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Datasheet for the decision of 28 March 2019

Case Number: T 1146/13 - 3.4.01

Application Number: 05254130.7

Publication Number: 1615160

IPC: G06K9/46, G06K9/64, G06K9/36

Language of the proceedings: EN

Title of invention:
Apparatus for and method of feature extraction for image recognition

Applicant:
Samsung Electronics Co., Ltd.

Headword:
Image recognition based on sub-regions / Samsung Electronics

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - obvious combination of known features

Decisions cited:

Europäisches Patentamt
European Patent Office
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Beschwerdekammern

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Case Number: T 1146/13 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 28 March 2019

Appellant: (Applicant)	Samsung Electronics Co., Ltd. 129, Samsung-ro Yeongtong-gu Suwon-si, Gyeonggi-do, 443-742 (KR)
Representative:	Elkington and Fife LLP Prospect House 8 Pembroke Road Sevenoaks, Kent TN13 1XR (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 5 December 2012 refusing European patent application No. 05254130.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	P. Scriven
Members:	J. Geschwind
	P. Fontenay

Summary of Facts and Submissions

I. The decision relates to the applicant's appeal against the Examining Division's decision to refuse European patent application No. 05 254 130.

II. The decision to refuse the application refers to three previous communications of the Examining Division. The last of them is dated 21 November 2012. The refusal erroneously refers to 13 November 2012, but the appellant has not objected and it is clear that the appellant understood which communication was meant. This last communication concerns the content of a phone conversation between the first examiner and the applicant's representative. The phone conversation followed the filing, by the applicant, of a new amended set of claims.

Concretely, in this communication, the objection was raised that the claims contained amendments extending beyond the content of the application as filed, contrary to Article 123(2) EPC. The Examining Division further considered that claims which were amended so as to meet the requirements of Article 123(2) would lack an inventive step in the sense of Article 56 EPC.

III. In the course of the examination procedure, reference was made inter alia to the following documents:

D1: R. Gottumukkal and V. K. Asari, "An improved face recognition technique based on modular PCA approach", Pattern Recognition Letters, 25, March 2004, pages 429-436;

D2: S. Shan et al., "Illumination Normalization for Robust Face Recognition Against Varying Lighting Conditions", Proceedings of the IEEE International Workshop on Analysis and Modeling of Faces and Gestures, 17 October 2003, pages 157-164;

D3: O. Toygar and A. Acan, "Multiple classifier implementation of a divide-and-conquer approach using appearance-based statistical methods for face recognition", Pattern Recognition Letters, September 2004 (Available online 10 June 2004), pages 1421-1430;

D4: L. Chen and N Tokuda, "Robustness of regional matching scheme over global matching scheme", Artificial Intelligence, 144, pages 213-232, 2003;

D5: Y. Ivanov et al., "Using Component Features for Face Recognition", in Proceedings of the Sixth IEEE International Conference on Automatic Face and Gesture Recognition, pages 421-426, 19 May 2004;

D6: M. Artiklar et al., "Local Voting Networks for Human Face Recognition", in Proceedings of the International joint conference on neural networks 2003, pages 2140-2145, 20 - 24 July 2003.

IV. The Examining Division based their objection of lack of an inventive step on document D2, considered to illustrate the closest prior art. In their view, it would have been obvious to modify the algorithm of D2 in the light of one of documents D3 to D6 in order to

improve image recognition rates and thus to arrive at the claimed subject-matter.

V. The appellant requested that the decision of the Examining Division to refuse the application be set aside and that a patent be granted on the basis of its main request, filed with the statement of grounds.

As an alternative, grant of a patent on the basis of a set of claims according to an auxiliary request, also filed with the statement of grounds, was requested.

Arguments supporting the existence of inventive step with regard to the various documents cited by the Examining Division were put forward.

VI. In a communication under Article 15(1) RPBA, the appellant was informed of the Board's preliminary view. While acknowledging that the objections regarding added subject-matter (Article 123(2) EPC) had been overcome, the Board submitted that the claimed subject-matter was not clearly defined in both the main and the auxiliary request.

