexical tree processor may also be asked during a subsequent time frame to start processing another instance of the lexical tree with a different path history. Thus a lexical tree processor 21 can be processing multiple instances of the lexical tree with different paths having different path histories. In this instance, the pruning applied in step S27 needs to take into account all paths currently being processed in all instances of lexical tree processing by the lexical tree processor 21. Thus although pruning is applied locally, it is applied over more than one instance of the lexical tree.

The operation of the search controller 27 will now be described with reference to the flow diagram of Figure 6.

After initialization (step S40) initial lexical tree data in the results memory 25 is read (step S41). The search controller distributes the initial lexical tree data amongst the

lexical tree processors for temporary lexical tree score determination (step S42) as described with reference to Figure 4. Temporary lexical tree scores are returned by the lexical tree processors 21 to the results memory 25 (step S43) and the search controller reads the temporary lexical tree scores in the results memory 25 and prunes the lexical trees in the results memory 25 on the basis of the read temporary lexical scores (step S44). Thus the set of initial lexical trees can be quite large and this requires a large number of temporary lexical tree score determinations to be performed by the lexical tree processors 21. However, since the lexical tree processors only need to determine a score for a single feature vector, this can be performed quite quickly. Thus the number of lexical trees for which full evaluation by the lexical tree processors 21 is required can thus be reduced by the selection of the lexical trees with the highest temporary lexical tree score. The search controller then distributes the lexical tree processing among the lexical tree processors 21 by sending each lexical tree processor data including a lexical tree pointer to a lexical tree data structure in the acoustic model memory 23 in the cluster 22. The search controller 27 then awaits the entry of processing results, i.e. history and scores in the results memory 25 for words (step S46). When history and scores for words are entered in the results memory, the search controller 27 determines next possible lexical trees using cross-word tri-phones (step S47). For example, as illustrated in Figures 3a and 3b, when the word HARD is entered in the results memory, the search controller identifies the final phone of the word as being d and thus next possible tri-phones can comprise any tri-phones having the left phone d. If there are 50 possible phones, this results in 50^2 possible tri-phones. In practice, only 1 to 200 are likely. However, this may still represent too many for full evaluation and thus the lexical tree data for the next possible lexical trees are distributed amongst the lexical tree processors for temporary lexical tree score determination (step S48). Temporary lexical tree scores are returned to the results memory 25 by the lexical tree processors 21 which execute the process as described with reference to Figure 4 (step S49).

The search controller 27 prunes the list of next lexical trees in the results memory 25 on the basis of the temporary lexical scores (step S50). The search controller then determines if the words in the results memory have been processed and there are no lexical trees left to be processed and whether or not lexical tree processes are finished (step S51). If not, the lexical tree processing is distributed amongst the lexical tree processors (step S45). When the end of the utterance is reached, next possible lexical

trees will all have been processed and the results can be output from the results memory 25 (step S52).

It can be seen from the foregoing description that the embodiment of the invention provides for an efficient parallel processing system incorporating a parallel lexical tree processing architecture and a segmented lexicon storage architecture. Each lexical tree processor performs lexical tree evaluation and language model look ahead for evaluation of company scores for lexical trees to assist in pruning of the number of potential lexical trees that require processing. The architecture is ideally suited to synchronous breadth first searching e.g. a Viterbi search (i.e. real time recognition). The breadth first search is performed synchronously by the parallel processors on the input search parameters when the language model look ahead takes place, it is possible for the feature vector buffer 20 to store a small number, e.g. one or two, feature vectors whilst the language model look ahead is performed on the feature vector so that synchronous breadth first searching can be carried out by re-reading the feature vector out of the buffer 20 when it is determined which lexical trees are to be evaluated by the lexical trees processors 21 after a word end. Thus, the feature vector buffer 20 provides a method of decoupling the search parameterisation circuitry from the search circuit.

If the buffer causes processing to get too far behind, e.g. there are a lot of word end language model look ahead operations to be performed, it is possible for the lexical tree processors to be controlled to temporarily halve their local beamwidths (i.e. more vigorously prune) and thus complete their processing more quickly. This would allow the content of the buffer to be decreased as the processors catch up.

Although the present invention has been described hereinabove with reference to a specific embodiment, it will be apparent to a skilled person in the art that modifications lie within the spirit and scope of the present invention. Although in the embodiment described hereinabove, the acoustic model memories 23 were described as storing parts of the lexical data, it is also possible for more than one copy of the lexical data to be stored in different acoustic model memories 23. Thus, more than one lexical tree processor cluster 22 can have access to the same lexical data. This increases the flexibility and allows the controller to avoid any bottlenecks in processing which, for

example, can occur if the highest pass scores all require processing by one or a number of lexical tree data structures residing in one of the acoustic model memories 23.

Although in the embodiments described hereinabove, the memory is partitioned in to a plurality of acoustic model memories 23, the present invention is not limited to the partitioning of the lexical data and a plurality of lexical tree processors can access a single memory containing lexical data.

The lexical data stored can comprise mono phone models of words. When the lexical data is partitioned, these can be distributed evenly across the memories. If there are 50 mono phones, there will be 50 lexical tree data structures having a unique initial model phone data node. Alternatively, the lexical tree data structures can comprise a context dependent n phone word models. If there are 50 mono phones, there are potentially 50^n lexical tree data structures. For tri-phones, this comprises 50^3 (i.e. 125,000). These are distributed so that trees with the same left context tri-phone, are eventually spread across memories when the lexical data is partitioned. Thus in this way the word end where the left context tri-phone is fixed i.e. the same, the next possible lexical trees will inherently be distributed across the memories, thus ensuring efficient parallel processing of the next lexical trees.

Although the embodiment described hereinabove uses a single results memory accessible by all processors, the present invention encompasses a plurality of results memories. For example, a results memory can be associated with each processor to store the processing results and the controller can read the results in the plurality of results memories in order to control the processors.

Although in the embodiment described above the input speech parameters are described as being feature vectors, the present invention encompasses any type of parameterization of speech data as an input to the circuit. Such parameterization methods are well known in the art.

Although in the embodiment described above there is only one language model processor, more than one can be used and these can be used to operate in parallel for processing scores at word boundaries.

What is claimed is:

1. A speech recognition circuit comprising:
 - one or more clusters of processors, each said cluster comprising:
 - one or more processors; and
 - an acoustic model memory storing acoustic model data;
 - wherein each said processor is configured to compute a probability using the said acoustic model data in said acoustic model memory;
2. The speech recognition circuit of claim 1 where said probability is an input to an evaluation of a state transition of a model of states.
3. The speech recognition circuit of claim 2 where said model is a Hidden Markov Model.
4. The speech recognition circuit of claim 2 where said probability is computed from a Gaussian mixture model and one or more feature vectors.
5. The speech recognition circuit of claim 1 where the circuit further comprising:
 - a buffer for storing one or more feature vectors coupled to said processors.
6. The speech recognition circuit of claim 5 further comprising:
 - a search controller coupled to said processors and capable of controlling said processors to initiate speech recognition processing in all said processors or in a subset of said processors.
7. The speech recognition circuit of claim 1 wherein the said acoustic model memory in each said cluster of processors is a distinct and separate memory from the said acoustic model memory in each other ones of said clusters of processors.
8. The speech recognition circuit of claim 1 where said acoustic model memory is coupled to all of said processors in all of said clusters of processors.

ABSTRACT OF THE DISCLOSURE

A speech recognition circuit comprises an input buffer for receiving processed speech parameters. A lexical memory contains lexical data for word recognition. The lexical data comprises a plurality of lexical tree data structures. Each lexical tree data structure comprises a model of words having common prefix components. An initial component of each lexical tree structure is unique. A plurality of lexical tree processors are connected in parallel to the input buffer for processing the speech parameters in parallel to perform parallel lexical tree processing for word recognition by accessing the lexical data in the lexical memory. A results memory is connected to the lexical tree processors for storing processing results from the lexical tree processors and lexical tree identifiers to identify lexical trees to be processed by the lexical tree processors. A controller controls the lexical tree processors to process lexical trees identified in the results memory by performing parallel processing on a plurality of said lexical tree data structures.

