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Datasheet for the decision of 27 February 2025

Case Number: T 2629/22 - 3.5.06

Application Number: 16794425.5

Publication Number: 3356994

IPC: G06V20/64, G06K7/10

Language of the proceedings: EN

Title of invention:
SYSTEM AND METHOD FOR READING CODED INFORMATION

Patent Proprietor:
Datalogic IP TECH S.r.l.

Opponent:
SICK AG

Headword:
3D decoding/DATALOGIC

Relevant legal provisions:
EPC Art. 54, 56
RPBA Art. 12(4), 13(1)

Keyword:
Novelty - (no)
Inventive step - (no)

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 2629/22 - 3.5.06

D E C I S I O N
of Technical Board of Appeal 3.5.06
of 27 February 2025

Appellant: (Patent Proprietor)	Datalogic IP TECH S.r.l. Via San Vitalino, 13 40012 Lippo di Calderara di Reno (BO) (IT)
Representative:	Porta & Consulenti Associati S.p.A. Via Winckelmann, 1 20146 Milano (IT)
Appellant: (Opponent)	SICK AG Erwin-Sick-Strasse 1 79183 Waldkirch (DE)
Representative:	Hehl, Ulrich SICK AG Intellectual Property Erwin-Sick-Strasse 1 79183 Waldkirch (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 21 October 2022 concerning maintenance of the European Patent No. 3356994 in amended form.**

Composition of the Board:

Chairman	M. Müller
Members:	T. Alecu
	A. Jimenez

Summary of Facts and Submissions

I. The appeal lies from the decision of the Opposition Division to maintain the opposed patent as amended on the basis of a sixth auxiliary request. Both parties appealed.

II. The Proprietor requested that the decision be set aside, and that the patent be maintained as granted or on the basis of one of thirteen auxiliary requests. The auxiliary requests numbered I to XII are identical to those filed with the Opposition Division. Auxiliary request VIa, ranked between auxiliary requests VI and VII, was filed in response to the Board's communication under Article 15(a) RPBA containing its preliminary opinion.

III. The Opponent requested that the decision be set aside and that the patent be revoked.

IV. The Patent was opposed inter alia under Article 100 a) EPC. The Opposition Division did not allow the main request (patent as granted) and the first to fifth auxiliary requests of the Proprietor for lack of novelty in view of

D1: US 2013/0223673 A1

V. Claim 1 of the patent as granted defines:

System (100) for reading coded information (2) from an object (1), comprising:
- a three-dimensional camera (20) configured such as to capture three-dimensional images (22) of the object (1),

- a processor (30), characterized in that said processor (30) is configured to process each three-dimensional image (22) captured by said camera (20) in order to:

• identify planes (24) upon which faces (25) of the object (1) lie;

• extract two-dimensional images (27) that lie on the identified planes (24);

• apply coded information recognition algorithms to at least part of the extracted two-dimensional images (27).

VI. Claim 1 of the auxiliary request I further defines the camera as *using range imaging technology*.

VII. Claim 1 of the auxiliary request II differs from that of the auxiliary request I by defining the following:

wherein the three-dimensional camera (20) is designed to provide, for each three-dimensional point of each three-dimensional image (22), information regarding the position of the three-dimensional point in space together with information regarding the intensity of the three-dimensional point.

VIII. Claim 1 of the auxiliary request III differs from that of the auxiliary request II by further defining the following:

each three-dimensional image being represented by a point cloud of three-dimensional points or by a pair of two-dimensional images obtained from the three-dimensional image and consisting of a two-dimensional brightness image and a two-dimensional depth image.

IX. Claim 1 of the auxiliary request IV differs from that of the auxiliary request III in that the step of identifying planes is amended as follows (additions underlined):

identify planes (24) upon which faces (25) of the object (1) lie by applying geometrical correlations to three-dimensional points within said point cloud or to points of said two-dimensional depth image.

X. Claim 1 of the auxiliary request V differs from that of the auxiliary request IV by removing the alternatives related to point clouds from the amendments carried out in auxiliary requests III and IV.