VII. With regard to inventive step, the Board, in essence, endorsed the observations of the Examining Division, according to which the claimed subject-matter would have been obvious starting from document D2. The Board further concurred with the view expressed by the Examining Division that the claimed invention resulted from the association of known processes and in that the skilled person would have indeed considered documents D3, D4, D5 and D6. It was further noted that an

alternative approach, starting from one of documents D1, D3, D4, D5 or D6, was also conceivable and led to the same conclusion.

VIII. In reply to the Board's communication, the appellant filed revised sets of claims for the main and auxiliary requests.

Concerning the objection of lack of inventive step starting either from D2 or from one of documents D1, D3, D4, D5 and D6, the appellant argued only that "it would have taken hindsight knowledge of the invention to realise that these two separate technical disclosures could usefully be combined to overcome the relevant technical problem."

IX. The appellant informed the Board that it did not intend to be represented at the oral proceedings, which were therefore cancelled.

X.

XI. Claim 1 of the main request reads:

A system for performing image recognition, the system comprising:
an image input device (100) arranged to obtain a first image; and
a database (130) arranged to store a plurality of reference images; and
characterized by further comprising a correction unit which is arranged to receive the first image having been divided into first image sub-regions, to compare each of the first image

sub-regions with the corresponding sub-region of a mean image obtained by averaging the plurality of reference images to remove an influence of illumination and/or occlusion in each of the first image sub-regions, and to produce a corrected first image based on corrected first image sub-regions; and
a comparison unit which is arranged to receive the corrected first image from the correction unit, to compare each of the corrected first image sub-regions in the corrected first image with a respective sub-region of the plurality of reference images so as to determine which of the reference images has a greatest correlation to the corrected first image based on the comparisons and to recognize the reference image having the most sub-regions in common with the corrected first image among the plurality of reference images as the corrected first image.

XII. Claim 1 according to the appellant's auxiliary request reads:

A system for performing image recognition, the system comprising:
an image input device (100) arranged to obtain a first image;
a database (130) arranged to store a

plurality of reference images; and a correction unit which is arranged to receive the first image having been divided into first image sub-regions, to compare each of the first image sub-regions with the corresponding sub-region of a mean image obtained by averaging the plurality of reference images to remove an influence of illumination and/or occlusion in each of the first image sub-regions, and to produce a corrected first image based on corrected first image sub-regions; and characterized by further comprising:
a comparison unit which is arranged to receive the corrected first image from the correction unit, to compare each of the corrected first image sub-regions in the corrected first image with a respective sub-region of the plurality of reference images so as to determine the reference image having a greatest correlation among the plurality of reference images for each sub-region of the corrected first image, and to recognize the reference image having the most sub-regions in common with the corrected first image among the plurality of reference images as the corrected first image.

Reasons for the Decision

1. The main and auxiliary requests were filed in reaction to the communication of the Board under Article 15(1) RPBA. Although the Board is still not satisfied that the current requests meet the requirements of Article 84 EPC, it admitted these requests into the proceedings (Article 13(1) RPBA). In this respect, the Board noted that its main concerns under Article 84 EPC, as were put forward in its provisional opinion, had been addressed, and that the remaining issues, which had not yet been communicated to the appellant, could possibly have been resolved, had the Board reached a different conclusion with regard to what it held to constitute the main obstacle to the grant of a patent, that is, the lack of an inventive step of the claimed subject-matter.

Main request

2. The Examining Division based their objection of lack of inventive step on document D2, which discloses a system for performing image recognition with an image input device, arranged to obtain a first image, and a database arranged to store a plurality of reference images.

3. Document D2 belongs to the same technical field as the claimed invention (cf. Title, Abstract) and shares structural and functional features with the claimed inventions which are essential for the claimed purpose

of recognising images. It is, therefore, a reasonable starting point.

4. Specifically, Document D2 discloses a correction unit (cf. section 2.2 "Region-based Strategy for HE and GIC"), arranged to receive the first image (divided into sub-regions), in order to compare each of the sub-regions with the corresponding sub-region of a mean image obtained by averaging the plurality of reference images. The purpose of the correction unit is to remove the influence of illumination or occlusion in each of the first image sub-regions (cf. section 4.2 comments regarding the GIC technique), and to produce a corrected first image based on corrected sub-regions.

