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Date
06.10.20

Reference	Application No./Patent No.
P158-EP1	20166411.7 - 1216 / 3716021
Applicant/Proprietor	
Tobii AB	

Communication

The extended European search report is enclosed.

The extended European search report includes, pursuant to Rule 62 EPC, the European search report (R. 61 EPC) or the partial European search report/ declaration of no search (R. 63 EPC) and the European search opinion.

Copies of documents cited in the European search report are attached.

☑ 0 additional set(s) of copies of such documents is (are) enclosed as well.

The following have been approved:

☑ Abstract ☑ Title

☐ The Abstract was modified and the definitive text is attached to this communication.

The following figure(s) will be published together with the abstract: 4

Refund of search fee
If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.

Should you wish to further prosecute this application in the examination phase, your attention is drawn to the provisions of Rule 70a EPC. An invitation to respond to the extended European search report will be issued once the date of publication of the European search report has been mentioned in the European Patent Bulletin (R. 69(1), R. 70(2) EPC).

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1 Application documents

The examination is being carried out on the **following application documents**

Description, Pages

1-23 as originally filed

Claims, Numbers

1-15 as originally filed

Drawings, Sheets

1-7 as originally filed

2 Prior Art

D1 WO 2010/118292 A1 (DYNAVOX SYSTEMS LLC [US]; LANKFORD CHRISTOPHER PAUL [US] ET AL.) 14 October 2010 (2010-10-14)

D2 US 2015/085251 A1 (LARSEN ERIC J [US]) 26 March 2015 (2015-03-26)

D3 WO 2019/010214 A1 (FACEBOOK TECH LLC [US]) 10 January 2019 (2019-01-10)

3 Non unity, Article 82 EPC

The application lacks unity within the meaning of Article 82 EPC.

3.1 The claims define five different groups of inventions, namely:

Group I: claims 1 (partial), 2-3, 9, 10 (partial), 11, 15

Group II: claims 1 (partial), 4, 6, 10 (partial), 12

Group III: claims 1 (partial), 5, 10 (partial), 14

Group IV: claims 1 (partial), 7, 10 (partial), 13

Group V: claims 1 (partial), 8, 10 (partial)

3.2 Single general inventive concept approach

3.2.1 The single general concept of the inventions is considered to be (claim 1):

"A method for training an eye tracking model, wherein the eye tracking model is adapted to predict eye tracking data based on sensor data from a first eye tracking sensor , the method comprising:

- receiving sensor data obtained by the first eye tracking sensor at a time instance;
- receiving reference eye tracking data for said time instance generated by an eye tracking system comprising a second eye tracking sensor, wherein the reference eye tracking data is generated by the eye tracking system based on sensor data obtained by the second eye tracking sensor at said time instance; and
- training the eye tracking model based on the sensor data obtained by the first eye tracking sensor at said time instance and the generated reference eye tracking data."

3.2.2 The single general concept is disclosed in D1 (see 5.1.1 below). Therefore the single general concept is not novel.

3.2.3 There are no further common or corresponding features. Therefore there is no single general inventive concept that would render the five groups of inventions unitary in the sense of Rule 44 EPC.

3.3 Special technical feature approach

3.3.1 Special technical features of each invention

3.3.1.1 Claim 3 does not show any special technical feature, because the subject-matter of claim 3 is not considered inventive in view of D1 (see item 5.2 below). The technical feature (TF 1) of claim 3 is considered to be predicting the absolute position of the user's eye in space.

3.3.1.2 The special technical feature (STF 2) of claim 4 is considered to be comparing the predicted eye tracking data to reference eye tracking data.

3.3.1.3 The special technical feature (STF 3) of claim 5 is considered to be providing a filter, which suppresses light emitted by another illuminator.

3.3.1.4 The special technical feature (STF 4) of claim 7 is considered to be only training the eye tracking model if a trigger action is received.

3.3.1.5 The special technical feature (STF 5) of claim 8 is considered to be providing several eye tracking models and choosing an eye tracking model being associated with the detected user.