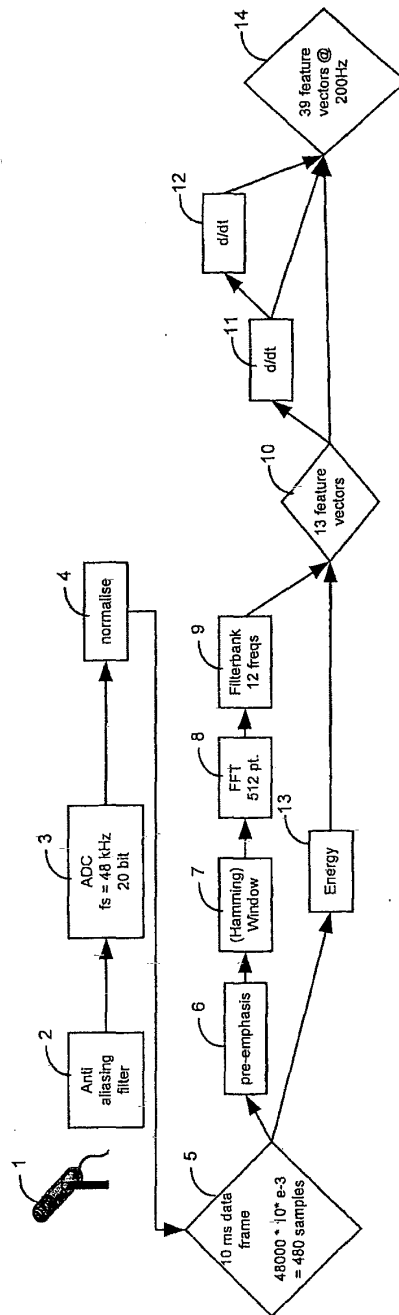


Fig 1

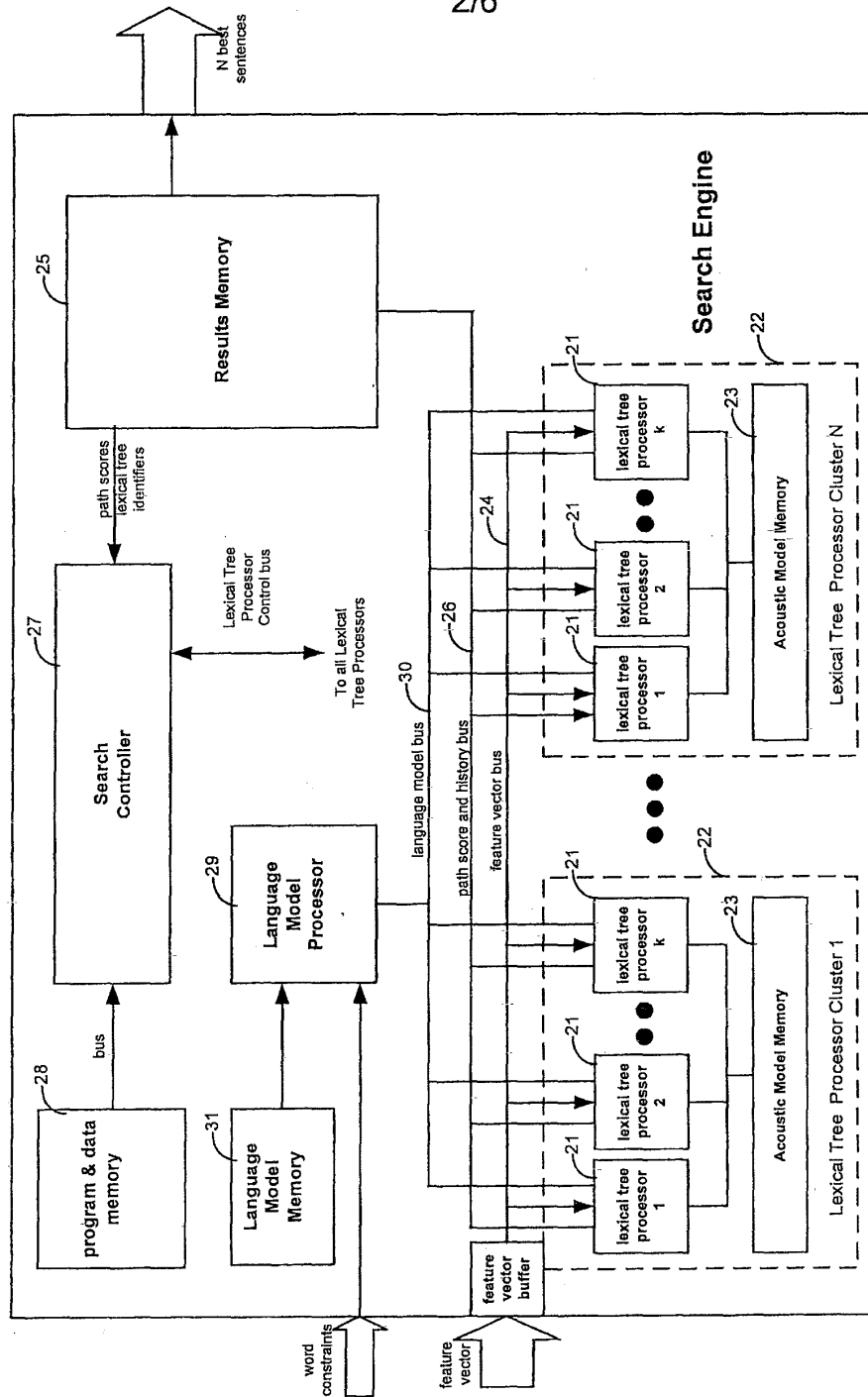


Fig 2

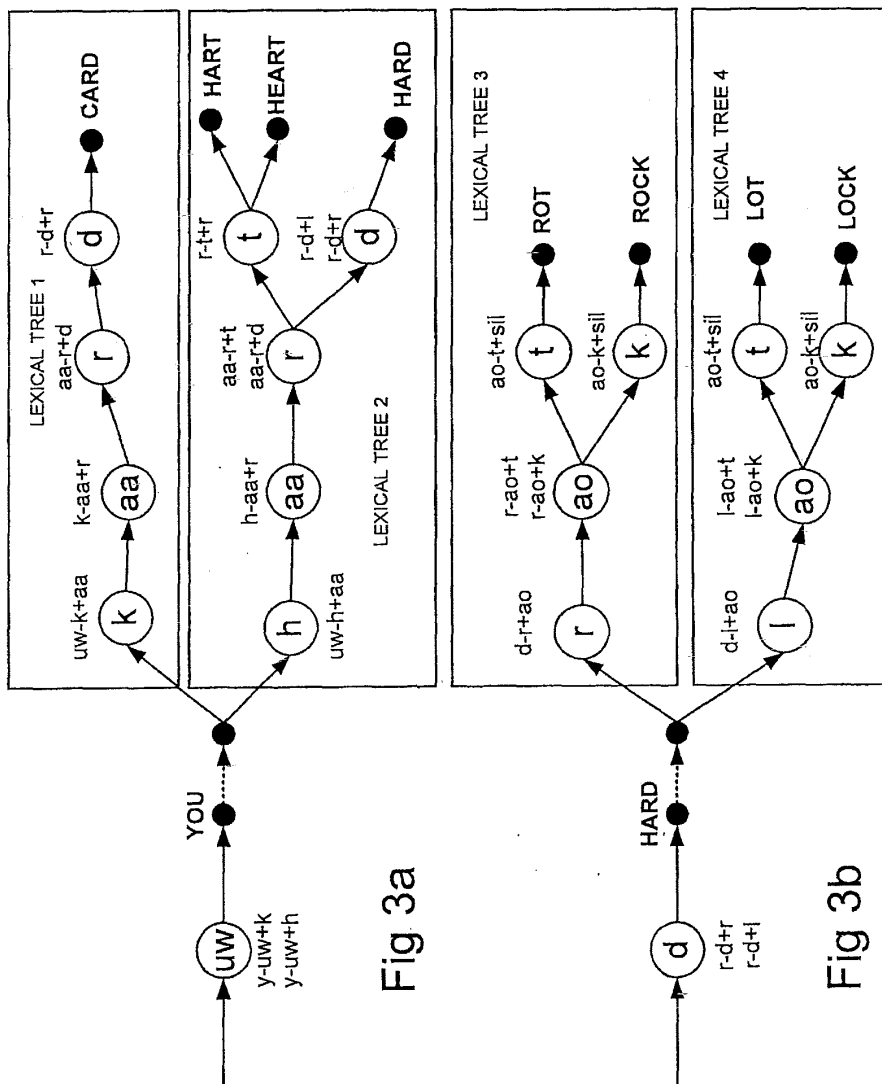


Fig 3a

Fig 3b

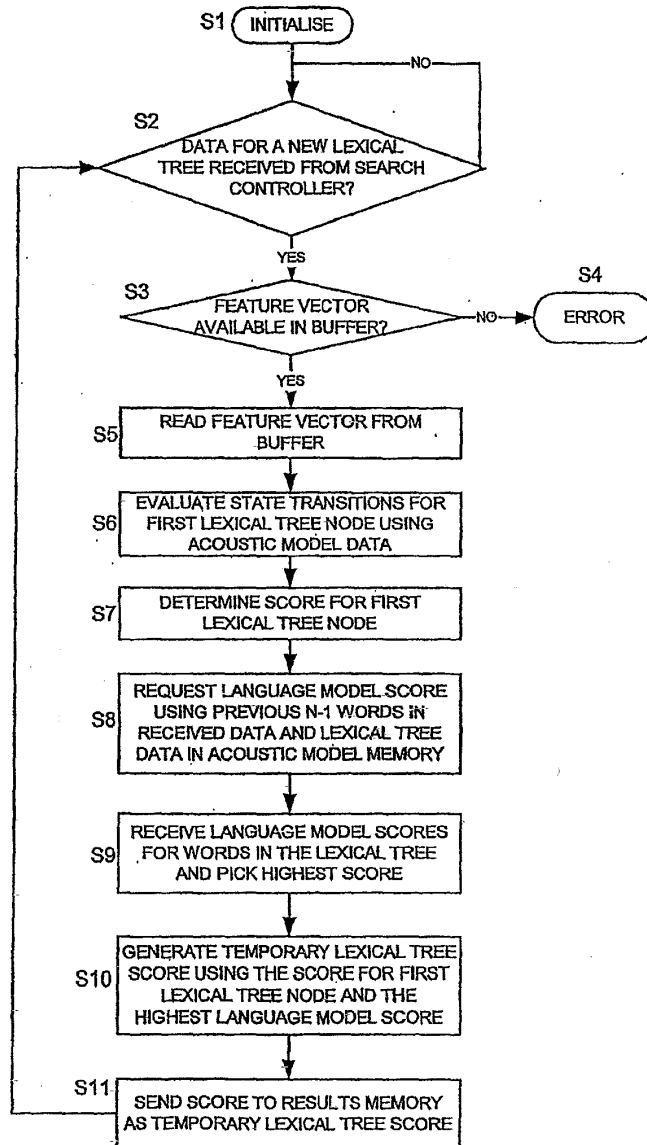


Fig 4

5/6

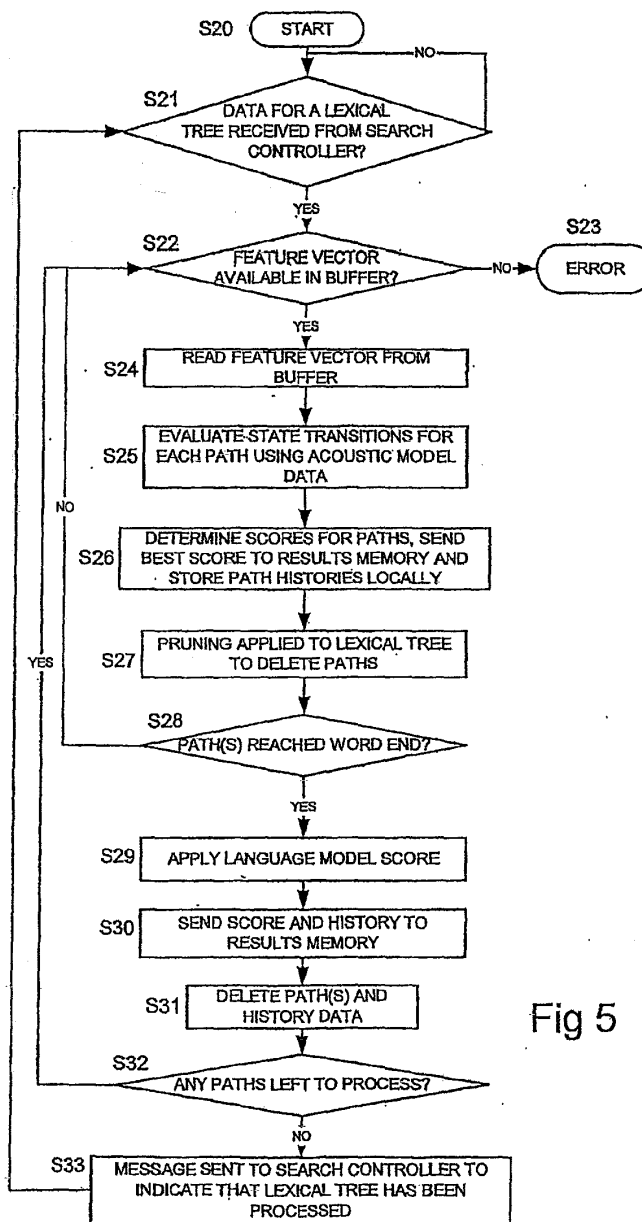
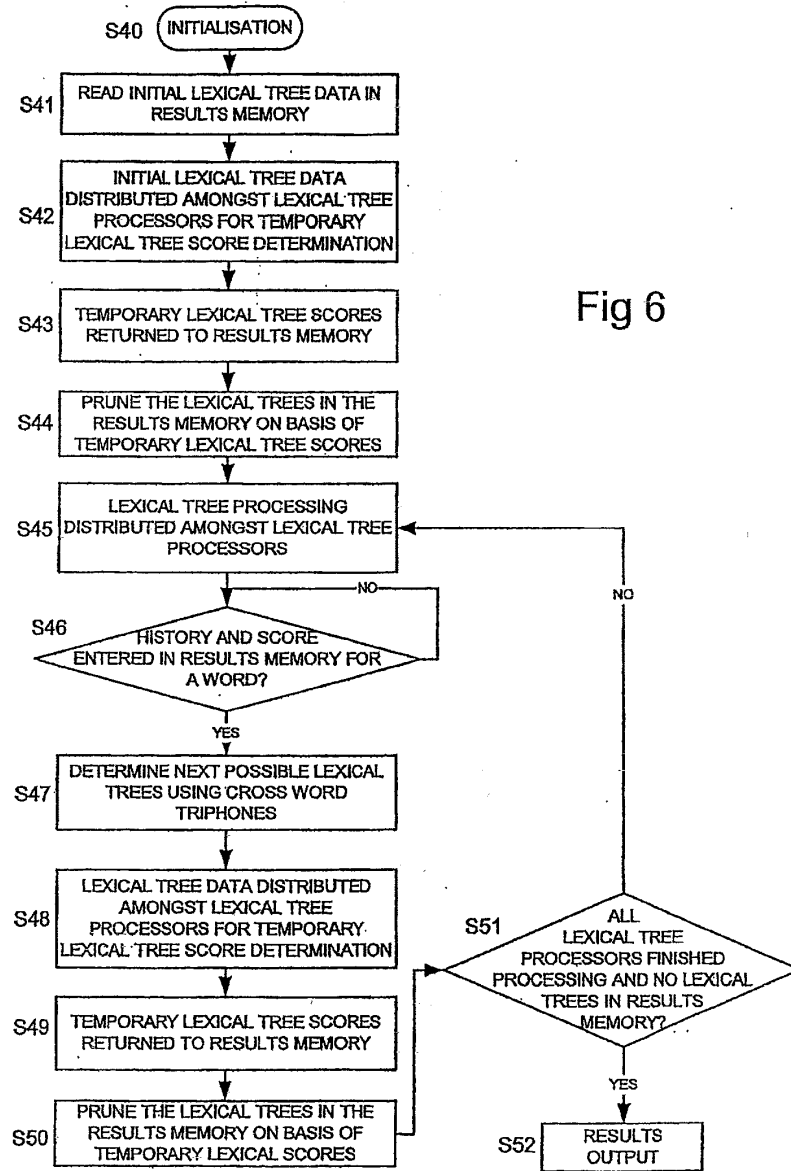


Fig 5



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

**Title of
Invention**

SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS

As the below named inventor, I hereby declare that:

This declaration ☒ The attached application, or
is directed to:

☐ United States application or PCT international application number _____
filed on _____.

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

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

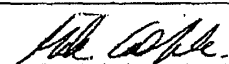
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001
by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

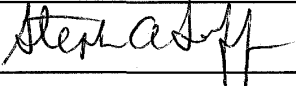
LEGAL NAME OF INVENTOR

Inventor: Mark Catchpole Date (Optional): _____

Signature: 

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

DSMDB-3265089v1

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS			
NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B or equivalent) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.			
Application Number	Not Yet Assigned		
Filing Date	Concurrently Herewith		
First Named Inventor	Mark Catchpole		
Title	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS		
Art Unit	N/A		
Examiner Name	Not Yet Assigned		
Attorney Docket Number	149369-00103		
SIGNATURE of Applicant or Patent Practitioner			
Signature		Date	February 4, 2019
Name	Stephen A. Soffen	Telephone	(202) 420-4879
Registration Number	31,063		
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.			
☒	*Total of <u>1</u> forms are submitted.		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. 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 3 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.**

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

As the Applicant and/or Assignee I hereby appoint:



Practitioners associated with the Customer Number:

24998

OR



Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the Applicant and/or Assignee before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned to the Applicant and/or Assignee, under an obligation to be assigned to the Applicant and/or Assignee, or for which the Applicant and/or Assignee has a sufficient proprietary interest.