XI. Claim 1 of the auxiliary request VI defines the following (amendments over claim 1 of the main request marked by underlining):

System (100) for reading coded information (2) from an object (1), comprising:
- a three-dimensional camera (20) using range imaging technology and configured such as to capture three-dimensional images (22) of the object (1),
- a processor (30), characterized in that said processor (30) is configured to process each three-dimensional image (22) captured by said camera (20) in order to:

• identify any regions of interest (72) of the object (1);

• identify planes (24) upon which faces (25) of the object (1) lie;

• extract two-dimensional images (27) that lie on the identified planes (24);

• apply coded information recognition algorithms to at least part of the extracted two-dimensional images

(27),
wherein the identification of planes (24) upon which faces (25) of the object (1) lie is performed limited to the plane/planes or to a portion of said plane/ planes, upon which the identified region/regions of interest (72) lies/lie.

XII. Claim 1 of the auxiliary request VIa is identical to claim 1 of the auxiliary request VI.

XIII. Claim 1 of auxiliary request VII combined the amendments in auxiliary requests V and VI.

XIV. Claim 1 of auxiliary request VIII differs from that of auxiliary request VII in that the step of identifying regions of interest is amended as follows (additions underlined):

• *identify any regions of interest (72) of the object (1), the identification of the regions of interest (72) being performed in the two-dimensional brightness image (70) of the three dimensional image (22)*.

XV. Claim 1 of auxiliary request IX is based on that of auxiliary request IV with the addition of the following features at the end:

wherein the system (100) comprises a plurality of three-dimensional cameras (20) configured to capture three-dimensional images (22) of the object (1) from different directions and the processor (30) is configured to merge the images captured by the plurality of three-dimensional cameras (20) such as to obtain a single merged three-dimensional image (26) representing the object (1) in its entirety, and the

extraction of two-dimensional images is performed from said single merged three-dimensional image (26), wherein the three-dimensional images (22) captured by the plurality of cameras (20) are represented by their respective three-dimensional point clouds (28, 29) and the processor (30) is configured to merge said three-dimensional images (22), and to perform the merging by
- representing said point clouds (28, 29) with respective stacks (31, 32) of parallel planes, stacked along a predetermined direction;
- identifying shared planes from the stacks (31, 32) of parallel planes, and
- performing a data merging algorithm on the points of the point clouds (28, 29) that belong to the identified shared planes;

or wherein the three-dimensional images (22) captured by the plurality of cameras (20) are represented by their respective pairs of two-dimensional images each consisting of a twod imensional brightness image and a two-dimensional depth image and the processor (30) is configured to perform the merging by:
- operating on said pairs of two-dimensional images, each brightness image being defined in a plane of a three-dimensional reference system of each camera by intensity values associated to the three-dimensional points of the respective three-dimensional image and the depth image being defined in said plane by distance values associated with the three-dimensional points of the respective three-dimensional image with respect to a predetermined point of view, and by
- identifying in the two-dimensional depth images, the points having in said plane the same distance value; and

- performing a data merging algorithm on the points thus identified.

XVI. Claim 1 of auxiliary request X differs from that of auxiliary request IX by removing the second alternative from the features added in auxiliary request IX (from *or wherein* until the end).

XVII. Claims 1 of auxiliary requests XI and XII differ from those of auxiliary request IX and X, respectively, by the addition of the following feature:

the processor (30) being configured to process the merged three-dimensional image (26) in order to identify any regions of interest (72) of the object (1) before performing the identification of planes (24), and wherein the identification of planes (24) upon which faces (25) of the object (1) lie is performed on the merged three-dimensional image (26) only for the plane/planes upon which lies/lie the identified region/ regions of interest (72) or a portion of said plane/ planes upon which lies/lie the identified region/ regions of interest.

XVIII. Oral proceedings before the Board were held, at the end of which the Chair announced the board's decision.

Reasons for the Decision

The opposed patent

1. The opposed patent relates to a system and method for reading coded information from objects, for instance on a conveyor belt (paragraph 6).

1.1 The system uses 3D cameras, which are said to have the advantage over 2D cameras of, inter alia, simplifying the setup and avoiding perspective distortions (paragraphs 13 and 14). The acquired 3D images are processed to identify planes upon which the faces of the object lie, extract 2D images of the object faces, and extract the codes from those images (paragraph 14).