3.3.2 Concepts underlying each invention

3.3.2.1 The concept underlying the subject-matter of claim 3 (invention 1), which is the solution to the problem 1 (problem 1: How to determine the user's eye position in an alternative manner) by means of (TF 1) predicting the absolute position of the user's eye in space, is not considered inventive in view of D1.

3.3.2.2 The concept underlying the subject-matter of claim 4 (invention 2), which is the solution to the problem 2 (problem 2: How to determine the quality of the predicted eye tracking data) by means of (STF 2) comparing the predicted eye tracking data to reference eye tracking data, defines a contribution over D1.

3.3.2.3 The concept underlying the subject-matter of claim 5 (invention 3), which is the solution to the problem 3 (problem 3: How to improve the detection of light emitted by an illuminator) by means of (STF 3) by providing a filter, which suppresses light emitted by another illuminator, defines a contribution over D1.

3.3.2.4 The concept underlying the subject-matter of claim 7 (invention 4), which is the solution to the problem 4 (problem 4: How to reduce the energy consumption) by means of (STF 4) only training the eye tracking model if a trigger action is received, defines a contribution over D1.

3.3.2.5 The concept underlying the subject-matter of claim 8 (invention 5), which is the solution to the problem 5 (problem 5: How to allow a better adaptation to different users) by means of (STF 5) providing several eye tracking models and choosing an eye tracking model being associated with the detected user, defines a contribution over D1.

3.3.2.6 Thus the features TF 1, STF 2, STF 3, STF 4, STF 5 are neither the same nor corresponding.

3.4 Therefore the subject-matter of the five groups of claims is not unitary and relates to five different inventions.

3.5 As the applicant has not had a search report drawn up on the inventions 2, 3, 4 and 5 (groups II, III, IV and V), the application will be prosecuted on the basis of the inventions in respect of which a search has already been carried out (Rule 64 EPC).

3.6 In case the applicant decides to go into examination phase the applicant should limit the application to the invention, which was searched and delete those parts in the claims of the application relating to any other invention.

4 Clarity, Article 84 EPC

The application does not meet the requirements of Article 84 EPC for the following reasons:

4.1 The independent claims 1, 10 and 15 are not supported by the description as required by Article 84 EPC, as its scope is broader than justified by the description and drawings.
Claim 1 currently only specifies one eye tracking system. However the core of the present application lies in having **two independent eye tracking systems**, whereby one eye tracking system (on p. 9, last paragraph it is named "the old eye tracking system 420") is used to provide reference eye tracking data for calibrating the other (or "new") eye tracking system. The current claim 1 however only specifies one eye tracking system ("eye tracking system (420)") and the claim is that broadly formulated that both, the first eye tracking sensor (411) and the second eye tracking sensor (421), could belong to the eye tracking system (420), which is not supported by the description and drawings.
It is noted that one could have also raised an objection of **lack of essential features** as this feature is considered to be essential to the definition of the invention (Article 84 EPC, taken in combination with Rule 43(1) EPC). It is moreover noted that if this feature is added to the independent claims, they would be considered **novel and inventive in view of D1.**

4.2 Moreover the independent claims 1, 10 and 15 are not supported by the description as required by Article 84 EPC, as its scope is broader than justified by the description and drawings. The independent claims currently do not specify that the eye tracking sensors are filming the eyes of the user. Thus the current independent claims are mappable to the embodiment disclosed in fig. 4 of D2: the second eye tracking sensor of claim 1 is mappable to the sensor 440, which is filming the screen 404. The present application, however, clearly discloses two eye tracking sensors, whereby both are filming the eyes of the user. Thus the current claim wording is too broad as the features in their full breadth are not sufficiently supported by the description as originally filed. If the independent claims would clearly specify that the eye tracking sensors are filming the eyes of the user, they would be considered **inventive in view of D2**.

4.3 Moreover the independent claims 1, 10 and 15 are not supported by the description as required by Article 84 EPC, as they specify "the eye tracking model is adapted to predict eye tracking data". It is noted that "predict" means to say that something will happen in the future (see definition of Oxford dictionaries). The description and drawings however clearly disclose that the eye tracking data is estimated (see last paragraph on p. 7 or p. 9, l. 14-15). If the complete set of claims would specify an estimation (instead of a prediction), this objection of lack of support will be overcome.