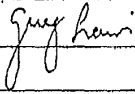
Assignee and/or Applicant Name and Address:

Zentian Limited
Paddock Row
Elsworth, Cambridge
Cambridgeshire CB23 4JG
United Kingdom

The practitioners appointed in this form are authorized to act on behalf of the assignee and/or applicant to transact all business in the United States Patent and Trademark Office.

SIGNATURE of Assignee and/or Applicant

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

Signature		Date	28 July 2014
Name	GUY LARRI	Telephone	07768 424838 in UK
Title and Company	Director, Zentian Limited		

DSMDB-3259765 v1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Mark Catchpole

Application No.: Not Yet Assigned

Confirmation No.: N/A

Filed: Concurrently Herewith

Art Unit: N/A

For: SPEECH RECOGNITION CIRCUIT USING
PARALLEL PROCESSORS

Examiner: Not Yet Assigned

INFORMATION DISCLOSURE STATEMENT (IDS)

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

Dear Sir:

Pursuant to 37 C.F.R. §§ 1.56, 1.97, and 1.98, the attention of the United States Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of the above-identified application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement accompanies the new patent application submitted herewith.

Copies of the references on the PTO/SB/08 are not provided.

In accordance with 37 C.F.R. § 1.98(d)(1) and as noted by a double-asterisk next to the Cite No. on the attached PTO/SB/08, the following references are not supplied because they were previously cited by or submitted to the Office in prior application number 15/392,396 filed December 28, 2016 and relied on in the above-identified application for an earlier effective filing

149369.00101/117147574v.1

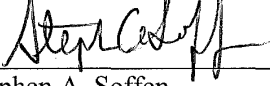
date under 35 U.S.C. § 120.

In accordance with 37 C.F.R. § 1.97(g), the filing of this Information Disclosure Statement shall not be construed as a representation that a search has been made. In accordance with 37 C.F.R. § 1.97(h), the filing of this Information Disclosure Statement shall not be construed to be an admission that the information cited in this Information Disclosure Statement is, or is considered to be, material to the patentability as defined in 37 C.F.R. § 1.56(b).

It is submitted that the Information Disclosure Statement is in compliance with 37 C.F.R. § 1.98, and the Examiner is respectfully requested to consider the listed references.

Dated: February 4, 2019

Respectfully submitted,

By 

Stephen A. Soffen

Registration No.: 31,063
BLANK ROME LLP
1825 Eye Street, NW
Washington, DC 20006-5403
(202) 420-2200
Attorney for Applicant

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	Not Yet Assigned
				Filing Date	Concurrently Herewith
				First Named Inventor	Mark Catchpole
				Art Unit	N/A
				Examiner Name	Not Yet Assigned
Sheet	1	of	2	Attorney Docket Number	149369-00103

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
**	AA	7,174,037 B2	02-2007	Arnone et al.	
**	AB	5,293,213	03-1994	Klein et al.	
**	AC	2003/0178584 A1	09-2003	Arnone et al.	
**	AD	6,526,380	02-2003	Thelen	
**	AE	5,983,180	11-1999	Robinson	
**	AF	6,374,222	04-2002	Kao	
**	AG	5,960,395	09-1999	Tzirkel-Hanock	
**	AH	5,832,428	11-1998	Chow	
**	AI	7,035,802	04-2006	Rigazio	
**	AJ	5,983,180	11-1999	Robinson	
**	AK	5,621,859	04-1997	Schwartz	
**	AL	5,349,645	09-1994	Zhao	
**	AM	5,457,768	10-1995	Tsuboi	
**	AN	5,832,428	11-1998	Chow et al.	
**	AO	5,881,312	03-1999	Dulong	
**	AP	5,995,930	11-1999	Hab-Umbach et al.	
**	AQ	6,047,283	04-2000	Braun	
**	AR	2001/0011218 A1	08-2001	Phillips et al.	
**	AS	2002/0143531	10-2002	Kahn	
**	AT	7,035,802	04-2006	Rigazio et al.	
**	AU	7,120,582	10-2006	Young et al.	
**	AV	2008/0255839 A1	10-2008	Larri et al.	
**	AW	7,899,669	03-2011	Gadbois	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T ⁶
		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)				
**	BA	GB 2 380 920 A	04-2003			
**	BB	GB 2 347 835 A	09-2000			
**	BC	WO 00/50859	08-2000			
**	BD	WO-03/067572 A2	08-2003			
**	BE	GB-2 331 392 A	05-1999			
**	BF	GB-2 112 194 A	07-1983			

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

149369.00101/117147599v.1

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	Not Yet Assigned
				Filing Date	Concurrently Herewith
				First Named Inventor	Mark Catchpole
				Art Unit	N/A
				Examiner Name	Not Yet Assigned
Sheet	2	of	2	Attorney Docket Number	149369-00103

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²	
**	CA	R.M. Woodward et al., "Tissue Classification Using Terahertz Pulsed Imaging", Proceedings of the SPIE - The International Society for Optical Engineering SPIE-INT. SOC. OPT. ENG. USA, Vol. 5318, No.1, 2004, pp. 23-33. Abstract also attached.		
**	CB	V.P. Wallace et al., "Biomedical Applications of THz Imaging", Microwave Symposium Digest, 2004, IEEE MTT-S International Fort Worth, TX, USA, June 6-11, 2004, Piscataway, NJ, USA, IEEE, Vol. 3, 6 June 2004 (2004 06-06), pp. 1579-1581		
**	CC	V.P. Wallace et al., "Biomedical Applications of Terahertz Pulse Imaging", Second Joint EMBS-BMES Conference 2002. Conference Proceedings. 24th Annual International Conference of the Engineering in Medicinal and Biology Society. Annual Fall Meeting of the Biomedical Engineering Society, Houston, TX, Oct. 23-26, 2002, Annual Vol. 1 of 3. Conf. 24, 23 October 2002 (2002-10-23), pp. 2333-2334.		
**	CD	A.J. Fitzgerald et al., "Terahertz Imaging of Breast Cancer, a Feasibility Study", Conference Digest of the 2004 Joint 29th International Conference on Infrared and Millimeter Waves and 12th International Conference on Terahertz Electronics IEEE Piscataway, NJ, USA, 2004, pp. 823-824.		
**	CE	B.E. Cole et al., "Terahertz Imaging and Spectroscopy of Human Skin, In-vivo", Proceedings of SPIE, Vol. 4276, pp. 1-10.		
**	CF	S. Glinski et al., "Spoken Language Recognition on a DSP Array Processor", IEEE Transactions on Parallel and Distributed Systems, July 5, 1994, No. 7, New York, USA, pp. 697-703.		
**	CG	S. Chatterjee et al., "Connected Speech Recognition on a Multiple Processor Pipeline", ICASSP 89, May 23, 1989, Glasgow, UK, pp. 774-777.		
**	CH	S. H. Chung et al. "A Parallel Phoneme Recognition Algorithm Based on Continuous Hidden Markov Model", Proceedings 13th International Parallel Processing Symposium and 10th Symposium on Parallel and Distributed Processing, IPPS/SPDP 1999, Proceedings of 13th International Parallel Processing Symposium and 10th Symposium on Parallel and Distributed Pro, IEEE Comput. Soc. pp. 453-457 (1999)		
**	CI	S.H. Chung et al. "A Parallel Computation Model for Integrated Speech and Natural Language Understanding", IEEE Transactions on Computers, Vol. 42, No. 10, October 1, 1993		
**	CJ	N. Deshmukh et al. "Hierarchical Search for Large-Vocabulary Conversational Speech Recognition: Working Toward a Solution to the Decoding Problem", IEEE Signal Processing Magazine, Vol. 16, No. 5, pp. 84-107 (September 1999)		

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

¹Applicant's unique citation designation number (optional). ²Applicant is to place a check mark here if English language Translation is attached.

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

149369.00101/117147599v.1

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS		
First Named Inventor/Applicant Name:		Mark Catchpole		
Filer:		Stephen A. Soffen/Cheryl de Lopez		
Attorney Docket Number:		149369-00103		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				785

Electronic Acknowledgement Receipt	
EFS ID:	35045773
Application Number:	16266265
International Application Number:	
Confirmation Number:	7067
Title of Invention:	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS
First Named Inventor/Applicant Name:	Mark Catchpole
Customer Number:	24998
Filer:	Stephen A. Soffen/Cheryl de Lopez
Filer Authorized By:	Stephen A. Soffen
Attorney Docket Number:	149369-00103
Receipt Date:	04-FEB-2019
Filing Date:	
Time Stamp:	12:24:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$785
RAM confirmation Number	020419INTEFSW12245100
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		continuation00103.pdf	3595315	yes	41
			a91e264d232b257ee07f466f7dd37e6836531911		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal of New Application		1	1	
	Application Data Sheet		2	6	
	Preliminary Amendment		7	7	
	Specification		8	8	
	Applicant Arguments/Remarks Made in an Amendment		9	9	
	Specification		10	26	
	Claims		27	27	
	Abstract		28	28	
	Drawings-only black and white line drawings		29	34	
	Oath or Declaration filed		35	35	
	Power of Attorney		36	37	
	Transmittal Letter		38	39	
	Information Disclosure Statement (IDS) Form (SB08)		40	41	
Warnings:					
Information:					

2	Fee Worksheet (SB06)	fee-info.pdf	35106	no	2
			00d4a79e0a623ad63c19517ffc029194b35a2934		
Warnings:					
Information:					
Total Files Size (in bytes):				3630421	
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.					

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 16/266,265			
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	75	N/A			
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A		N/A	330	N/A			
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	380	N/A			
TOTAL CLAIMS (37 CFR 1.16(i))	8	minus 20 =	*	x 50 =	0.00	OR			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 =	*	x 230 =	0.00				
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				0.00				
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					0.00				
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	785	TOTAL			
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	RATE(\$)	ADDITIONAL FEE(\$)		
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=		
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=		
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
TOTAL ADD'L FEE				TOTAL ADD'L FEE					
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	RATE(\$)	ADDITIONAL FEE(\$)		
	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=		
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=		
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
TOTAL ADD'L FEE				TOTAL ADD'L FEE					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.									



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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/266,265	02/04/2019	2658	785	149369-00103	8	1

CONFIRMATION NO. 7067

FILING RECEIPT



24998
Blank Rome LLP
1825 Eye Street, NW
Washington, DC 20006-5403

Date Mailed: 02/25/2019

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 submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Mark Catchpole, Prickwillow, UNITED KINGDOM;

Applicant(s)

Zentian Limited, Cambridge, UNITED KINGDOM;

Power of Attorney: The patent practitioners associated with Customer Number 24998

Domestic Priority data as claimed by applicant

This application is a CON of 15/392,396 12/28/2016 PAT 10217460
which is a CON of 14/309,476 06/19/2014 PAT 9536516
which is a CON of 13/253,223 10/05/2011 PAT 8768696
which is a CON of 12/554,607 09/04/2009 PAT 8036890
which is a CON of 10/503,463 05/24/2005 PAT 7587319
which is a 371 of PCT/GB2003/000459 02/04/2003

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

UNITED KINGDOM 0202546.8 02/04/2002 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 02/21/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/266,265**

Projected Publication Date: 06/06/2019

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS

Preliminary Class

704

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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

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

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.



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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/266,265	02/04/2019	Mark Catchpole	149369-00103

CONFIRMATION NO. 7067

24998
Blank Rome LLP
1825 Eye Street, NW
Washington, DC 20006-5403

PUBLICATION NOTICE



OC000000108728005

Title:SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS

Publication No.US-2019-0172447-A1

Publication Date:06/06/2019

NOTICE OF PUBLICATION OF APPLICATION

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

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

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

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

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

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



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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/266,265	02/04/2019	Mark Catchpole	149369-00103	7067
24998	7590	12/09/2019	EXAMINER	
Blank Rome LLP			ABEBE, DANIEL DEMELASH	
1825 Eye Street, NW				
Washington, DC 20006-5403				
			ART UNIT	PAPER NUMBER
			2657	
			NOTIFICATION DATE	DELIVERY MODE
			12/09/2019	ELECTRONIC

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

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

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

WashingtonDocketing@blankrome.com

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Claim Objections

Claim1 is objected to because of the following informalities: it doesn't end with a period. Appropriate correction is required.

