

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

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

To:

see form PCT/ISA/220

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/EP2020/052446

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01.02.2019

International Patent Classification (IPC) or both national classification and IPC
INV. G06F16/783 G06F16/683 G06F16/632

Applicant
MOODAGENT A/S

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 43*bis*.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 66.1*bis*(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.

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Date of completion of this opinion

see form
PCT/ISA/210

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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 43bis.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:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.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	
	No: Claims	<u>1-17</u>
Industrial applicability (IA)	Yes: Claims	<u>1-17</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item VIII

ARTICLE 6 PCT

- 1 The application does not meet the requirements of Article 6 PCT, because independent claims 1, 13 and 17 in one group, and independent claim 2 with its dependent claims in another group, do not contain a consistent set of the same or corresponding features, but rather each of these groups contains a different subset of features, overlapping with the subset of features of other independent claims. The intended scope of protection is thus unclear and the entire set of claims lacks conciseness and clarity and thus does not meet the requirements of Article 6 PCT.

Re Item V

- 2 Reference is made to the following documents:

- D1 LUCA CANINI ET AL: "Affective Recommendation of Movies Based on Selected Connotative Features",
IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, IEEE, USA, vol. 23, no. 4, 1 April 2013 (2013-04-01), pages 636-647, XP011499090, ISSN: 1051-8215, DOI: 10.1109/TCSVT.2012.2211935
- D2 LEHINEVYCH TARAS ET AL: "Discovering Similarities for Content-Based Recommendation and Browsing in Multimedia Collections",
2014 TENTH INTERNATIONAL CONFERENCE ON SIGNAL-IMAGE TECHNOLOGY AND INTERNET-BASED SYSTEMS, IEEE, 23 November 2014 (2014-11-23), pages 237-243, XP032762905, DOI: 10.1109/SITIS.2014.98
- D3 HELEN M ET AL: "Query by Example of Audio Signals using Euclidean Distance Between Gaussian Mixture Models",
2007 IEEE INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH, AND SIGNAL PROCESSING 15-20 APRIL 2007 HONOLULU, HI, USA, IEEE, PISCATAWAY, NJ, USA, 15 April 2007 (2007-04-15), pages I-225, XP031462839, ISBN: 978-1-4244-0727-9

- 3 The following written opinion of the International Preliminary Search Authority (ISA) refers to several paragraphs of the Guidelines for Search and Examination at the EPO as PCT Authority (in the following, called "PCT-EPO Guidelines" for short). In particular, paragraphs G-II 3.3, 3.7 and 3.7.1 as well as G-VII 5.4 - 5.4.1 thereof are referred to in this written opinion. Said paragraphs essentially refer to corresponding sections in the Guidelines for Examination in the EPO, *mutatis mutandis*.

Article 33(1)(3) PCT

INDEPENDENT CLAIM 1

- 4 The subject-matter of amended claim 1 does not involve an inventive step in the sense of Article 33(3) PCT, and the criteria of Article 33(1) PCT are therefore not met, for the following reasons.

- 4.1 Claim 1 comprises technical and non-technical features. The assessment of inventive step is therefore carried out in accordance with section G-VII, 5.4 - 5.4.1 of the PCT-EPO Guidelines. In the case of claims comprising technical and non-technical features, only those features which contribute to the technical character of the invention are taken into account for the assessment of inventive step.

- 4.2 Document D1 is regarded as the closest prior art to the subject-matter of amended claim 1 and discloses the following features of claim 1 (the references in parentheses applying to this document, the feature missing in D1 given in ~~strikeout~~).