4.4 Claim 1 specifies in lines 2-3 "the eye tracking model is adapted to predict eye tracking data based on sensor data (709) from a first eye tracking sensor (411)", whereby the last paragraph of claim 1 clearly specifies that the training is based on the sensor data obtained by the first eye tracking sensor and the generated reference eye tracking data. If the underlined wording is added to line 3 of claim 1 this contradiction will be removed. The same objection applies for independent claims 10 and 15.

4.5 Claim 1 specifies: "receiving (301) sensor data obtained by the first eye tracking sensor at a time instance", whereby it is not clear if the wording "at a time instance" refers to the receiving or to the obtaining. Claim 1 should be clarified based on the description and drawings. The same objection applies for independent claims 10 and 15.

4.6 Claim 1 reads "training (303) the eye tracking model based on the sensor data obtained by the first eye tracking sensor at said time instance and the generated reference eye tracking data". For the sake of consistent wordings throughout the entire set of claims the wording "for said time instance" should be added at the end of the quotation. The same objection applies repeatedly throughout the entire set of claims.

4.7 Claim 2 repeats features of the antecedent claim 1. Thus claim 2 renders the current set of claims not concise. If claim 2 is deleted, the set of claims will be considered concise. The same objection applies for claim 11.

4.8 Claim 4 is not supported by the description as required by Article 84 EPC, as its scope is broader than justified by the description and drawings. Claim 4 specifies "applying (802) an objective function", which is that broad that e.g. scrolling or any filtering falls under this broad wording. According to the last paragraph on p. 16 of the description it is clear that such as a cost function or loss function is employed to detect if the predictions made by the eye tracking model seem to be compatible with the reference eye tracking data. This is

however not apparent from the wording of claim 4. Therefore the wording is currently too broad as the feature in its full breadth is not sufficiently supported by the description as originally filed.

4.9 Claim 4 is moreover not clear, as it specifies "updating (803) the eye tracking model" without any context, nor it specifies based on what the eye tracking model is updated (e.g. based on the eye tracking data on which the objective function has been applied?).

4.10 The wording "based on" used in claim 5 is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear (Article 84 EPC). It could mean that the sensor is capable of detecting light within said wavelength range or it could mean that the emitted light is detected. Claim 5 should be clarified based on the description and drawings.

4.11 Claim 5 is not supported by the description as required by Article 84 EPC, as its scope is broader than justified by the description and drawings. According to the second paragraph on p. 11 of the description and the second paragraph of p. 12 it is clear that two independent eye tracking systems are provided, whereby the filter suppresses the light emitted by the other eye tracking system. This is however not apparent from the wording of claim 5. Therefore the wording is currently too broad as the feature in its full breadth is not sufficiently supported by the description as originally filed. The same objection applies for claim 14.

4.12 Claim 6 renders the set of claims inconcise, as it repeats various features of claim 4. If claim 6 would depend on claim 4, this objection will be overcome.

4.13 Claim 6 is not clear as it is not clear to what the wording "and the sensor data" refers. It could refer to "predicting" or to "using". Claim 6 should be clarified based on the description and drawings. The same objection applies for claim 12.

4.14 Claim 14 is not clear as its category is not clear. It is noted that a claim can be either of the category "method claim " **or** of the category "system claim". Moreover as claim 14 repeats features of claim 5 it renders the set of claims inconcise. If claim 14 would be limited to a system claim, which depends on claim 10-13 both objections will be overcome.

4.15 Claim 9 specifies "receiving sensor data obtained by the first eye tracking sensor at a sequence of time instances", whereby this wording has to be amended to clarify that the time instance specified in claim 1 is included in this sequence of time instances. Currently claim 9 defines a "hidden" independent claim, which is not allowable (Rule 43(2) EPC).

4.16 The objections mentioned above could apparently be overcome by filing an amended set of claims, giving an indication of the parts of the description that support the amendment(s). If the applicant is of the opinion that any objection would be inappropriate, reasons therefore should be given.