1.2 To reduce computations, regions of interest may be extracted before processing, e.g. by detecting regions containing optical codes (see paragraph 29).

1.3 The 3D cameras use range imaging type technology, which may produce point clouds or a pair of 2D images, more specifically one 2D depth image and one 2D brightness image (see e.g. paragraphs 45, 50, 51).

1.4 Multiple cameras can be used and their 3D images may be merged before processing (paragraphs 80 to 86).

Main request - Patent as granted

2. The Opposition Division found claim 1 to lack novelty in view of D1. This document teaches methods for product identifications.

2.1 D1 discloses primarily the use of 2D cameras. In this case (paragraphs 77 to 86, with reference to figures 1A and 1B) surface patches of an object are recognised, and their orientation is identified so as to correct the patches for perspective and to produce a "virtually flattened" package surface. From this "remapped image data", barcodes or watermarks are extracted (paragraph 88).

2.2 In paragraphs 329 to 334, D1 also discusses the use of 3D cameras such as Kinect. In paragraph 329 the following is stated:

"*In some of the detailed embodiments, the geometrical pose information for component surfaces on products/ packaging is discerned from the camera imagery. In other implementations, the pose information can be determined otherwise. One such alternative is to use the Microsoft Kinect sensor device to sense the 3D environment*".

2.3 D1 further explains that Kinect may also be used for volumetric modelling to help product identification. See e.g. paragraph 333:

"*In addition to providing pose information for component item surfaces, such arrangement provides an additional manner of product identification - by volumetric product configuration*."

3. The Proprietor did not contest that these passages, taken together, disclose all the features of claim 1. The Proprietor argued, however, that they relate to different embodiments, and that D1 did not disclose their combination (see e.g. statement of grounds of appeal, II.1 on page 3).

3.1 The embodiment of figures 1A and 1B "*relate[d] to 2D imagery in the case of malleable product packaging*" (statement of grounds of appeal, bottom of page 2), whereas the embodiment of paragraphs 329 to 334 related to volumetric modelling (ibid., top of page 3). D1 early on made a clear distinction between these two embodiments: in paragraph 16 D1 identified first one embodiment for sensing crinkled and otherwise deformed

product packaging with 2D cameras, and then "*another*" one for sensing product configuration with Kinect.

3.2 In the second embodiment, the pose information was identified for the purpose of product identification based on shapes. In particular, pose information as referred to in that embodiment was not patch position or angle as per the embodiment of figure 1.

3.3 Also, D1 did not disclose the use of Kinect for barcode decoding. In the second embodiment, no 2D information recognition algorithm (as needed for barcode decoding) was used to identify the product; only volumetric information was processed. D1 thus did not disclose a sequence of steps as claimed in relation to a 3D camera.

4. The Opponent argued that D1 did not distinguish the embodiments in the way argued by the Proprietor. It first presented a generic method and system, as per figure 1, and later proposed technical means for its implementation. When a Kinect camera was used in the context of figure 1, as stated in paragraph 329, all the features of claim 1 were disclosed.

5. The Board agrees with the Opponent and the Opposition Division (decision, reasons 10.2).

5.1 D1 discloses a link between the two embodiments in stating explicitly in paragraph 329 as quoted above (point 2.2) that pose information for previous embodiments can be determined using Kinect. The pose information referred to therein is the one needed in figure 1A and 1B. This is corroborated by paragraphs 70 and 71 where the term "pose" is used to denote patch

orientation. The use of the Kinect camera in the embodiment of figure 1 is thus disclosed in D1.

5.2 The Board also notes that the Kinect camera is a range imaging camera in the sense of the patent specification providing both 3D information and 2D images (see D1 paragraph 330), which would be used for product identification in the context of the embodiment of figure 1. Therefore, D1 discloses the claimed sequence of steps carried out on imagery from a range imaging camera, namely Kinect.

5.3 It is also clear that volumetric modelling is only an additional possible use of Kinect information, so the Appellant's argument in this regard is not pertinent.