Claim Rejections - 35 USC § 102

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

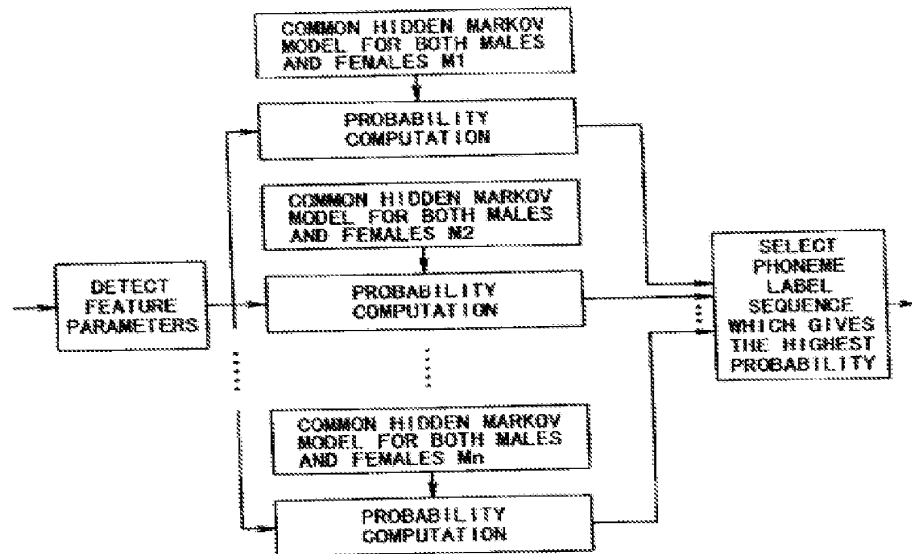
A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim(s) 1-4 and 7-8 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Miazaki et al. (US 2005/0119883).

As to claim 1, Miazaki teaches a speech recognition circuit (Fig.8) comprising:
one or more clusters of processors (probability computation model), each said cluster comprising: one or more processors; and
an acoustic model memory storing acoustic model data (HMM data);
wherein each said processor is configured to compute a probability using the said acoustic model data in said acoustic model memory (Figs.8, 10).

FIG. 8



As to claim 2, Miyazaki teaches where said probability is an input to an evaluation of a state transition of a model of states (claim 1).

As to claim 3, Miyazaki teaches where said model is a Hidden Markov Model (Fig.8).

As to claim 4, Miyazaki teaches where said probability is computed from a Gaussian mixture model and one or more feature parameters (Fig.8).

As to claims 7-8, Miyazaki teaches wherein the said acoustic model memory in each said cluster of processors is a distinct and separate and where said acoustic model memory is coupled to all of said processors in all of said clusters of processors (Figs.8, 10).

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Miazaki as applied above and in view of Bahl et al. (US 4,980,918).

As to claim 6, Miazaki doesn't explicitly teach a search controller. Bahl teaches a speech recognition system comprising a search controller (Figs.7-8, #1002).

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to combine the two analogous teachings in order to improve the recognition process.

Claim 5 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Miazaki as applied above and in view of Chang et al. (US 7,024,359).

With regard to claim 5, Miazaki doesn't explicitly teach the buffer as claimed. Chang teaches a speech recognition system comprising a buffer for storing one or more feature vectors (Fig.1, 227). The buffer would be obvious in Miazaki teaching in order to temporarily store the extracted feature vectors for modification and other purposes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL DEMELASH ABEBE whose telephone number is (571)272-7615. The examiner can normally be reached on monday-friday 7-4.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel Washburn can be reached on 571-272-5551. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. 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 questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

Application/Control Number:16/266,265
Art Unit:2657

Page6

USPTO Customer Service Representative or access to the automated information
system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DANIEL ABEBE/
Primary Examiner, Art Unit 2657

<i>Notice of References Cited</i>	Application/Control No. 16/266,265	Applicant(s)/Patent Under Reexamination Catchpole, Mark	
	Examiner DANIEL D ABEBE	Art Unit 2657	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20050119883-A1	06-2005	Miyazaki, Toshiyuki	G10L15/142	704/231
*	B	US-4977599-A	12-1990	Bahl; Lalit R.	G10L15/02	704/256.4
*	C	US-5579436-A	11-1996	Chou; Wu	G10L15/063	704/236
*	D	US-5710866-A	01-1998	Alleva; Fileno A.	G10L15/10	704/246
*	E	US-5983180-A	11-1999	Robinson; Anthony John	G10L15/142	704/254
*	F	US-7065488-B2	06-2006	Yajima; Kiyoshi	G10L15/20	704/226
*	G	US-4980918-A	12-1990	Bahl; Lalit R.	G10L15/08	704/240
*	H	US-7024359-B2	04-2006	Chang; Chienchung	G10L15/065	704/251
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

*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.

Search Notes 	Application/Control No. 16/266,265	Applicant(s)/Patent Under Reexamination Catchpole, Mark
	Examiner DANIEL D ABEBE	Art Unit 2657

CPC - Searched*		
Symbol	Date	Examiner
G10L 15/32, 15/34	12/04/2019	DA

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes		
Search Notes	Date	Examiner
WEST search	12/04/2019	DA

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/DANIEL ABEBE/ Primary Examiner, Art Unit 2657	
---	--

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Application Number	Not Yet Assigned
				Filing Date	Concurrently Herewith
				First Named Inventor	Mark Catchpole
				Art Unit	N/A
				Examiner Name	Not Yet Assigned
Sheet	1	of	2	Attorney Docket Number	149369-00103

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
**	AA	7,174,037 B2	02-2007	Arnone et al.	
**	AB	5,293,213	03-1994	Klein et al.	
**	AC	2003/0178584 A1	09-2003	Arnone et al.	
**	AD	6,526,380	02-2003	Thelen	
**	AE	5,983,180	11-1999	Robinson	
**	AF	6,374,222	04-2002	Kao	
**	AG	5,960,395	09-1999	Tzirkel-Hanock	
**	AH	5,832,428	11-1998	Chow	
**	AI	7,035,802	04-2006	Rigazio	
**	AJ	5,983,180	11-1999	Robinson	
**	AK	5,621,859	04-1997	Schwartz	
**	AL	5,349,645	09-1994	Zhao	
**	AM	5,457,768	10-1995	Tsuboi	
**	AN	5,832,428	11-1998	Chow et al.	
**	AO	5,881,312	03-1999	Dulong	
**	AP	5,995,930	11-1999	Hab-Umbach et al.	
**	AQ	6,047,283	04-2000	Braun	
**	AR	2001/0011218 A1	08-2001	Phillips et al.	
**	AS	2002/0143531	10-2002	Kahn	
**	AT	7,035,802	04-2006	Rigazio et al.	
**	AU	7,120,582	10-2006	Young et al.	
**	AV	2008/0255839 A1	10-2008	Larri et al.	
**	AW	7,899,669	03-2011	Gadbois	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T ⁶
		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)				
**	BA	GB 2 380 920 A	04-2003			
**	BB	GB 2 347 835 A	09-2000			
**	BC	WO 00/50859	08-2000			
**	BD	WO-03/067572 A2	08-2003			
**	BE	GB-2 331 392 A	05-1999			
**	BF	GB-2 112 194 A	07-1983			

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

Examiner Signature	/DANIEL ABEBE/	Date Considered	12/04/2019
--------------------	----------------	-----------------	------------

149369.00101/117147599v.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.A./

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	Not Yet Assigned
				Filing Date	Concurrently Herewith
				First Named Inventor	Mark Catchpole
				Art Unit	N/A
				Examiner Name	Not Yet Assigned
Sheet	2	of	2	Attorney Docket Number	149369-00103

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²	
**	CA	R.M. Woodward et al., "Tissue Classification Using Terahertz Pulsed Imaging", Proceedings of the SPIE - The International Society for Optical Engineering SPIE-INT. SOC. OPT. ENG. USA, Vol. 5318, No.1, 2004, pp. 23-33. Abstract also attached.		
**	CB	V.P. Wallace et al., "Biomedical Applications of THz Imaging", Microwave Symposium Digest, 2004, IEEE MTT-S International Fort Worth, TX, USA, June 6-11, 2004, Piscataway, NJ, USA, IEEE, Vol. 3, 6 June 2004 (2004 06-06), pp. 1579-1581		
**	CC	V.P. Wallace et al., "Biomedical Applications of Terahertz Pulse Imaging", Second Joint EMBS-BMES Conference 2002. Conference Proceedings. 24th Annual International Conference of the Engineering in Medicinal and Biology Society. Annual Fall Meeting of the Biomedical Engineering Society, Houston, TX, Oct. 23-26, 2002, Annual Vol. 1 of 3. Conf. 24, 23 October 2002 (2002-10-23), pp. 2333-2334.		
**	CD	A.J. Fitzgerald et al., "Terahertz Imaging of Breast Cancer, a Feasibility Study", Conference Digest of the 2004 Joint 29th International Conference on Infrared and Millimeter Waves and 12th International Conference on Terahertz Electronics IEEE Piscataway, NJ, USA, 2004, pp. 823-824.		
**	CE	B.E. Cole et al., "Terahertz Imaging and Spectroscopy of Human Skin, In-vivo", Proceedings of SPIE, Vol. 4276, pp. 1-10.		
**	CF	S. Glinski et al., "Spoken Language Recognition on a DSP Array Processor", IEEE Transactions on Parallel and Distributed Systems, July 5, 1994, No. 7, New York, USA, pp. 697-703.		
**	CG	S. Chatterjee et al., "Connected Speech Recognition on a Multiple Processor Pipeline", ICASSP 89, May 23, 1989, Glasgow, UK, pp. 774-777.		
**	CH	S. H. Chung et al. "A Parallel Phoneme Recognition Algorithm Based on Continuous Hidden Markov Model", Proceedings 13th International Parallel Processing Symposium and 10th Symposium on Parallel and Distributed Processing, IPPS/SPDP 1999, Proceedings of 13th International Parallel Processing Symposium and 10th Symposium on Parallel and Distributed Pro, IEEE Comput. Soc. pp. 453-457 (1999)		
**	CI	S.H. Chung et al. "A Parallel Computation Model for Integrated Speech and Natural Language Understanding", IEEE Transactions on Computers, Vol. 42, No. 10, October 1, 1993		
**	CJ	N. Deshmukh et al. "Hierarchical Search for Large-Vocabulary Conversational Speech Recognition: Working Toward a Solution to the Decoding Problem", IEEE Signal Processing Magazine, Vol. 16, No. 5, pp. 84-107 (September 1999)		

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

¹Applicant's unique citation designation number (optional). ²Applicant is to place a check mark here if English language Translation is attached.

Examiner Signature	/DANIEL ABEBE/	Date Considered	12/04/2019
--------------------	----------------	-----------------	------------

149369.00101/117147599v.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /D.A./

WEST Search History for Application 16266265

Creation Date: 2019120412:03

Prior Art Searches

Query	DB	Hits	Op.	Plur.	Thes.	Date
("20020007273" "20050240402" "20060184861" "20060265216" "20070027683" "20070094009" "20070118369" "20070271480" "20080033718" "20080126096" "20080126904" "20080133242" "20080294428" "20100008663" "20100057447" "20110099008" "5729556" "6968309" "7590525" "7805297" "7931076" "7962835" "8423358" "8457115" "8468015" "8620644" "8693540" "8712765" "9357233").PN.	PGPB, USPT	29	ADJ	YES		11-29-2019
((state transition near4 probability) and (acoustic model) and ((G10L15/22 G10L15/063 G10L2015/025 G10L15/26 G10L13/08 G10L15/02 G10L15/142 G10L15/16 G10L2015/223 G10L15/14 G10L15/08 G10L15/20 G10L15/144 G10L2015/0635 G10L2015/088 G10L15/187 G10L13/033 G10L15/065 G10L15/07 G10L15/19 G10L15/265 G10L25/63 G10L13/02 G10L15/30 G10L17/00 G10L17/02 G10L2015/228 G10L13/027 G10L13/04 G10L13/086 G10L13/10 G10L15/06 G10L15/1807 G10L15/1815 G10L15/1822 G10L15/34 G10L17/04 G10L2015/0633 G10L2021/02082 G10L21/0272 G10L21/10 G10L25/78 G10L13/00 G10L13/047 G10L15/075 G10L15/18 G10L15/197 G10L15/28 G10L15/285 G10L17/26 G10L19/005 G10L2015/081 G10L2019/0012 G10L2021/0135 G10L2021/105 G10L25/18 G10L25/21 G10L25/51 G10L13/06 G10L13/07 G10L15/005 G10L15/01 G10L15/05 G10L15/083 G10L15/10 G10L15/193 G10L15/24 G10L15/32 G10L17/16 G10L19/0212 G10L19/032 G10L2013/105 G10L2015/022 G10L2015/027 G10L2015/225 G10L2015/226 G10L2021/02166 G10L2025/786 G10L21/00 G10L21/0208 G10L21/0232 G10L21/028 G10L25/24 G10L25/27 G10L25/54 G10L25/84 G10L25/90).CPC.) and ((acoustic) near4 (similarity or likelihood or match\$4 or probability))) and transition\$4) AND @pd>20191202	PGPB, USPT	0	ADJ	YES		12-03-2019