5 Novelty and Inventive Step

5.1 Independent claims 1, 10 and 15

Furthermore, notwithstanding the above-mentioned lack of clarity, the subject-matter of the independent claims is not new within the meaning of Article 54(1) and (2) EPC, and therefore the requirements of Article 52(1) EPC are not met.

5.1.1 Document D1 discloses the subject-matter of claim 1 as follows (comments are in *italic type*):

"A method for training an eye tracking model *(see [120])*, wherein the eye tracking model is adapted to predict eye tracking data *(see fig. 17, step 1708 with [133])* based on sensor data from a first eye tracking sensor *("first image capture device 102", see fig. 1 with [51])*, the method comprising:

- receiving sensor data obtained by the first eye tracking sensor *("first image capture device 102", see fig. 1 with [51])* at a time instance *(see fig. 17, step 1700 with [122]: "obtaining an initial set of eye images and at least one subsequent set of eye images. In one particular example, each set of images may include images taken by respective first and second image capture devices")*;
- receiving reference eye tracking data for said time instance generated by an eye tracking system *("eye gaze detection system 100", see fig. 1 with [51])* comprising a second eye tracking sensor *("second image capture device 103", see fig. 1 with [51])*, wherein the reference eye tracking data is generated by the eye tracking system based on sensor data obtained by the second eye tracking sensor *("second image capture device 103", see fig. 1 with [51])* at said time instance *(see passages from [122] and fig. 17 cited in antecedent paragraph of claim 1)*; and
- training the eye tracking model based on the sensor data obtained by the first eye tracking sensor at said time instance and the generated reference eye tracking data *(see fig. 17, step 1704 with [125]-[129])*."

5.1.2 It is noted that "reference eye tracking data" as currently specified in claim 1 is considered to be a name for the eye tracking data generated by the second eye tracking sensor. According to the description and drawings (see last paragraph

on p. 9 - first paragraph on p. 10), however, it is clear that the reference eye tracking data is used as a reference value to correct the eye tracking data of the eye tracking system having the first eye tracking sensor. This is however currently not apparent from the wording of claim 1. If the independent claim 1 would clearly specify that the reference eye tracking data is used to correct the tracking implemented by the eye tracking system comprising the first eye tracking sensor, claim 1 would be considered inventive in view of D1.

5.1.3 Claim 10 is an apparatus claim and corresponds to the method claim 1, therefore mutatis mutandis the same objection of lack of novelty arises for claim 10. Claim 15 is a storage medium claim and corresponds to the method claim 1, therefore mutatis mutandis the same objection of lack of novelty arises for claim 10.

5.1.4 Furthermore it is noted that the independent claims are also not inventive (Article 56 EPC) in view of D2 cited in the European Search Report (see the passages cited in the European Search Report).

5.2 Dependent claims

The dependent claims do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to novelty (Article 54 EPC) or inventive step (Article 56 EPC). Therefore the requirement of Article 52(1) EPC is not met. The relevant passages in the prior art are as follows:

- claim 2, 11: See passages cited under item 5.1.1 above.
- claim 3: D1, [133] discloses predicting a gaze point. Predicting a gaze ray is well known in the art and not considered inventive in view of D1, [49], which already discloses determining a gaze direction. [20] discloses that the relative position of the user's eye is determined (represented by the scaling factor). Determining the absolute position of the eye in space is a well known alternative to relative position determination and not considered inventive.
- claim 9: The passages cited under item 5.1.1 above disclose a sequence of time instances. D1, [57] discloses storing input and output data.

6 Further Proceedings

6.1 To meet the requirements of Rule 42(1)(b) EPC, D1 to D3 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

6.2 For future amendments it is furthermore noted that if the applicant adds features to the independent claims which are not present in the closest prior art document, the applicant is reminded to cast the independent claims in the two-part form with respect to the closet prior art document (Rule 43(1) EPC). If, however, the applicant is of the opinion that the two-part form would be inappropriate, reasons therefor should be provided.

6.3 The attention of the applicant is drawn to the fact that the application may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC).

