PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

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PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.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.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2018/047611	22.08.2018	30.08.2017

International Patent Classification (IPC) or both national classification and IPC
INV. G06K9/00

Applicant
QUALCOMM INCORPORATED

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 notifed 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.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	see form PCT/ISA/210	Sagrebin-Mitzel, M Telephone No. +31 70 340-0

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:

      ☐ 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 13*ter*.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 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.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 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	5-27, 30
	No:	Claims	1-4, 28, 29
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-30
Industrial applicability (IA)	Yes:	Claims	1-30
	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 V

1 Reference is made to the following documents:

D1 Dennis Mitzel ET AL: "Real-Time Multi-Person Tracking with Time-Constrained Detection", Procedings of the British Machine Vision Conference, 1 January 2011, XP055139622

D2 Michalis Zervos: "Multi-camera face detection and recognition applied to people tracking", Master Thesis, 1 January 2013, XP055521316

Independent claims 1 and 28

Novelty - Article 33(2) PCT

2 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.

2.1 Document D1 discloses all features of claim 1:

- An apparatus for prioritizing objects for object recognition in one or more video frames **(D1: abstract, lines 4-8)**, comprising:
- a memory configured to store video data associated with the one or more video frames **(D1: page 9, lines 12-13)**; and
- a processor **(D1: page 9, lines 12-13)** configured to:
- obtain a current video frame **(D1: page 8, section 6, first paragraph; page 4, section 3, second paragraph, line 4, *"in each frame"*)**;
- detect a plurality of objects in the current video frame **(D1: page 4, section 3, third paragraph, line 1, *"we extract ROI candidates"*)**;
- determine state information associated with the plurality of objects **(D1: page 4, section 3, third paragraph, lines 4-5; 'state information' is interpreted in the context of document D1 as information whether the newly extracted ROI candidates in the current frame could have been associated with the candidates regions of past frames)**;
- determine priorities for the plurality of objects, wherein a priority is determined for an object based on state information associated with the object **(D1: page 4, section 3, third paragraph, lines 3-6; *"urgency of verification of the ROI by the detector"*)**; and

- perform object recognition for one or more objects from the plurality of objects based on one or more priorities determined for the one or more objects, wherein object recognition is performed for objects having higher priorities before objects having lower priorities **(D1: page 4, section 3, third paragraph, lines 6-7; 'object recognition' corresponds in D1 to the process of ROI verification by the detector)**.

3 The same objection applies mutatis mutandis to the independent claim 28.

Dependent claims

4 In as much as clear (see objections in paragraphs ... below) the additional features of the dependent claim 2 and corresponding claim 29 are disclosed in document D1:

- *"obtain object identifiers"* -> **D1: page 6, last two lines, "existing trajectories"**
- *"confidence scores"* -> **D1: page 7, second paragraph, lines 1-2, "the score of each hypothesis"**
- *"history counter information for the plurality of objects"* -> **D1: page 7, first paragraph, line 3, "trajectory's history"; page 7, fourth paragraph, lines 6-7**

5 The additional features of the dependent claims 3 (and corresponding claim 30) and 4 are disclosed in document D1:

- Claim 3 (and corresponding claim 30) -> **D1: page 5, second paragraph, first sentence**
- Claim 4 -> **D1: page 7, third paragraph, "ROI-based Tracking"**

6 Dependent claims 5 to 17 do not appear to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of novelty or inventive step, the reasons being as follows:

The additional features of these claims deal with the procedure of updating the the priority of the detected objects based on "history counter", "confidence score" and whether the detected object could have been matched with an object detected in a previous frame. Document D1 discloses on pages 4 to 5 the Poisson Process Attention Model which describes the process of updating

the urgency (i.e. the priority) of verifying a ROI candidate (which corresponds to the detected object). According to the teachings of document D1, the urgency for verification of given ROI candidate is updated based on information regarding the appearance change, last time verification and whether the detected ROI candidate could have been associated with ROIs from a previous frame.

Thus claims 5 to 17 in so far as they are not lacking novelty, lack an inventive step, Article 33(3) PCT.

7 Dependent claims 18 to 25 disclose a procedure according to which a priority for an object is also updated based on information whether the detected object is registered in a database of known objects. Document D2 discloses a Kalman Filter Tracker for people which also incorporates information from face recognitions (D2: page 35, sections 5.1 and 5.1.1). Therefore, the subject-matter of the dependent claims 18 to 25 is not inventive over the combination of documents D1 and D2, Article 33(3) PCT.

8 The additional feature of claim 26, i.e. *"object recognition includes face recognition"* is disclosed in document D2 (D2: page 35, section 5.1.1.). Therefore this claim is not inventive over a combination of documents D1 and D2, Article 33(3) PCT.

9 The feature of claim 27, i.e. *"mobile device comprising [...] a camera for capturing [...] video frames"* is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill. Therefore, claim 27 lacks inventive step, Article 33(3) PCT.

Re Item VIII

10 The term "state information" used in claim 1 is not a commonly used term within the field of the art and its precise meaning, i.e. definition is not clear to the skilled reader. Furthermore, the expression *"determine state information"* also leaves the skilled 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 6 PCT.

11 The expression *"priority is determined [...] based on state information associated with the object"* used in claim 1 is not clear, as the expression "based on" does not enable the skilled person to determine which technical features are necessary to perform the stated function., Article 6 PCT.

12 In claim 2 recites *"obtain [...] confidence scores"* and leaves the skilled reader in doubt concerning which entity the confidence scores are to be obtained, e.g. confidence scores concerning the detection or the recognition of the object or concerning the correctness of the "state information", Article 6 PCT.

13 Claim 2 recites *"obtain object identifiers"* and allows for the interpretation that this step incorporates object recognition. Since this scenario is not supported by the description, objection of lack of support arises, Article 6 PCT.

14 In claim 2, it is not clear how a *"current state"* is defined, Article 6 PCT.

15 In claim 6, it is not clear how a *"new state"* is defined, Article 6 PCT.