6. Claim 1 lacks novelty in view of D1.

Auxiliary requests I to V

7. The Proprietor (statement of grounds of appeal, section III) argued in favour of novelty of these requests only by reference to the arguments in favour of the main request.

8. The Board agrees with the decision under appeal (point 11) that the new features in these requests are disclosed in D1, as they either do not add any limitations to the claim (auxiliary request IV), or they are disclosed by the fact that D1 uses the Kinect sensor (the other requests).

9. Therefore, the respective claims 1 of auxiliary requests I to V lack novelty in view of D1.

Auxiliary request VI

10. This request adds a group of features defining identification of regions of interest of the objects and performing the processing of the 3D image (plane extraction, face image extraction, code identification) only for the identified regions of interest.

11. The Opponent argued (statement of grounds of appeal, II) that the claimed subject-matter was not new, because the regions of interest (ROIs) could cover the entire image.

12. The Board disagrees: the step of identifying a ROI is one extra step in the process, and using the result of this step for processing is not the same as directly processing the entire image.

13. Claim 1 of this auxiliary request IV is therefore new in view of D1.

14. The Opposition Division acknowledged inventive step (decision, reasons 12.4) on the basis that, although ROI detection per se was well known in the context of 2D barcode reading, the claim defined that ROIs are detected before 3D plane identification, and not before processing the coded information itself. This caused an unexpected effect.

15. The Opponent argued (statement of grounds of appeal III) that detecting ROIs was common practice so that no inventive step could be acknowledged. The person skilled in the art routinely used ROIs to improve efficiency.

15.1 Regarding the arguments in the decision, the Opponent submitted that there were only two alternatives for a step of ROI detection: either before extracting the planes, or after plane extraction but before extracting the codes from the surface images. Choosing one of the two options was not inventive. The person skilled in the art would also recognise that more resources were saved if the ROIs were identified at the beginning.

16. The Proprietor argued that the analysis of the Opponent was ex post facto, as it relied on a processing sequence that the claim defined, and was not disclosed in D1. Once the sequence was known it was easy to argue that the claimed order was just an alternative. The Opponent's argument was speculative and did not acknowledge that D1 did not mention ROIs.

16.1 Using ROIs as claimed did not only improve efficiency, but improved also accuracy. By limiting the search for coded information to ROIs the number of false positives was reduced.

17. The Board notes first that the starting point for the person skilled in the art is the embodiment in D1 where a Kinect camera is used in the embodiment of figure 1, which, as concluded above, defines the same general sequence as the claim: patch (plane) identification, patch image extraction, decoding.

17.1 Second, as the Opponent argued, the idea of limiting image processing to detected ROIs is indeed a technique widely used in image processing to improve computational efficiency. Thus the person skilled in the art would consider improving computational efficiency by detecting ROIs. It is further clear to the person skilled in the art that most gains would be

made if this detection took place at the beginning of the process. Unlike the Opposition Division, the Board sees nothing surprising therein.

17.2 This renders the claimed subject matter obvious: the claim does not go beyond expressing in general terms the detection of ROIs and the processing only of image regions containing ROIs.

17.3 As regards the Proprietor's argument that the ROI detection at the beginning increases accuracy, the Board notes the following: limiting the search for coded information to regions of interest may increase accuracy by avoiding the detection of coded information in regions in which there cannot be any and thereby reduce false positives. Firstly, however, this effect of ROI processing is, in principle, known to the skilled person as well. And secondly, whether accuracy is increased also depends on whether the regions of interest themselves are detected correctly. If not, coded information outside the detected regions of interest may be missed, leading to false negatives and *reducing* accuracy. For lack of detail, no conclusions on accuracy of the claimed ROI detection can be drawn. Therefore, the alleged effect of increased accuracy cannot be accepted.

18. The Board therefore concludes that claim 1 of auxiliary request VI lacks inventive step.

Auxiliary request VIa

19. Claim 1 of this request is identical to that of the previous request. The amendments in this request are therefore not suitable to overcome the above inventive

step objection.The request is not admitted (Article 13(1) RPBA).

Auxiliary request VII

20. This request combines the amendments in the auxiliary requests V and VI. Claim 1 of auxiliary request VII lacks inventive step as well.