A method of recommending video content using a computer-based system (**see the title, abstract, page 636 section I left-hand column, page 637 section I.A left-hand column lines 3-26, pages 638-639 section III, in particular point e), with figure 3**), the method comprising:

providing an initial set of a plurality of videos (**the 75 movie scenes used in the recommendation scenario - see figure 3, page 639 left-hand column point e), and pages 644-645 section VII.B**);

extracting a digital audio signal from each of said plurality of videos; determining at least one temporal sequence of low-level audio features for each digital audio signal of said plurality of videos by analyzing said digital audio signals (**see page 639 left-hand column points b) and c) and right-hand column lines 1-4 of section IV with Table I the middle row "Audio", page 640 section IV.B "Audio Features", in particular right-hand column lines 14-28 and the**

last four lines; for the features selected for computing a distance matrices see the top boldfaced features in Table II and the bottom half of left-hand column on page 643);

calculating an audio similarity index between each of said plurality of videos by comparing their respective at least one temporal sequence of low-level audio features (**see page 639 left-hand column: the last sentence of point b), point d), point e), figure 3, page 643 section VI in particular the first and last passage of section VI with formulae (9) and (10): computed inter-scene distances on selected features for 75 movie scenes are used to predict connotative distances, by means of a learned SVR model);**

receiving, from an input device of said computer-based system, a query Q comprising reference to a seed video, said seed video being one of said plurality of videos (**see the top 3 lines of right-hand column on page 639, figure 3, page 643 right-hand column lines 1-4 of section VII);**

determining, for said seed video, a ranking of the rest of the initial set of videos based **exclusively** on their audio similarity index with respect to said seed video; and returning to a display device of said computer-based system, as a reply to said query Q, an ordered set of video references according to said ranking (**see page 639 right-hand column: the penultimate sentence of point e); section VII: page 643 right-hand column lines 4-12 of section VII and the passage bridging pages 643-644, said section VII and its sub-section VII.B continued on pages 644 and 645, in particular see page 644 left-hand column the last sentence of the middle paragraph ("*Here, we also consider the case when ranking is performed by using the learned models, i.e., how good is the ranking obtained by using the approximated distances Δ^C provided by the SVR models (i.e., ranking by connotative properties predicted by audiovisual features)*" and page 645 left-hand column lines 9-18 with figure 8)).**

- 4.3 The subject-matter of claim 1 therefore differs from this known from D1 in the sole differentiating feature that said ranking of the rest of the initial set of videos is based **exclusively** on their **audio** similarity index with respect to said seed video.
- 4.4 This differentiating feature is regarded as a non-technical feature which does not produce any technical effect, does not solve any technical problem and therefore does not make any technical contribution to the art (PCT-EPO Guidelines G-VII 5.4 and G-II 3.3, 3.7 - 3.7.1), for the following reasons.

4.4.1 In the context of the closest prior art, this differentiating feature refers to a modification of a mathematical method/algorithm for recommending, to a user, information/video(s) with a non-technical cognitive content, such that only audio features are selected for calculation of video (inter-scene) distances and, consequently, of the connotative distances calculated on their basis.

According to PCT-EPO Guidelines G-II 3.3 and 3.7.1 such a modified recommendation method/algorithm, even if implemented in a user interface, does not qualify as serving a technical purpose and providing a technical effect, in particular in the light of the criteria laid down under PCT-EPO Guidelines G-II 3.3 and 3.7 section "*What (which information) is presented?*".

Even though claim 1 refers to analysis of digital audio signals of videos, this analysis is known from D1, and the claimed modification of the mathematical method of claim 1 (i.e. omitting other video content features, e.g. the visual ones) does not serve any technical application, like e.g. de-noising, detecting persons in video, or estimating the quality of a transmitted digital audio signal (cf. PCT-EPO Guidelines G-II 3.3).

Instead, the modification (differentiating feature) serves a non-technical purpose of presenting recommendations to the user to help her/him to make a mental decision on which video/movie to watch next or in the future. The cognitive content of the information proposed and presented to the user to choose from (i.e. different videos/movies being similar - according to claim 1 only by audio similarity - to the query/seed video and thus being presented as recommendations) does not relate to an internal state prevailing in a technical system and does not enable the user to properly operate this technical system. The content of these recommendations is not directly linked to any technical task (PCT-EPO Guidelines G-II 3.7 & 3.7.1, in particular its 2nd paragraph last sentence).

4.4.2 The effect that a user is (or not) satisfied with such a recommendation because the audio/soundtrack of a recommended video/movie is similar to the seed video/movie which the user possibly likes arises merely in the mind of the user, not in any technical system. Therefore, this effect is not technical either.