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. 7067

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
16/266,265	02/04/2019	704	2657	149369-00103

APPLICANTS Zentian Limited, Cambridge, UNITED KINGDOM; INVENTORS Mark Catchpole, Prickwillow, UNITED KINGDOM; ** CONTINUING DATA ***** This application is a CON of 15/392,396 12/28/2016 PAT 10217460 which is a CON of 14/309,476 06/19/2014 PAT 9536516 which is a CON of 13/253,223 10/05/2011 PAT 8768696 which is a CON of 12/554,607 09/04/2009 PAT 8036890 which is a CON of 10/503,463 05/24/2005 PAT 7587319 which is a 371 of PCT/GB2003/000459 02/04/2003 ** FOREIGN APPLICATIONS ***** UNITED KINGDOM 0202546.8 02/04/2002 ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED *** SMALL ENTITY ** 02/21/2019					
--	--	--	--	--	--

Foreign Priority claimed ☒ Yes ☐ No	☐ Met after Allowance Initials _____	STATE OR COUNTRY UNITED KINGDOM	SHEETS DRAWINGS 6	TOTAL CLAIMS 8	INDEPENDENT CLAIMS 1
35 USC 119(a-d) conditions met ☒ Yes ☐ No					
Verified and /DANIEL DEMELASH					
Acknowledged ABEBE/ Examiner's Signature _____					

ADDRESS Blank Rome LLP 1825 Eye Street, NW Washington, DC 20006-5403 UNITED STATES	
---	--

TITLE SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS	
--	--

FILING FEE RECEIVED 785	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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Mark CATCHPOLE et al.	)	Group Art Unit: 2657
	)	
Application No.: 16/266,265	)	Examiner: Daniel Demelash ABEBE
	)	
Filed: February 4, 2019	)	Confirmation No.: 7067
	)	
For: SPEECH RECOGNITION	)	<i>Via EFS-Web</i>
CIRCUIT USING PARALLEL	)	
PROCESSORS	)	

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

Dear Commissioner:

AMENDMENT

In reply to the Office Action dated December 9, 2019, the period for response having been extended through May 11, 2020 (May 9 being a Saturday) by a petition for a two-month extension and appropriate fee, Applicant respectfully requests reconsideration of this application in view of the following:

Amendments to the Claims are reflected in the listing of the claims that begins on page 2 of this paper.

Remarks begin on page 5 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A speech recognition circuit comprising:
one or more clusters of processors, each ~~said cluster of the one or more clusters~~
of processors comprising:
one or more a plurality of processors; and
an acoustic model memory storing acoustic model data[[:]], wherein each
~~said processor of the plurality of processors~~ is configured to compute a
probability using the [[said]] acoustic model data in [[said]] the acoustic model
memory[[:]].
2. (Currently Amended) The speech recognition circuit of claim 1, ~~where said~~ wherein
the probability is an input to an evaluation of a state transition of a model of states.
3. (Currently Amended) The speech recognition circuit of claim 2, ~~where said~~ wherein
the model is a Hidden Markov Model.
4. (Currently Amended) The speech recognition circuit of claim 2, ~~where said~~ wherein
the probability is computed from a Gaussian mixture model and one or more feature
vectors.

5. (Currently Amended) The speech recognition circuit of claim 1, ~~where the circuit~~
further comprising:

a buffer for storing one or more feature vectors coupled to ~~[[said]]~~ at least one
of processor of one of the one or more clusters of processors.

6. (Currently Amended) The speech recognition circuit of claim 5, further comprising:

a search controller coupled to ~~said processors~~ the at least one of processor of
one of the one or more clusters of processors and capable of controlling said
~~processors~~ at least one of processor of one of the one or more clusters of processors to
initiate speech recognition processing in ~~all said processors or in~~ at least a subset of
~~[[said]] processors~~ of the one or more clusters of processors.

7. (Currently Amended) The speech recognition circuit of claim 1, wherein:

the one or more clusters of processors comprises a first cluster of processors
and a second cluster of processors;

the first cluster comprises a first acoustic model memory; and

the second cluster comprises a second acoustic model memory that is distinct
and separate from the first acoustic model memory ~~the said acoustic model memory in~~
~~each said cluster of processors is a distinct and separate memory from the said~~
~~acoustic model memory is each other ones of said clusters of processors.~~

8. (Currently Amended) The speech recognition circuit of claim 1, ~~where said~~ wherein:

the one or more clusters of processors comprises a first cluster of processors;

and

the first cluster comprises a first acoustic model coupled to all processors of the
first cluster ~~acoustic model memory is coupled to all of said processors in all of said~~
~~clusters of processors.~~

9. (New) The speech recognition circuit of claim 2, wherein the processors of the one or more clusters of processors are fabricated on a single integrated circuit.

10. (New) The speech recognition circuit of claim 9, wherein:

the speech recognition circuit is configured to generate an initial score for an audio sample; and

the initial score is used to determine whether to continue processing to determine a final score via processing a larger amount of model data than that was processed to generate the initial score.

REMARKS

I. Status of the Claims

In the Office Action dated December 9, 2019 (the "Office Action"),¹ the Examiner took the following actions:

- i. objected to claim 1 as allegedly containing informalities;
- ii. rejected claims 1-4, 7, and 8 under 35 U.S.C. § 102(e) as allegedly anticipated by U.S. Patent Application Publication No. 2005/0119883 ("*Miazaki*");
- iii. rejected claim 6 under 35 U.S.C. § 103(a) as allegedly unpatentable over *Miazaki* and U.S. Patent No. 4,980,918 ("*Bahl*"); and
- iv. rejected claim 5 under 35 U.S.C. § 103(a) as allegedly unpatentable over *Miazaki* and U.S. Patent No. 7,024,359 ("*Chang*").

By this Amendment, Applicant amends claims 1-8. Claims 9 and 10 have been added. No new subject matter has been added. Support for the amendments and new claims can be found in the as-filed specification at, for example, pages 7-8 and 11-12, and Figure 2. Claims 1-10 are pending, of which claim 1 is independent.

In view of the above amendments and following remarks, Applicant respectfully requests reconsideration and withdrawal of the objection and rejections, and timely allowance of the pending claims.

II. Claim Objection

Applicant respectfully traverses the claim objection for alleged informalities. Nevertheless, without acquiescing to the objection, and solely to advance prosecution,

¹ The Office Action contains a number of statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant declines to automatically subscribe to any statement or characterization in the Office Action.

Applicant has amended claim 1. In view of the amendments, Applicant respectfully requests withdrawal of the claim objection.

III. Claim Rejection Under 35 U.S.C. § 102

Applicant respectfully traverses the rejection of claims 2-4, 7, and 8 under 35 U.S.C. § 102(e) as allegedly anticipated by *Miazaki*. *Miazaki* does not teach each and every element of the claims.

Miazaki relates to “speech recognition method.” *Miazaki*, ¶ [0001]. *Miazaki* discloses, for example, a method for “recognition operations using the conventional common hidden Markov model for both males and females.” *Miazaki*, ¶¶ [0045], [0010]-[0012], [0016]; FIGs. 8, 10. The Office Action appears to allege that Figures 8 and 10 disclose “one or more clusters of processors” and “an acoustic model memory storing acoustic model data.” Office Action, pp. 2-3. This is incorrect, at least because Figures 8 and 10 merely illustrate two flowcharts of “recognition operations.” See, e.g., *Miazaki*, ¶¶ [0045] (“FIG. 8 is a diagram showing an **overall flow of recognition operations** using the conventional common hidden Markov model for both males and females.”); [0047] (“FIG. 10 is a diagram showing an **overall flow of recognition operations** using the conventional multi-template, gender-specific hidden Markov models.”) (emphases added). In fact, nowhere does *Miazaki* teach (or suggest) “one or more **clusters** of processors,” as recited in claim 1 (emphasis added). Accordingly, *Miazaki* does not anticipate claim 1.

Nevertheless, solely to advance prosecution and without acquiescing to the rejection, Applicant has amended the claims. For example, amended independent claim 1 calls for a combination, including, for example, “each of the one or more clusters of

processors comprising . . . a **plurality of processors**” and “**each of the plurality of processors** is configured to **compute a probability** using the acoustic model data in the acoustic model memory.” (Emphases added.) *Miazaki* does not teach these additional elements of amended independent claim 1.

Claims 2-4, 7, and 8 each depend from independent claim 1 and thus include all the elements thereof. Accordingly, claims 2-4, 7, and 8 are allowable at least due to their dependence from an allowable claim. These dependent claims also recite additional elements that are not taught or suggested by the cited references.

Accordingly, the rejection of claims 1-4, 7, and 8 under 35 U.S.C. § 102 should be withdrawn.

IV. Claim Rejections Under 35 U.S.C. § 103

Applicant respectfully traverses the § 103 rejections of claim 5 as allegedly unpatentable over *Miazaki* in view of *Bahl*, and claim 6 as allegedly unpatentable over *Miazaki* in view of *Chang*. A *prima facie* case of obviousness has not been established with respect to Applicant’s claims.

Claims 5 and 6 each depend from independent claim 1 and thus include all elements thereof. The Office Action alleges that *Bahl* discloses various elements of claim 5 and *Chang* discloses various elements of claim 6. Office Action, p. 4. Even assuming that the Office Action’s characterizations of *Bahl* and *Chang* are correct, which Applicant does not concede, *Bahl* and *Chang* fail to cure the deficiencies of *Miazaki* discussed above with respect to independent claim 1.

In view of the deficiencies of the prior art set forth above, the Office Action has neither properly determined the scope and content of the cited references nor properly ascertained the differences between the cited references and the claimed combination. Moreover, the Office Action has provided no motivation for one of ordinary skill in the art to modify the teachings of the cited references to achieve the claimed combinations. Accordingly, no reason has been articulated as to why one of skill in the art would find the claimed combination obvious in view of the prior art. For at least these reasons, no *prima facie* case of obviousness has been or can be established for claims 5 and 6. Accordingly, claims 5 and 6 are allowable over the cited references.

Accordingly, the rejection of claims 5 and 6 under 35 U.S.C. § 103 should be withdrawn.

V. New Claims 9 and 10

New claims 9 and 10 each depend from independent claim 1 and thus include all elements thereof. Accordingly, claims 9 and 10 are allowable at least due to their dependence from an allowable claim. These dependent claims also recite additional elements that are not taught or suggested by the cited references.

CONCLUSION

In view of the foregoing remarks and amendments, Applicant respectfully requests reconsideration of the application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this paper and charge any additional required fees to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: May 11, 2020

By: /Wei Yuan/

Wei Yuan
Reg. No. 71,772
(202) 408-4103

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Mark CATCHPOLE et al.	)	Group Art Unit: 2657
	)	
Application No.: 16/266,265	)	Examiner: Daniel Demelash ABEBE
	)	
Filed: February 4, 2019	)	Confirmation No.: 7067
	)	
For: SPEECH RECOGNITION	)	<i>Via EFS-Web</i>
CIRCUIT USING PARALLEL	)	
PROCESSORS	)	

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

Dear Commissioner:

PETITION FOR EXTENSION OF TIME

Applicant petitions for a two-month extension of time to file a reply to the Non-Final Office Action. A fee of \$300.00 (for a small entity) is enclosed.