5. The claimed invention is distinguished from the system of D2 in that it includes a comparison unit, as recited in claim 1. Concretely, D2 does not disclose a comparison unit which is arranged to receive the corrected first image from the correction unit, to compare each of the corrected first image sub-regions in the corrected first image with a respective sub-region of the plurality of reference images so as to determine which of the reference images has greatest correlation to the corrected first image and to recognize the reference image having the most sub-regions in common with the corrected first image.

6. Such a comparison improves recognition rates.

7. Faced with this problem of improving recognition rates, the skilled person would have certainly considered all

items of prior art concerned with image or pattern recognition, which may have possibly contributed to improving said recognition rate, at least insofar as these documents would provide teachings compatible with the disclosure in D2.

With regard to the particular embodiments of the invention, the skilled person would have concentrated his investigations in the field of face recognition.

8. In this respect, he would undoubtedly have recognised the relevance of document D3 (cf. title, Abstract). D3 suggests to use statistical methods such as Principal Component Analysis (PCA) or Linear Discrimant Analysis (LDA) for extracting features from facial images previously divided into a plurality of horizontal segments. The method includes measuring Euclidean distances between a test image and various images (training images) stored in a database (cf. page 1434, left hand column, first full paragraph). According to D3, majority voting (among other techniques) is envisaged to increase the level of recognition (cf. page 1427, left hand column, third paragraph).

9. In effect, the skilled person would have identified various documents relating to face recognition, which suggests a similar approach as the one proposed in D3, combining a regional approach by defining sub-regions with a statistical decision making process.

Reference is made to D4, section "Introduction" lines 24-27 which combines majority voting and PCA. Similar strategies may also be found in D5 (cf. abstract,

section 3.3 "Results") and in D6 (cf. abstract, section 2.1 "Local Distance Calculation".

10. The Board fails to identify any unexpected effect from the combination of the technique known from D2, in order to correct for the influence of illumination, with the techniques disclosed in any of documents D3, D4, D5 or D6, in order to improve the identification (recognition) rate of an image in a database of reference images. The approach developed in D2 in order to tackle problems associated with different illumination environments does not appear to have any bearing on the approach developed in either D3, D4, D5 or D6 to increase the face recognition rate.

The Board thus concurs with the Examining Division in their findings that the claimed invention, in effect, results from the association of known processes for which the existence of an inventive step is to be denied.

11. According to an alternative approach, any of the documents D1, D3, D4, D5 or D6 could be considered as a starting point in order to decide on the merits of the claimed inventions. This approach appears justified since, as stressed above, these documents also belong to the field of the invention and share common structural and functional features with it (cf. sections 8 and 9 above).

The claimed system differs from these known systems, essentially, in that it comprises a correction unit arranged to remove the influence of illumination.

Since also D2 belongs to the field of the invention (cf. section 2 above) and focuses on the problem associated to degraded performance in recognition due to the variations of the illumination, its teaching would have been considered by the skilled person who would have adapted the systems known from D1, D3, D4, D5 or D6 accordingly, thus arriving at the claimed subject-matter.

12. The appellant objected to the analyses developed above, saying that it would have taken hindsight to realise that the two separate technical disclosures could usefully be combined to overcome the relevant technical problem.

This view is simply wrong. The analyses developed by the Examining Division, and the Board, are based on the problem - solution approach, as recognised by the jurisprudence of the boards of appeal. In this respect, both analyses expounded above rely on the identification of prior art documents which appear fully suitable to qualify as closest prior art since they belong to the technical field of the invention and further share with it various technical features. The effects provided by the distinguishing features and the problems associated therewith, as to the need to correct for various illumination conditions or to improve the recognition rates, relied upon in theses analyses, are those acknowledged by the applicant in the application. Since, moreover, the documents which address said respective problems also belong to the field of the invention, no hindsight can be recognised in the fact that the skilled person would have considered these documents.

13. The subject-matter of claim 1 according to the main requests does not involve an inventive step in the sense of Article 56 EPC.

Auxiliary request

14. The reasoning developed above with regard to claim 1 of the main request applies equally to the subject-matter of claim 1 according to the auxiliary request.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

R. Schumacher P. Scriven

Decision electronically authenticated