4.4.3 Whether the similarity between a recommended video and the seed video shall be based solely on audio, solely on visual characteristics, or on both as in closest prior art D1, is a subjective user's preference. This differentiating feature is thus regarded as a non-technical one.

4.4.4 For the aforementioned reasons, the method/algorithm of claim 1 does not serve a technical purpose and the differentiating feature has no technical effect.

- 4.4.5 Moreover, the claimed method/algorithm does not appear to be particularly suitable for being performed on a computer in that its design is motivated by technical considerations of the internal functioning of the computer. The reason therefor is that claim 1 is silent on any technical details or implementation features, in particular on features related to any, e.g. advantageous or efficient, implementation of the claimed method/algorithm on a computer system/device.
- 4.5 Thus, for the aforementioned reasons, the differentiating feature does not, in the context of the invention, contribute to the technical character of the invention and therefore cannot support the presence of an inventive step.
- Therefore, the only technical contribution which can be identified lies in the implementation of said non-technical feature.
- In view of the above, the objective technical problem is regarded as how to implement said non-technical differentiating feature in the closest prior art (PCT-EPO Guidelines G-VII, 5.4(iii)(c)).
- 4.6 The claimed implementation, at the level of detail of the differentiating feature, would have been straightforward for the skilled person being a computer programmer who would have no difficulty in implementing the amended steps of the mathematical method/algorithm according to claim 1 in a computer program. The subject-matter of claim 1 therefore lacks an inventive step in the sense of Article 33(3) PCT.

INDEPENDENT CLAIM 2

- 5 The subject-matter of independent claim 2 differs from the one of claim 1 in that the following two additional features are added:
- i) calculating at least one high-level feature vector V_f for each digital audio signal by analyzing said at least one temporal sequence of low-level audio features, wherein the elements of said high-level feature vector V_f each represent a high-level audio feature associated with said digital audio signal; and*
- ii) calculating an audio similarity index between each of said plurality of videos by calculating a respective pairwise distance D_p between said high-level feature vectors V_f in the vector space, wherein the shorter pairwise distance D_p represents a higher degree of similarity between the respective digital audio signals.*

- 6 Firstly, it has to be noted that D1 discloses on page 639 left-hand column at the end of point b) that "[f]or each feature, matrices of interscene distances Δ^F are computed as distances between feature histograms". Because three audio features are selected (spectral rolloff standard deviation, rhythmic strength and sound energy - see page 640 right-hand column lines 14-28 and the last four lines, the top boldfaced features in Table II, and the bottom half of left-hand column on page 643), the objective problem seems to be how to store the histograms of said three audio features, respectively, for the need of calculating the matrices of interscene distances. Storing said three histograms of said three audio features in a common multi-dimensional feature vector ("*high-level feature vector V_f* " in the language of claim 2) would be an obvious design alternative for the skilled person who would thus arrive at the subject-matter according to claim 2.
- 7 Alternatively, and for the sake of completeness, it is pointed out that the aforementioned differentiating features i) and ii) represent in fact another modification of the mathematical method/algorithm for recommending, to a user, information/video(s) with a non-technical cognitive content, said modification confined to the field of mathematics. In the opinion of this ISA, these differentiating features have no technical effect, for essentially the same or similar reasons as given with regard to claim 1 above, *mutatis mutandis*.
Moreover, the subject-matter of claim 2 does not serve a technical purpose, for essentially the same or similar reasons as given with regard to claim 1 above, *mutatis mutandis*.
- 8 For any of the reasons given above under points 6 and 7, the differentiating features i) and ii) do not, in the context of the invention, contribute to the technical character of the invention and therefore cannot support the presence of an inventive step.
The subject-matter of claim 2 does not, therefore, involve an inventive step in the sense of Article 33(3) PCT, for essentially the same or similar reasons as given with regard to claim 1 above, *mutatis mutandis*.

INDEPENDENT CLAIMS 13 and 17

- 9 Independent claims 13 and 17 comprise the same or corresponding features as claim 1, and therefore said independent claims lack an inventive step for the same reasons as given above with regard to claim 1, *mutatis mutandis*, Article 33 (1) (3) PCT.