Please grant any additional extensions of time required to enter the attached reply and charge any additional required fees to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: May 11, 2020

By: /Wei Yuan/

Wei Yuan
Reg. No. 71,772
(202) 408-4103

Electronic Patent Application Fee Transmittal				
Application Number:		16266265		
Filing Date:		04-Feb-2019		
Title of Invention:		SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS		
First Named Inventor/Applicant Name:		Mark Catchpole		
Filer:		Wei Yuan/Donna Beckford		
Attorney Docket Number:		149369-00103		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description		Fee Code	Quantity	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 2 months with \$0 paid	2252	1	300	300
Miscellaneous:				
Total in USD (\$)				300

Electronic Acknowledgement Receipt	
EFS ID:	39411252
Application Number:	16266265
International Application Number:	
Confirmation Number:	7067
Title of Invention:	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS
First Named Inventor/Applicant Name:	Mark Catchpole
Customer Number:	24998
Filer:	Wei Yuan/Donna Beckford
Filer Authorized By:	Wei Yuan
Attorney Docket Number:	149369-00103
Receipt Date:	11-MAY-2020
Filing Date:	04-FEB-2019
Time Stamp:	21:34:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$300
RAM confirmation Number	E20205AL34541235
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		as-filed_Amendment_15372-0001.pdf	45703	yes	9
			7b3f723531dbeff2b655c7fc8aea1cd2b75a0129		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
	Claims		2	4	
	Applicant Arguments/Remarks Made in an Amendment		5	9	
Warnings:					
Information:					
2	Extension of Time	as-filed_EOT.pdf	15013	no	1
			e038fc80aa2fbada07973fb9424e744aef150453		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30851	no	2
			4584728c52a77e4bab035f467df4eb4ea8cc5613		
Warnings:					
Information:					
Total Files Size (in bytes):			91567		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/266,265		Filing Date 02/04/2019		☐ To be Mailed	
ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO									
APPLICATION AS FILED - PART I									
		(Column 1)		(Column 2)					
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A		N/A		N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A			
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *				x \$50 =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$230 =			
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
APPLICATION AS AMENDED - PART II									
AMENDMENT		(Column 1)		(Column 2)		(Column 3)			
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	
		ADDITIONAL FEE (\$)							
		Total (37 CFR 1.16(i))		* 20 Minus ** 20 = 0		x \$50 =		0	
		Independent (37 CFR 1.16(h))		* 3 Minus *** 3 = 0		x \$230 =		0	
		☐ Application Size Fee (37 CFR 1.16(s))							
		☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
						TOTAL ADD'L FEE		0	
AMENDMENT		(Column 1)		(Column 2)		(Column 3)			
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)	
		ADDITIONAL FEE (\$)							
		Total (37 CFR 1.16(i))		* Minus ** =		x \$0 =			
		Independent (37 CFR 1.16(h))		* Minus *** =		x \$0 =			
		☐ Application Size Fee (37 CFR 1.16(s))							
		☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
						TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/MINNIE A JACKSON/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

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

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

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	16/266,265
Filing Date	February 4, 2019
First Named Inventor	Mark CATCHPOLE
Title	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS
Art Unit	2657
Examiner Name	Daniel Demelash ABEBE
Attorney Docket Number	15372.0001-00000

SIGNATURE of Applicant or Patent Practitioner

Signature	/Wei Yuan/	Date (Optional)	05/18/2020
Name	Wei Yuan	Registration Number	71772
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☒ *Total of <u>1</u> forms are submitted.			

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Doc Code: PA...
Document Description: Power of Attorney

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

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018, OMB 0551-0038
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below:

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

22852

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☒ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.48(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	28 FEBRUARY 2020
Name	GUY LARRÉ		
Title	Zentian Limited Director		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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

Electronic Acknowledgement Receipt	
EFS ID:	39461928
Application Number:	16266265
International Application Number:	
Confirmation Number:	7067
Title of Invention:	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS
First Named Inventor/Applicant Name:	Mark Catchpole
Customer Number:	24998
Filer:	Wei Yuan/Maria Poulakos
Filer Authorized By:	Wei Yuan
Attorney Docket Number:	149369-00103
Receipt Date:	18-MAY-2020
Filing Date:	04-FEB-2019
Time Stamp:	09:45:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	15372_0001_as_filed_Power_of_Attorney.pdf	1594406	no	2
			e0d409b1d1acb862200422935c7f77d69c771ba6		
Warnings:					

Information:	
Total Files Size (in bytes):	1594406
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.	



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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/266,265	02/04/2019	Mark Catchpole	149369-00103

24998
Blank Rome LLP
1825 Eye Street, NW
Washington, DC 20006-5403

CONFIRMATION NO. 7067
POWER OF ATTORNEY NOTICE



OC000000117107789

Date Mailed: 05/20/2020

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/18/2020.

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

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/tlulu/



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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/266,265	02/04/2019	Mark Catchpole	15372.0001-00000

CONFIRMATION NO. 7067

POA ACCEPTANCE LETTER



OC000000117107848

22852
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

Date Mailed: 05/20/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/18/2020.

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.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/tulu/



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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/266,265	02/04/2019	Mark Catchpole	15372.0001-00000	7067
22852	7590	07/14/2020		
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP 901 NEW YORK AVENUE, NW WASHINGTON, DC 20001-4413			EXAMINER ABEBE, DANIEL DEMELASH	
			ART UNIT	PAPER NUMBER
			2657	
			NOTIFICATION DATE	DELIVERY MODE
			07/14/2020	ELECTRONIC

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

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

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

regional-desk@finnegan.com

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Claim Rejections - 35 USC § 112

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

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

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

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

Claims 9-10 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention. In claim 9 the limitation where the processors are fabricated on a single integrated circuit is new matter.

In claim 10, the limitation, where the speech recognition circuit is configured to generate an initial score for an audio sample used to determine whether to continue processing to determine a final score via processing a larger amount of model data than that was processed to generate the initial score is new matter.

Response to Arguments

Applicant's arguments filed 5/11/20 have been fully considered but they are not persuasive for the following reasons.

With respect to independent claim 1, applicant argue that Miazaki (US 2005/0119883) fails to teach where the speech recognition comprises clusters of processors. In response, the examiner disagree noting that Miazaki does teach the limitation and argued by the applicant. Specifically Fig.1 shows a speech recognition system, 4, comprising a memory storing acoustic model and processor (probability computation module) for processing input feature vectors using the stored acoustic model. Figs.3, 8 and 10 demonstrate the functions performed by the processors/modules of the speech recognition engine. According to these figures, the speech recognition circuit, 4, comprises a group/clusters of probability computation modules or processors arranged in parallel for processing the detected input feature parameter, also showing in the figures, for computing a plurality of probability values using the corresponding acoustic/HMM model in memory. According to Miazaki the input features are fed to each of the computation modules for producing occurrence probabilities of the feature parameter sequence in the corresponding HMM model and the highest probability is processed and selected from the computed probabilities. Fig.3, shows a group of probability computation modules where each group of modules comprise a selecting module for selecting the largest value from the computed probability value by each module. For these reasons applicant's arguments with regard

to claim 1 and the dependent claims, asserting Miazaki system lacks teaching the claimed clusters of processors, have been considered but are not convincing.

Claim Rejections - 35 USC § 102

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

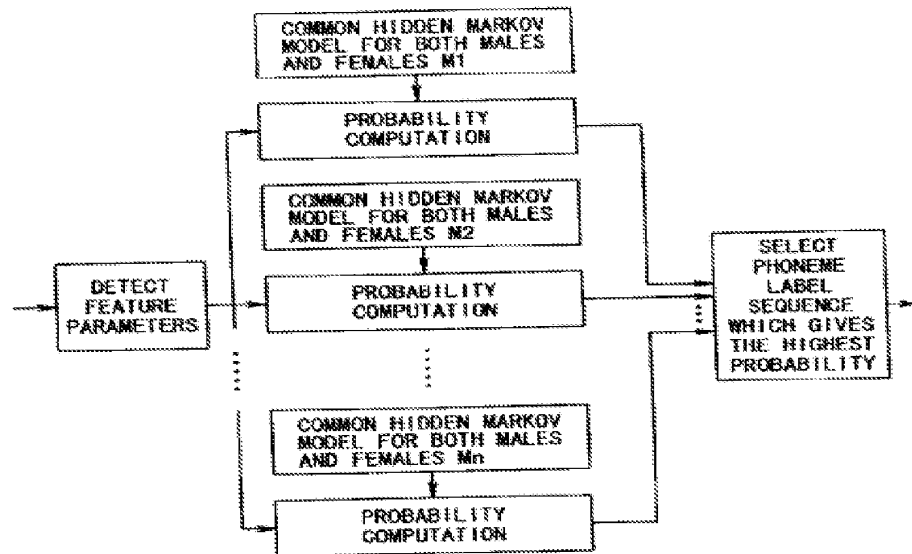
A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim(s) 1-4 and 7-8 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Miazaki et al. (US 2005/0119883).

As to claim 1, Miazaki teaches a speech recognition circuit (Fig.8) comprising:
one or more clusters of processors (probability computation model), each said cluster comprising: one or more processors; and
an acoustic model memory storing acoustic model data (HMM data);
wherein each said processor is configured to compute a probability using the said acoustic model data in said acoustic model memory (Figs.8, 10).

FIG. 8



As to claim 2, Miyazaki teaches where said probability is an input to an evaluation of a state transition of a model of states (claim 1).

As to claim 3, Miyazaki teaches where said model is a Hidden Markov Model (Fig.8).

As to claim 4, Miyazaki teaches where said probability is computed from a Gaussian mixture model and one or more feature parameters (Fig.8).

As to claims 7-8, Miyazaki teaches wherein the said acoustic model memory in each said cluster of processors is a distinct and separate and where said acoustic model memory is coupled to all of said processors in all of said clusters of processors (Figs.3, 8, 10).

As to claim 9, it is inherent that the plurality of computation processors of the speech recognition engine, 4, comprise integrated circuit.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Miazaki as applied above and in view of Bahl et al. (US 4,980,918).

As to claim 6, Miazaki doesn't explicitly teach a search controller. Bahl teaches a speech recognition system comprising a search controller (Figs.7-8, #1002).

It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to combine the two analogous teachings in order to improve the recognition process.

Claim 5 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Miazaki as applied above and in view of Chang et al. (US 7,024,359).

With regard to claim 5, Miazaki doesn't explicitly teach the buffer as claimed. Chang teaches a speech recognition system comprising a buffer for storing one or more feature vectors (Fig.1, 227). The buffer would be obvious in Miazaki teaching in order to temporarily store the extracted feature vectors for modification and other purposes.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL DEMELASH ABEBE whose telephone number is (571)272-7615. The examiner can normally be reached on monday-friday 7-4.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an

interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel Washburn can be reached on 571-272-5551. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. 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 <https://ppair-my.uspto.gov/pair/PrivatePair>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DANIEL ABEBE/
Primary Examiner, Art Unit 2657

Doc Code: A.NE.AFCP

Document Description: After Final Consideration Pilot Program Request

PTO/SB/434 (05-13)

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0		
Practitioner Docket No.: 15372.0001-00000	Application No.: 16/266,265	Filing Date: February 4, 2019
First Named Inventor: Mark Catchpole	Title: SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS	
APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116. 1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (<i>e.g.</i>, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c). 2. The above-identified application contains an outstanding final rejection. 3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect. 4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection. 5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response. 6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web). 7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, <i>e.g.</i>, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.] 8. By filing this certification and request, applicant acknowledges the following: • Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0. • The examiner will verify that the AFCP 2.0 submission is compliant, <i>i.e.</i>, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions: ○ The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, <i>e.g.</i>, by mailing an advisory action. ○ If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview. ▪ The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate. ▪ If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.		
Signature /Wei Yuan/	Date December 14, 2020	
Name (Print/Typed) Wei Yuan	Practitioner Registration No. 71772	
Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.		
☒ * Total of 1 forms are submitted.		

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.

RESPONSE UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE REQUESTED
EXAMINING GROUP 2657
Attorney Docket No. 15372.0001-00000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Mark CATCHPOLE et al.	)	Group Art Unit: 2657
	)	
Application No.: 16/266,265	)	Examiner: Daniel Demelash ABEBE
	)	
Filed: February 04, 2019	)	Confirmation No.: 7067
	)	
For: SPEECH RECOGNITION	)	<u>VIA EFS-WEB</u>
CIRCUIT USING PARALLEL	)	
PROCESSORS	)	

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

Dear Commissioner:

**AMENDMENT AFTER FINAL WITH REQUEST FOR
RECONSIDERATION UNDER AFTER FINAL CONSIDERATION PILOT 2.0**

In reply to the Final Office Action dated July 14, 2020, the period for response having been extended through December 14, 2020 by a petition for extension of time and the extension fee, and pursuant to 37 C.F.R. § 1.116, Applicant requests reconsideration of this application in view of the following amendments and remarks. Applicant also respectfully submits herewith a Certification and Request for Reconsideration under the After Final Consideration Pilot 2.0 (Form PTO/SB/434).

Amendments to the Claims are reflected in the listing of the claims that begins on page 2 of this paper.

Remarks follow the amendments section of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A speech recognition circuit comprising:

one or more clusters of processors, each of the one or more clusters of processors comprising:

a plurality of processors; and

an acoustic model memory storing acoustic model data, wherein each of the plurality of processors is configured to compute a probability using the acoustic model data in the acoustic model memory, wherein:

the speech recognition circuit is configured to generate an initial score for an audio sample; and

the initial score is used to determine whether to continue processing to determine a final score via processing a larger amount of model data than that was processed to generate the initial score.

2. (Previously Presented) The speech recognition circuit of claim 1, wherein the probability is an input to an evaluation of a state transition of a model of states.