6.4 In order to comply with the requirements of Rule 137(4) EPC, the applicant should clearly identify any amendments made, irrespective of whether they concern amendments by addition, replacement or deletion. The basis provided by the applicant should be complete and precise, i.e. cite every amended wording and indicate a page and lines of the description serving as a basis. If a wording is not literally disclosed in the description as originally filed, the applicant should argue in detail why it is considered to be directly and unambiguously derivable from the application as originally filed.

6.5 Last but not least the applicant is asked to bring the description into conformity with any amended claims. Meaning that throughout the entire description it should be always clear which features are obligatory for the present invention (i.e. specified in the independent claim(s)) and which features are optional (and e.g. specified in the dependent claims). Moreover the wording "embodiment" should only be used if it refers to subject-matter falling within the scope of the current independent claim(s). Furthermore the introductory part of the description (which usually repeats the claims) and the problem and technical effect of the present application should be adapted to any amended claims.

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 6411

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2010/118292 A1 (DYNAVOX SYSTEMS LLC [US]; LANKFORD CHRISTOPHER PAUL [US] ET AL.) 14 October 2010 (2010-10-14) * paragraph [0051]; figure 1 * * page 17, paragraph 119 - paragraph 133; figure 17 * * paragraph [0049] * * paragraph [0057] * * paragraph [0020] *	1-3,9, 11,15	INV. G06F3/01
X	US 2015/085251 A1 (LARSEN ERIC J [US]) 26 March 2015 (2015-03-26) * paragraph [0062] - paragraph [0066]; figure 4 *	1-3, 9-11,15	
A	WO 2019/010214 A1 (FACEBOOK TECH LLC [US]) 10 January 2019 (2019-01-10) * paragraph [0070]; figure 3 *	1-3,9, 11,15	

TECHNICAL FIELDS SEARCHED (IPC)

G06F
H04N

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	25 June 2020	Most, Stefanie

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 20 16 6411

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

2, 3, 9, 11, 15(completely); 1, 10(partially)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 20 16 6411

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 2, 3, 9, 11, 15(completely); 1, 10(partially)

   How to determine the user's eye position in an alternative manner by predicting the absolute position of the user's eye in space.

   ---

2. claims: 4, 6, 12(completely); 1, 10(partially)

   How to determine the quality of the predicted eye tracking data by comparing the predicted eye tracking data to reference eye tracking data.

   ---

3. claims: 5, 14(completely); 1, 10(partially)

   How to improve the detection of light emitted by an illuminator by providing a filter, which suppresses light emitted by another illuminator.

   ---

4. claims: 7, 13(completely); 1, 10(partially)

   How to reduce the energy consumption by only training the eye tracking model if a trigger action is received.

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5. claims: 8(completely); 1(partially)

   How to allow a better adaptation to different users by providing several eye tracking models and choosing an eye tracking model being associated with the detected user.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 16 6411

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-06-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010118292 A1	14-10-2010	US 2012105486 A1	03-05-2012
		US 2014334666 A1	13-11-2014
		US 2015301600 A1	22-10-2015
		US 2015309570 A1	29-10-2015
		WO 2010118292 A1	14-10-2010
US 2015085251 A1	26-03-2015	US 2015085251 A1	26-03-2015
		WO 2015048030 A1	02-04-2015
WO 2019010214 A1	10-01-2019	EP 3485356 A1	22-05-2019
		US 10108261 B1	23-10-2018
		WO 2019010214 A1	10-01-2019

Information on Search Strategy - **Pilot phase (see OJ 2015, A86)**
The type of information contained in this sheet may change during the pilot for improving the usefulness of this new service.

Application Number

EP 20 16 6411

TITLE: TRAINING AN EYE TRACKING MODEL

APPLICANT: Tobii AB

IPC CLASSIFICATION: G06F3/01

EXAMINER: Most, Stefanie

CONSULTED DATABASES: DOSYS, ANSERA

CLASSIFICATION SYMBOLS DEFINING EXTENT OF THE SEARCH:

IPC:

CPC: G06F3/013

FI/F-TERMS:

KEYWORDS OR OTHER ELEMENTS FEATURING THE INVENTION:
Eye tracking system using a eye tracking model to estimate the gazed position of the user. The eye tracking model can be trained or updated using calibration data (i.e. reference data), which is created by another eye tracking system.