Auxiliary request VIII

21. This request further defines that the ROI detection takes place in the 2D brightness image.

21.1 The Kinect camera of D1 provides one depth image and one brightness image. The detection of ROIs can can only take place in one of the two images - both alternatives are obvious.

21.2 The Board therefore concludes that claim 1 of auxiliary request VIII lacks inventive step as well.

Auxiliary requests IX to XII: admittance

22. The Opponent objected to the admittance of these requests.

22.1 The auxiliary requests IX and X were not convergent with the previous requests. The features related to ROI detection were replaced by unrelated, different features, namely ones related to using several 3D cameras and to merging the 3D images before processing.

22.2 In requests XI and XII, features related to ROI detection were reinserted, but with different wording in comparison with the one used in auxiliary

request VI. It was not clear whether the change in wording was meant to incur a change in meaning, and if so, which one.

23. The Proprietor argued that these requests were all filed before the Opposition Division within the time limit set out by the Opposition Division under Rule 116(1) EPC. They were legitimate fallback positions for an inventive step over D1 filed in view of the preliminary opinion of the Opposition Division, which was negative on all requests. They defined specific 3D merging schemes which were not disclosed in D1.

23.1 Regarding the auxiliary requests XI and XII, the Proprietor indicated that no change in meaning was intended and that the features in question, although worded differently, meant the same.

24. The Board considers these requests as legitimate attempts to overcome the inventive step objection raised by the Opposition Division in view of D1. The Board also sees no difference in substance caused by the different words used to define the ROI-related features in auxiliary requests VI, XI, and XII. Considering also the circumstances (timing and reasons) of their original filing as explained by the Proprietor, the Board exercises its discretion to admit them in the procedure (Article 12(4) RPBA).

Auxiliary requests IX to XII: inventive step

25. As already stated, these requests add features related to using several 3D cameras and to merging the 3D images before processing.

25.1 The Board had indicated in its preliminary opinion that D1 used multiple cameras and appeared to at least hint at merging their images before processing (figures 3A and 3B in conjunction with paragraph 94, last two phrases). So the usage of multiple cameras and some form of merging was obvious from D1.

25.2 The Proprietor focused its arguments during oral proceedings on the fact that the claims provided details of the merging step which were neither disclosed, nor hinted at, in D1.

26. The Board notes that the auxiliary request IX defines two alternative merging procedures, the first using a 3D data representation in the form of point clouds, and the second using a 3D data representation in the form of a pair of 2D depth and brightness images.

26.1 The Board remarked during the oral proceedings that the second alternative did not appear to go beyond stating the obvious, namely that merging was done by identifying points with corresponding spatial positions (depth). The Proprietor did not contest this.

27. The Proprietor argued, however, that the first alternative used a plane stack representation which was not common general knowledge for 3D point clouds. This representation allowed for a more efficient merging, namely by proceeding plane by plane, and for a more efficient detection of the object planes, namely by using the depth planes.

28. The Opponent argued that neither the claims, nor the specification provided sufficient details so that a technical effect could be acknowledged. In particular, neither the axis along which the planes were stacked,

nor the positions of the multiple cameras were specified. There was no predefined correspondence between the stack of planes and the object planes.

29. The Board agrees with the Opponent. The claim specifies a discretization of the 3D space in one *unspecified* direction. The discretization steps (distances between planes) are not specified either. Why such discretization would be beneficial in the current context, within a generic camera setup, is not explained.

29.1 Consequently, the details of the merging procedure which the Proprietor argued to be non-obvious boil down to no more than an arbitrary discretization of the 3D space which cannot support the presence of an inventive step.

30. Therefore, claim 1 of the auxiliary request IX lacks an inventive step. The same applies to the auxiliary request X which contains only this first alternative merging procedure.

31. This conclusion is valid for the auxiliary requests XI and XII as well, in which the ROI related features, already found to be obvious (see auxiliary request VI), were reintroduced on the basis of the auxiliary requests IX and X respectively.

Order

For these reasons it is decided that:

1. The decision of the Opposition Division is set aside.
2. The patent is revoked.

The Registrar: The Chairman:

L. Stridde M. Müller

Decision electronically authenticated