3. (Previously Presented) The speech recognition circuit of claim 2, wherein the model is a Hidden Markov Model.

4. (Previously Presented) The speech recognition circuit of claim 2, wherein the probability is computed from a Gaussian mixture model and one or more feature vectors.

5. (Currently Amended) The speech recognition circuit of claim 1, further comprising:
a buffer for storing one or more feature vectors coupled to at least one of the plurality of processors ~~processor of one of the one or more clusters of processors~~.

6. (Currently Amended) The speech recognition circuit of claim 5, further comprising:
a search controller coupled to the at least one of the plurality of processors ~~processor of one of the one or more clusters of processors~~, the search controller ~~[[and]]~~ capable of controlling the at least one of the plurality of processors ~~processor of one of the one or more clusters of processors~~ to initiate speech recognition processing in at least a subset of processors of the one or more clusters of processors.

7. (Previously Presented) The speech recognition circuit of claim 1, wherein:
the one or more clusters of processors comprises a first cluster of processors and a second cluster of processors;
the first cluster comprises a first acoustic model memory; and
the second cluster comprises a second acoustic model memory that is distinct and separate from the first acoustic model memory.

8. (Previously Presented) The speech recognition circuit of claim 1, wherein:

the one or more clusters of processors comprises a first cluster of processors;

and

the first cluster comprises a first acoustic model coupled to all processors of the first cluster.

9-10. (Canceled)

REMARKS

Applicant respectfully requests that the Examiner consider this Amendment After Final under the After Final Consideration Pilot (AFCP) 2.0. As indicated above, a Certification and Request for Consideration under the After Final Consideration Pilot Program 2.0 (Form PTO/SB/434) is filed concurrently herewith. The Examiner is invited to contact the undersigned to schedule an interview and/or resolve any outstanding issues to place this application in condition for allowance.

I. Status of the Claims

In the Final Office Action dated July 14, 2020 (the "Office Action"),¹ the Examiner:

- i. rejected claims 9 and 10 under 35 U.S.C. § 112(a) as allegedly failing to comply with the written description requirement;
- ii. rejected claims 1-4, 7, 8, and 9 under 35 U.S.C. § 102(e) as allegedly anticipated by U.S. Patent Application Publication No. 2005/0119883 ("*Miazaki*");
- iii. rejected claim 5 under 35 U.S.C. § 103(a) as allegedly unpatentable over *Miazaki* and U.S. Patent No. 7,024,359 ("*Chang*"); and
- iv. rejected claim 6 under 35 U.S.C. § 103(a) as allegedly unpatentable over *Miazaki* and U.S. Patent No. 4,980,918 ("*Bahl*").

By this Amendment, Applicant proposes to cancel claims 9 and 10 without prejudice to, or disclaimer of, the subject matter recited therein; amend independent claim 1 to incorporate the subject matter of canceled claim 10; and amend dependent claims 5 and 6 to even further clarify the subject matter recited therein. The amended claims are fully supported by Applicant's specification, including at least the original

¹ The Office Action contains a number of statements reflecting characterizations of the related art and the claims. Regardless of whether any such statement is identified herein, Applicant declines to automatically subscribe to any statement or characterization in the Office Action.

claims. No new matter has been added. Upon entry of the above amendments, claims 1-8 will be pending and under examination.

In view of the above amendments and following remarks, Applicant respectfully requests reconsideration and withdrawal of the rejections, and timely allowance of the pending claims.

II. Claim Rejection Under 35 U.S.C. § 112(a)

Applicant respectfully traverses the rejection of claims 9 and 10 under 35 U.S.C. § 112(a) as allegedly failing to comply with the written description requirement. Office Action at 2. Claim 10 is fully described and supported by the originally filed application. Moreover, in view of the cancellation of claim 9, the rejection of that claim is now moot.

The Office Action alleges that claim 10 fails to comply with the written description requirement and constitutes new matter. Office Action at 2. This is incorrect.

The M.P.E.P. explains that “[t]he subject matter of the claim need not be described literally” to satisfy the written description requirement under 35 U.S.C. § 112(a). M.P.E.P. § 2163.02. Instead, a claim satisfies the written description requirement under 35 U.S.C. § 112(a) when the originally-filed application “describe[s] the claimed invention in sufficient detail that one skilled in the art **can reasonably conclude** that the inventor had possession of the claimed invention.” M.P.E.P. § 2163(I) (citations omitted) (emphasis added). Indeed, each claim limitation may be supported either expressly, implicitly, or inherently. *See id.* at § 2163(b). Moreover, the fundamental factual inquiry for written description “is whether the specification conveys with reasonable clarity to those skilled in the art that, as of the filing date sought, applicant was in possession of the invention as now claimed.” *Id.* at § 2163.02.

Here, one of ordinary skill would conclude that Applicant's application clearly supports the full scope of the claims and there is possession of the claimed invention. For example, Figure 4 of Applicant's Specification illustrates a "process performed by a lexical tree processor to determine a **temporary** lexical tree score." Applicant's As-filed Specification at 11 (emphasis added). *See also* FIG. 4; Applicant's As-filed Specification at 11-12 (describing the process for determining a temporary lexical tree score for a lexical tree in connection with Figure 4); FIG. 6 (illustrating steps S42 for temporary lexical tree score determination). The temporary lexical tree score "can be used to **prune out** lexical trees from the processing which have a low score." Applicant's As-filed Specification at 11 (emphasis added). In other words, the process for processing the lexical tree branches having a temporary lexical tree score lower than a threshold would not continue to determine a "final score via processing a larger amount of model data than that was processed to generate the initial score," as originally recited in claim 10 (now canceled; the subject matter of which has been incorporated in amended independent claim 1). *See, e.g.*, Applicant's As-filed Specification at 13 ("Pruning is applied to the lexical tree by the lexical tree processor to delete paths in order to keep the breadth of the search manageable. . . . The pruning applied locally by the lexical tree processor can be purely on the basis of a local threshold").

Additionally, Figure 5 of Applicant's Specification illustrates a process for lexical tree evaluation, which includes step for determining the claimed "final score." For example, of Applicant's Specification at 13 discloses:

Pruning is applied to the lexical tree by the lexical tree processor to **delete paths** in order to keep the breadth of the search manageable (step S27). The pruning applied locally by the lexical tree processor can be

purely on the basis of a local threshold, which can be provided by the search controller 27, or it can be determined on a relative-basis dependent upon the range of scores for paths being processed within the lexical tree processor 21. . . . The language model processor then **determines the language model score** using the language model memory 31 and modifies the accumulated score using **the language model score**. The language model processor 29 can then **return the modified score** to the lexical tree processor 21 which can then pass it to the results memory 25, or a connection between the language model processor 29 and the results memory 25 (not shown) can enable the language model processor 29 to **send the score** directly to the results memory 25 for the lexical tree processor 21.

Applicant's As-filed Specification at 13 (emphases added); *see also* FIG. 5. Accordingly, contrary to the assertions in the Office Action, claim 10 is fully supported by Application's originally filed specification and drawings.

In view of the foregoing, Applicant respectfully submits that the claimed subject matter of claim 10, now incorporated in independent claim 1, complies with the written description requirements under § 112(a).

III. Claim Rejection Under 35 U.S.C. § 102

Applicant respectfully traverses the rejection of claims 1-4, 7, 8, and 9 under 35 U.S.C. § 102(e) as allegedly anticipated by *Miazaki*. *Miazaki* does not teach each and every element of the claims. Moreover, in view of the cancellation of claim 9, the rejection of that claim is now moot.

Nevertheless, solely to advance prosecution and without acquiescing to the rejection, Applicant proposes to amend independent claim 1 by incorporating the subject matter of claim 10 (now canceled). *Miazaki* does not anticipate proposed amended claim 1. Indeed, the Office Action does not assert that *Miazaki* discloses (or

suggests) the subject matter of claim 10. See Office Action, pp. 4-6. Accordingly, amended claim 1 is allowable over *Miazaki*.

Claims 2-4, 7, and 8 each depend from independent claim 1 and thus include all the elements thereof. Accordingly, claims 2-4, 7, and 8 are allowable at least due to their dependence from an allowable claim. These dependent claims also recite additional elements that are not taught or suggested by the cited references.

Accordingly, the rejection of claims 1-4, 7, and 8 under 35 U.S.C. § 102 should be withdrawn.

IV. Claim Rejections Under 35 U.S.C. § 103

Applicant respectfully traverses the § 103 rejection of claim 5 as allegedly unpatentable over *Miazaki* in view of *Bahl*, and the § 103 rejection of claim 6 as allegedly unpatentable over *Miazaki* in view of *Chang*. A *prima facie* case of obviousness has not been established with respect to Applicant's claims.

Claims 5 and 6 each depend from independent claim 1 and thus include all elements thereof. The Office Action alleges that *Bahl* discloses various elements of claim 5 and *Chang* discloses various elements of claim 6. Office Action at 4. Even assuming that the Office Action's characterizations of *Bahl* and *Chang* are correct, which Applicant does not concede, *Bahl* and *Chang* fail to cure the deficiencies of *Miazaki* discussed above with respect to independent claim 1. Accordingly, claims 5 and 6 are allowable over the cited references.

Accordingly, the rejection of claims 5 and 6 under 35 U.S.C. § 103 should be withdrawn.

CONCLUSION

In view of the foregoing, Applicant submits that the pending claims are allowable over the prior art references cited against this application. Applicant, therefore, requests the entry of this Amendment under 37 C.F.R. § 1.116, the Examiner's reconsideration of the application, and the timely allowance of the pending claims. Entry of this Amendment After Final is also requested under the After Final Consideration Pilot (AFCP) 2.0.

Applicant submits that the proposed amendments to claim 1 do not raise new issues and any additional search of the art by the Examiner should be minimal and capable of being completed within the allotted time. Therefore, this Amendment should allow for an immediate action and allowance by the Examiner.

Finally, Applicant submits that the entry of the Amendment would place the application in better form for appeal, should the Examiner dispute the patentability of the pending claims. Please grant any extensions of time required to enter this paper and charge any additional required fees to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: December 14, 2020

By: /Wei Yuan/

Wei Yuan
Reg. No. 71,772
(202) 408-4103

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Mark CATCHPOLE et al.	)	Group Art Unit: 2657
	)	
Application No.: 16/266,265	)	Examiner: Daniel Demelash ABEBE
	)	
Filed: February 4, 2019	)	Confirmation No.: 7067
	)	
For: SPEECH RECOGNITION	)	<i>Via EFS-Web</i>
CIRCUIT USING PARALLEL	)	
PROCESSORS	)	

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

Dear Commissioner:

PETITION FOR EXTENSION OF TIME

Applicant petitions for a two-month extension of time to file a reply to the Final Office Action. A fee of \$320.00 (for a small entity) is enclosed.

Please grant any additional extensions of time required to enter the attached reply and charge any additional required fees to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: December 14, 2020

By: /Wei Yuan/

Wei Yuan
Reg. No. 71,772
(202) 408-4103

Electronic Patent Application Fee Transmittal				
Application Number:		16266265		
Filing Date:		04-Feb-2019		
Title of Invention:		SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS		
First Named Inventor/Applicant Name:		Mark Catchpole		
Filer:		Wei Yuan/Donna Beckford		
Attorney Docket Number:		15372.0001-00000		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description		Fee Code	Quantity	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 2 months with \$0 paid	2252	1	320	320
Miscellaneous:				
Total in USD (\$)				320

Electronic Acknowledgement Receipt	
EFS ID:	41382875
Application Number:	16266265
International Application Number:	
Confirmation Number:	7067
Title of Invention:	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS
First Named Inventor/Applicant Name:	Mark Catchpole
Customer Number:	22852
Filer:	Wei Yuan/Donna Beckford
Filer Authorized By:	Wei Yuan
Attorney Docket Number:	15372.0001-00000
Receipt Date:	14-DEC-2020
Filing Date:	04-FEB-2019
Time Stamp:	20:46:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$320
RAM confirmation Number	E2020BDK47131686
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	After Final Consideration Program Request	As-filed_AFCP.pdf	207169	no	2
			5d0c705220eeb7304a0b4cedffc0cfb12515c5a4		
Warnings:					
Information:					
2		As-filed_Amendment_After_Final.pdf	60243	yes	10
			b8159b15193868b6faa1401bd2bd84fe76040c4c		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Response After Final Action		1	1	
	Claims		2	4	
	Applicant Arguments/Remarks Made in an Amendment		5	10	
Warnings:					
Information:					
3	Extension of Time	As-filed_EOT.pdf	15040	no	1
			875af85aea22c35e89edcc1f3f22dd1f748e8206		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	31000	no	2
			1560f6a9dfbf452a63a5eb8364d0ada416d2a0be2		
Warnings:					
Information:					
Total Files Size (in bytes):			313452		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/266,265		Filing Date 02/04/2019		☐ To be Mailed			
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO											
APPLICATION AS FILED - PART I											
		(Column 1)		(Column 2)							
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)			
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A					
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A		N/A		N/A					
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A					
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 = *				x \$100 =					
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 = *				x \$460 =					
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))											
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL					
APPLICATION AS AMENDED - PART II											
		(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		12/14/2020		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA			
								RATE (\$)			
								ADDITIONAL FEE (\$)			
		Total (37 CFR 1.16(i))		* 8		Minus ** 20		= 0		x \$100 =	
		Independent (37 CFR 1.16(h))		* 1		Minus *** 3		= 0		x \$480 =	
		☐ Application Size Fee (37 CFR 1.16(s))									
		☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE		0			
		(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)			
								ADDITIONAL FEE (\$)			
		Total (37 CFR 1.16(i))		*		Minus **		=		x \$0 =	
		Independent (37 CFR 1.16(h))		*		Minus ***		=		x \$0 =	
		☐ Application Size Fee (37 CFR 1.16(s))									
		☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
						TOTAL ADD'L FEE		LIE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						/ANTHONY TYSON/					
** 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.**

