

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2022/049251

International filing date (day/month/year)
08.11.2022

Priority date (day/month/year)
08.11.2021

International Patent Classification (IPC) or both national classification and IPC
INV. G10L15/197 G10L15/06

Applicant
GENESYS CLOUD SERVICES, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed.
 - b. ☐ furnished subsequent to the international filing date for the purposes of international search (Rule 13*ter*.1(a)),
 - ☐ accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.
4. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established to the extent that a meaningful opinion could be formed without a WIPO Standard ST.26 compliant sequence listing.
5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-17</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-17</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-17</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Technical field

The present application deals with updating of a language model with speech data

2 Independent claims

Claim 1 (method)

Claim 15 (corresponding system)

3 Prior art

D1 US 2021/295846 A1 (YANG XU [US]) 23 September 2021 (2021-09-23)

D2 US 2003/233235 A1 (PARK YOUNGJA [US]) 18 December 2003 (2003-12-18)

D3 US 2019/189115 A1 (HORI TAKAAKI [US] ET AL) 20 June 2019 (2019-06-20)

4 Novelty, Article 33(2) PCT

D1 discloses, in the context of speech recognition (see D1, title), to apply, as usual, a combination of acoustic model and language model to recognize words (corresponding to the "unigrams" in claim 1, see para. [0051] in the description of the present application). Moreover D1 discloses output of a per-grapheme probability distribution as determined by the acoustic model, see D1, para. [0063], corresponding to the feature in claim 1 of "*applying an acoustic machine-learning (ML) model on one or more first speech data elements to obtain a character distribution function*".

However, as also derivable from para. [0063], in D1 this probability distribution is only used to derive a relative weight assigned to the acoustic vs. language model for identification of a word. This is to be understood as a process during speech recognition, i.e. the recognizer at runtime, but not during training and/or update of a model.

Hence the probability distribution is in D1 not used in a way comprising the steps in claim 1 of:

*"applying a greedy decoder on the character distribution function, to predict an initial corpus of unigrams;
filtering out one or more unigrams of the initial corpus to obtain a corpus of candidate unigrams, said candidate unigrams not included in the language model;
analyzing the one or more first speech data elements, to extract at least one n-gram that comprises a candidate unigram; and
updating the language model to include the extracted at least one n-gram."*

D2 discloses to learn a language model with character trigram statistics from a dictionary to be applied in speech recognition of words or word sequences (D2, paras. [0053], [0054]). This however does not correspond to the configuration in claim 1 of that the language model comprises n-grams, each comprising one or more "unigrams", when read in combination with the above-cited distinguishing features from claim 1 that define how the character distribution is related to the "unigrams". As such D2 does also not disclose the process of updating the language model with the steps as cited from claim 1 above.

In D3 a speech recognition approach is presented that uses language models at both character and word levels (D3, para. [0006]) and for training of the language models, probabilities for character and word sequences, respectively, from corpora are used (D3, paras. [0065], [0066], [0107]). But D3 does not disclose either to use a character distribution for the purpose as claimed, i.e. for obtaining a corpus of unigrams so as to update the n-grams of the language models therewith, particularly not with the steps as claimed.

Thus the subject-matter of claim 1 is **novel**.

The **same reasoning and conclusion** applies to corresponding independent claim 15.

5 Inventive step, Article 33(3) PCT

According to paras. [0004], [0006] of the description of the present application, the purpose of the claimed approach is that the problem of recognition of out-of-vocabulary words is addressed. This topic is not discussed in D1 where the goal of the proposed approach is rather formulated as to improve accuracy of speech-to-text conversion in general (D1, para. [0003] and para. [0049], first sentence).

Hence, compared to D1 the objective technical problem may be regarded as to provide a language model for speech data that is able to cope with out-of-vocabulary words.

As to D1, as it was set out above, the probability distributions for the graphemes/characters are only used for determining a weighting between the acoustic and the language model during recognition. There is no hint in D1 to exploit the information so as to update the language model therewith, particularly not with the steps defined by the above-cited differentiating features.

Although D2 basically discusses the problem of out-of-vocabulary words (see D2, para. [0054], already cited above), it does not lead in an obvious manner to the claimed solution either. In D2 the n-grams (of the language model; in D2 more concretely trigrams) themselves represent character sequences based on the statistical evaluation of such sequences. Starting from this setup the skilled person would not get any hint to exploit these statistics to predict, with the "unigrams" of claim 1, a higher-level unit that is the actual target unit for the language model und to update the model accordingly.

Also D3 discusses out-of-vocabulary words and according to D3, paras. [0006] and [0029] specifically the scores of the character-level language model are used for recognizing them. But, according to the teaching in D3 as already set out above, D3 does not disclose to use a character probability/distribution (in D3

derived from an existing corpus) other than for training the character-level language model. There is no hint in D3 towards another use and particularly not to the steps as defined with the above-cited distinguishing features.

Thus the solution proposed in claim 1 is considered as involving an **inventive step**.

The **same reasoning and conclusion** applies to corresponding independent claim 15.