APPLICANT'S ARGUMENTS

- 10 The applicant has requested to have the present application processed under PCT Direct (PCT Guidelines B-IV, 1.2.1). Account taken of the applicant's comments submitted with the PCT Direct letter of 31.01.2020, this Authority considers that the claims do not meet the requirements of the PCT with regard to inventive step (Article 33 (1) (3) PCT) for the reasons given above and below.
- 11 The applicant submitted the following argument regarding the objective technical problem to be solved and alleged technical effects of the invention:
"The problem to be solved by the above differentiating features is providing a video recommendation method that takes into account nuances as well as larger scale correlations of audio characteristics while also improving efficiency both in computing resources as well as in storage and transmission of data, and optimizing load distribution on any used computer network."
- This argument of the applicant is not deemed persuasive for the following reasons.
- 11.1 Providing a video recommendation method that takes into account nuances as well as larger scale correlations of audio characteristics is devoid of a technical effect, and of a technical purpose either, as elaborated above under points 4.4 - 4.5. In essence, recommending, to a user, information with a non-technical cognitive content, i.e. a video/movie having audio/soundtrack similar to the seed video/movie which the user possibly likes, serves a non-technical purpose of helping her/him to make a mental decision on which video/movie to watch next or in the future. Such recommendation is not directly linked to any technical task. The effect of such recommendation arises merely in the mind of the user, not in any technical system. This effect is therefore not technical.
- 11.2 The aforementioned alleged technical effects of the invention are rather an obvious consequence of the modification of the mathematical algorithm of recommendation by using only audio features and culling visual and other low-level video content features. In other words, if the mathematical method/algorithm uses less video content features than the one of the closest prior art, then obviously less computing, storage and transmission resources are needed to handle said features in an implementation of said method/algorithm in a computer program executing on a computer. Moreover, because the assessment of inventive step at the EPO is to be carried out in accordance with section G-VII, 5.4 of the PCT-EPO Guidelines, the technically skilled person is regarded to be a computer engineer/programmer, who will be provided with the

modification of the mathematical method/algorithm as part of a requirements specification, or a constraint that has to be met, by a non-technical expert in mathematical methods / algorithms for content recommendation.

- 12 The applicant submitted also the following argument which appears relevant to the current closest prior art D1 (although the wording of the argument refers to document D1 from a priority search, now numbered D2):

"In particular, it is clear from the elaborate description in D1 of using both [...] visual and audio similarities that, even if the skilled person would take the teachings of D1 and, faced with the problem of needing to generate video recommendations, [...] he would not be motivated to exclude all other similarity calculations and only use audio similarity for the ranking".

This argument of the applicant is not deemed persuasive essentially for the same reasons as given above under point 11.2, i.e. it is not the the technically skilled person (computer programmer), who would consider modifying the mathematical method/algorithm for content recommendation, but he/she would receive it from a non-technical expert.

- 13 The other arguments submitted by the applicant are strongly bound to a different document (now D2) which was considered the closest prior art by the authority treating the priority application. These arguments do not appear to be relevant to D1, and to the reasoning based on D1, as presented above.

DEPENDENT CLAIMS 3-12 and 14-16

- 14 The present dependent claims 3-12 and 14-16 do not appear to contain any additional features which, in combination with the features of any claim to which said dependent claims refer, meet the requirements of Article 33 (1) (3) PCT in respect of inventive step, since these features are regarded as:

a) known from prior art documents on file, in particular D1 or D2, and/or

b) known from the common general knowledge of the person skilled in the art, and/or

c) further non-technical features having no technical effect, no technical purpose, solving no technical problem and thus making no technical contribution to the art. These non-technical features do not support the presence of an inventive step, Article 33(3) PCT and PCT-EPO Guidelines G-VII 5.4 - 5.4.1 for essentially the same reasons as given above with regard to claim 1, mutatis mutandis.

INDUSTRIAL APPLICABILITY

- 15 With regard to the assessment of the present claims on the question of industrial applicability, the following is stated. The subject matter of the present claims relates to a method implemented on a computer-based system, and the corresponding: computer-based system and non-transitory computer-readable storage medium, and therefore it fulfills the requirements of industrial applicability as set out in Article 33(4) PCT.