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



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

NOTICE OF ALLOWANCE AND FEE(S) DUE

22852 7590 12/21/2020
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER

ABEBE, DANIEL DEMELASH

ART UNIT

PAPER NUMBER

2657

DATE MAILED: 12/21/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/266,265	02/04/2019	Mark Catchpole	15372.0001-00000	7067

TITLE OF INVENTION: SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$600	\$0.00	\$0.00	\$600	03/22/2021

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

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

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

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

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

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

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

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22852 7590 12/21/2020

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/266,265	02/04/2019	Mark Catchpole	15372.0001-00000	7067

TITLE OF INVENTION: SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$600	\$0.00	\$0.00	\$600	03/22/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
ABEBE, DANIEL DEMELASH	2657	704-253000

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 03-09 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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

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

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

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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

- ☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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

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

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

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

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

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

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/266,265	02/04/2019	Mark Catchpole	15372.0001-00000	7067
22852	7590	12/21/2020	EXAMINER	
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP 901 NEW YORK AVENUE, NW WASHINGTON, DC 20001-4413			ABEBE, DANIEL DEMELASH	
			ART UNIT	PAPER NUMBER
			2657	

DATE MAILED: 12/21/2020

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

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

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

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

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

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

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. 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. 16/266,265	Applicant(s) Catchpole, Mark	
	Examiner DANIEL D ABEBE	Art Unit 2657	AIA (FITF) Status No

-- 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 amendment filed on 12/14/20.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-8 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
Certified copies:
a) ☐ All b) ☐ Some *c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
* Certified copies not received: _____.

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

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

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

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☒ Other <u>PTO-2323</u> .
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/DANIEL ABEBE/ Primary Examiner, Art Unit 2657	
---	--

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Allowable Subject Matter

Claims 1-8 are allowed.

The following is an examiner's statement of reasons for allowance:

The rejection of the subject matter of claim 10, under 35 USC 112(a), as failing to comply with the written description requirement is withdrawn for the reasons pointed out by the applicant in the applicant's argument.

Independent claim 1 was rejected as being anticipated by Miazaki et al. US 2005/0119883. However the claim is allowed because Miazaki doesn't teach the limitations included in the amended claim.

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 on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL DEMELASH ABEBE whose telephone number is (571)272-7615. The examiner can normally be reached on monday-friday 7-4.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an

interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel Washburn can be reached on 571-272-5551. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. 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 <https://ppair-my.uspto.gov/pair/PrivatePair>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DANIEL ABEBE/
Primary Examiner, Art Unit 2657

Issue Classification 	Application/Control No. 16/266,265	Applicant(s)/Patent Under Reexamination Catchpole, Mark
	Examiner DANIEL D ABEBE	Art Unit 2657

CPC						
Symbol					Type	Version
G10L	/	15	/	187	F	2013-01-01
G10L	/	15	/	34	I	2013-01-01
G10L	/	15	/	05	I	2013-01-01

CPC Combination Sets							
Symbol				Type	Set	Ranking	Version
	/		/				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	8	
/DANIEL ABEBE/ Primary Examiner, Art Unit 2657	15 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3b

U.S. Patent and Trademark Office

Part of Paper No.: 20201215A

Issue Classification 	Application/Control No. 16/266,265	Applicant(s)/Patent Under Reexamination Catchpole, Mark
	Examiner DANIEL D ABEBE	Art Unit 2657

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G10L	/	15	/ 32
NON-CLAIMED			
/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	8	
/DANIEL ABEBE/ Primary Examiner, Art Unit 2657	15 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3b

U.S. Patent and Trademark Office

Part of Paper No.: 20201215A

Issue Classification 	Application/Control No. 16/266,265	Applicant(s)/Patent Under Reexamination Catchpole, Mark
	Examiner DANIEL D ABEBE	Art Unit 2657

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	8	
/DANIEL ABEBE/ Primary Examiner, Art Unit 2657	15 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3b

AFCP 2.0 Decision	Application No.	Applicant(s)	
	16/266,265	Catchpole, Mark	
	Examiner	Art Unit	AIA (FITF) Status
	DANIEL D ABEBE	2657	No

This is in response to the After Final Consideration Pilot request filed 14 December 2020.

1. **Improper Request** – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.
☐ A non-broadening amendment to at least one independent claim was not submitted.
☐ The request is not the first proper AFCP 2.0 request submitted in response to the most recent final rejection.
☐ Other: _____

2. **Proper Request**

A. After final amendment submitted with the request will not be treated under AFCP 2.0.
 The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.
☐ The after final amendment will be treated under pre-pilot procedure.

B. Updated search and/or completed additional consideration.
 The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

☒ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.
☐ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action. See attached interview summary for further details.
☐ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.
☐ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.
☐ 5. Other: _____

Examiner Note: Please attach an interview summary when necessary as described above.

Search Notes 	Application/Control No. 16/266,265	Applicant(s)/Patent Under Reexamination Catchpole, Mark
	Examiner DANIEL D ABEBE	Art Unit 2657

CPC - Searched*		
Symbol	Date	Examiner
G10L 15/32, 15/34	12/04/2019	DA

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes		
Search Notes	Date	Examiner
WEST search	12/04/2019	DA

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
G10L	15/32	12/15/2020	DA

/DANIEL ABEBE/ Primary Examiner, Art Unit 2657	
---	--

RESPONSE UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE REQUESTED
EXAMINING GROUP 2657
Attorney Docket No. 15372.0001-00000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Mark CATCHPOLE et al.	)	Group Art Unit: 2657
	)	
Application No.: 16/266,265	)	Examiner: Daniel Demelash ABEBE
	)	
Filed: February 04, 2019	)	Confirmation No.: 7067
	)	
For: SPEECH RECOGNITION	)	<u>VIA EFS-WEB</u>
CIRCUIT USING PARALLEL	)	
PROCESSORS	)	

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

Dear Commissioner:

**AMENDMENT AFTER FINAL WITH REQUEST FOR
RECONSIDERATION UNDER AFTER FINAL CONSIDERATION PILOT 2.0**

In reply to the Final Office Action dated July 14, 2020, the period for response having been extended through December 14, 2020 by a petition for extension of time and the extension fee, and pursuant to 37 C.F.R. § 1.116, Applicant requests reconsideration of this application in view of the following amendments and remarks. Applicant also respectfully submits herewith a Certification and Request for Reconsideration under the After Final Consideration Pilot 2.0 (Form PTO/SB/434).

Amendments to the Claims are reflected in the listing of the claims that begins on page 2 of this paper.

Remarks follow the amendments section of this paper.

OK TO ENTER 12/15/2020

/D.A./

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

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

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

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

22852 7590 12/21/2020

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/266,265	02/04/2019	Mark Catchpole	15372.0001-00000	7067

TITLE OF INVENTION: SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$600	\$0.00	\$0.00	\$600	03/22/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
ABEBE, DANIEL DEMELASH	2657	704-253000

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 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 FINNEGAN HENDERSON
2 FARABOW GARRETT
3 & DUNNER LLP

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

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

(A) NAME OF ASSIGNEE

Zentian Limited

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

Cambridge, United Kingdom

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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

- ☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)
- ☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 06-0916

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

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

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

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

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

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

Authorized Signature /Wei Yuan/

Date March 3, 2021

Typed or printed name Wei Yuan

Registration No. 71772

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Mark CATCHPOLE et al.	)	Group Art Unit: 2657
	)	
Application No.: 16/266,265	)	Examiner: Daniel Demelash ABEBE
	)	
Filed: February 4, 2019	)	Confirmation No.: 7067
	)	
For: SPEECH RECOGNITION	)	<i>Via EFS-Web</i>
CIRCUIT USING PARALLEL	)	
PROCESSORS	)	

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

Dear Commissioner:

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Applicant thanks the Examiner for the Notice of Allowance dated December 21, 2020. Without withdrawing the allowed claims from issue, Applicant submits these comments for the record.

In the Examiner's Statement of Reasons for Allowance that was included with the Notice of Allowability, the Examiner made characterizations and assertions regarding the basis for the allowability of the claims and the prior art of record. Although Applicant agrees with the Examiner's ultimate conclusion that the pending claims are patentable, Applicant does not necessarily agree with the characterizations and assertions made in the Examiner's Statement.

Applicant submits that each of the allowed claims is patentable based on the subject matter defined by the claim language and the combination of recitations within

the claims, and not based solely on the reasons emphasized in any statement by the Examiner.

Should the Examiner disagree with the Applicant's comments submitted herewith, the Examiner is invited to contact the undersigned to resolve such disagreement.

If there is any fee due in connection with the filing of these Comments, please charge the fee to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: March 3, 2021

By: /Wei Yuan/

Wei Yuan
Reg. No. 71,772
(202) 408-4103

Electronic Patent Application Fee Transmittal				
Application Number:		16266265		
Filing Date:		04-Feb-2019		
Title of Invention:		SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS		
First Named Inventor/Applicant Name:		Mark Catchpole		
Filer:		Wei Yuan/Lauren Brown		
Attorney Docket Number:		15372.0001-00000		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	600	600

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				600

Electronic Acknowledgement Receipt	
EFS ID:	42080039
Application Number:	16266265
International Application Number:	
Confirmation Number:	7067
Title of Invention:	SPEECH RECOGNITION CIRCUIT USING PARALLEL PROCESSORS
First Named Inventor/Applicant Name:	Mark Catchpole
Customer Number:	22852
Filer:	Wei Yuan/Lauren Brown
Filer Authorized By:	Wei Yuan
Attorney Docket Number:	15372.0001-00000
Receipt Date:	03-MAR-2021
Filing Date:	04-FEB-2019
Time Stamp:	16:07:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$600
RAM confirmation Number	E202133G09291948
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	0001feexmit.pdf	264948	no	1
			33f5f1e8c4c7092d4b23f20d269bd49d47b07cef		
Warnings:					
Information:					
2	Post Allowance Communication - Incoming	0001comments.pdf	17406	no	2
			ccad4bb3e8a2834cccf601b3398e241e7bdd4d3		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30625	no	2
			a6ab5aee174a0f1268564b0880ea5d4b6d7096b5		
Warnings:					
Information:					
Total Files Size (in bytes):			312979		
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.					



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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/266,265	04/06/2021	10971140	15372.0001-00000	7067

22852 7590 03/17/2021

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

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

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

Applicant will be able to obtain more detailed information by accessing the Patent 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):

Mark Catchpole, Prickwillow, UNITED KINGDOM;
Zentian Limited, Cambridge, UNITED KINGDOM;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

IR103 (Rev. 10/09)

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court _____ for the Western District of Texas _____ on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 6:22-cv-00123	DATE FILED 2/2/2022	U.S. DISTRICT COURT for the Western District of Texas
PLAINTIFF Zentian Ltd.		DEFENDANT Amazon.com, Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,979,277	7/12/2011	Zentian Ltd.
2 7,587,319	9/8/2009	Zentian Ltd.
3 10,971,140	4/6/2021	Zentian Ltd.
4 10,062,377	8/28/2018	Zentian Ltd.
5 10,839,789	11/17/2020	Zentian Ltd.

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT		
CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
---	---

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court _____ for the Western District of Texas _____ on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 6:22-cv-00122	DATE FILED 2/2/2022	U.S. DISTRICT COURT for the Western District of Texas
PLAINTIFF Zentian Ltd.		DEFENDANT Apple, Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,979,277	7/12/2011	Zentian Ltd.
2 7,587,319	9/8/2009	Zentian Ltd.
3 10,971,140	4/6/2021	Zentian Ltd.
4 10,062,377	8/28/2018	Zentian Ltd.
5 10,839,789	11/17/2020	Zentian Ltd.

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT		
CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy