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Datasheet for the decision of 22 July 2020

Case Number: T 2190/17 - 3.5.02

Application Number: 14152990.9

Publication Number: 2763116

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Language of the proceedings: EN

Title of invention:
Fall detection system and method for detecting a fall of a monitored person

Applicant:
FamilyEye BVBA

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Novelty - (yes)
Inventive step - (yes)

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Boards of Appeal

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Case Number: T 2190/17 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 22 July 2020

Appellant: (Applicant)	FamilyEye BVBA Baron Ruzettelaan 7 Gebouw 7 8310 Brugge (BE)
Representative:	IP HILLS NV Hubert Frère-Orbanlaan 329 9000 Gent (BE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 2 June 2017 refusing European patent application No. 14152990.9 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	R. Lord
Members:	C.D. Vassoille
	J. Hoppe

Summary of Facts and Submissions

I. The applicant (appellant) has filed an appeal against the decision of the examining division to refuse European patent application no. 14 152 990.9.

II. The following document is relevant for the present decision:

D1: C. Kawatsu et al.: "Development of a fall detection system with Microsoft Kinect", Robot Intelligence Technology and Applications 2012: An Edition of the Presented Papers from the 1st International Conference on Robot Intelligence Technology and Applications; International Conference on Robot Intelligence Technology and Applications, vol. 133, 1 January 2013, pages 623-630, ISBN: 978-3-642-37373-2.

III. In the decision under appeal the examining division *inter alia* came to the conclusion that the subject-matter of claim 1 of the main request filed on 10 March 2017 was not new in view of D1, the only document cited in the procedure.

IV. The appellant requested in writing that the decision under appeal be set aside and a patent be granted on the basis of the main request or, if this was not possible, according to one of the auxiliary requests 1 to 5, each of these requests having been filed on 10 March 2017 and corresponding to the requests underlying the decision under appeal.

Oral proceedings in accordance with Article 116 EPC were not requested by the appellant.

The appellant's main request is based on the following documents:

Claims:
No. 1 to 15 filed in electronic form on 10 March 2017;

Description:
Pages 1 to 21 as originally filed;

Drawings:
Sheets 1/3 to 3/3 as originally filed.

V. Claim 1 of the main request reads as follows:

"Fall detection system (1) for detecting a fall of a monitored person (10), wherein said fall detection system (1) comprises:
- at least one infrared source and at least one depth infrared sensor, wherein said infrared source is provided to irradiate said monitored person (10) with a predetermined infrared dot pattern which is detectable by said depth infrared sensor in order to generate an image of said infrared dot pattern; and
- a control unit which:
- comprises an image-processing unit which is configured to generate at least one identification point (10a) which is located in the area of the head of said monitored person (10) on the basis of said infrared dot pattern and to add it to said image received from said depth infrared sensor; and
- comprises a fall-processing unit which is configured to:
• receive at least a first and a second said image (3a, 3b) of said infrared dot pattern from said image-processing unit at a different time within a

predetermined time interval, wherein said identification points (10a-10t) on said images comprise a vertical Y-position,
CHARACTERIZED IN THAT said fall processing unit is further configured to:
• detect said fall if, for said identification point (10a) which is located in the area of the head, the extent of change in said Y-position between said first and said second image (3a, 3b) exceeds a predetermined minimum threshold value."

Claims 2 to 13 are dependent on claim 1.

VI. Independent method claim 14 of the main request reads as follows:

"Method for detecting a fall of a monitored person (10), wherein said method comprises the following steps:
- the irradiation of said monitored person (10) with a predetermined infrared dot pattern which is detectable by at least one depth infrared sensor using at least one infrared source;
- the generation of an image (3a, 3b) of said infrared dot pattern;
- the generation of at least one identification point (10a) which is located in the area of the head of said monitored person (10) on the basis of said infrared dot pattern using an image-processing unit;
- the addition of said identification point to said image (3a, 3b) received from said depth infrared sensor; and
- the reception of at least a first and a second said image (3a, 3b) of said infrared dot pattern from said image-processing unit at a different time within a predefined time interval using a fall processing unit,

wherein said identification points (10a-10t) on said images (3a, 3b) comprise a vertical Y-position, CHARACTERIZED IN THAT said method further comprises the step of:
- the detection of said fall by means of said fall-processing unit if, for said identification point (10a) which is located in the area of the head, the extent of change in said vertical Y-position between said first and said second image (3a, 3b) exceeds a predetermined minimum threshold value."

Claim 15 is dependent on claim 14.

VII. The appellant's arguments in so far as they are relevant for the present decision are as follows:

Document D1 did not disclose the characterising feature of claim 1, i.e. that the fall processing unit is configured to detect said fall if, for said identification point which is located in the area of the head, the extent of change in said Y-position between said first and said second image exceeds a predetermined minimum threshold value.

D1 rather disclosed in section 3.2 a "velocity algorithm" determining the average vertical velocity across twenty joints and across N frames and only if the average velocity was less than the threshold of -1 m/s, a fall was detected.

It was further not possible to adjust the threshold such that the effect of nineteen joints disappeared and only the change in vertical position of the head-related identification point was considered to detect the fall. Nor was a corresponding adjustment of the threshold disclosed by D1.

Furthermore, the characterising feature clearly excluded the impact of identification points other than the one located in the area of the head on the fall detection.

The subject-matter of claim 1 also involved an inventive step in view of document D1. The fall detection system and method of D1 was disadvantageous in terms of accuracy, reliability and computational complexity.

The objective technical problem was to provide a more simple and reliable fall detection method and system with reduced false positive fall detections.

Although this problem was recognised in D1, it did not teach the characterising portion of claim 1.

D1 at best taught that validation of the fall by the fallen person might be mandatory to rule out certain false positives. Validation, however, further complicated the fall detection system of D1 and involved new disadvantages. D1 further at best taught to switch from the "velocity algorithm" to a different one, namely the "position algorithm" described in D1 in certain situations.

Reasons for the Decision

1. The appeal is admissible.

2. Main request - Amendments (Article 123(2) EPC)

Independent claims 1 and 14 of the main request were amended with respect to the originally filed version of the claims only in so far as the beginning of the characterising portion of these claims was moved (Rule 43(1)(b) EPC). No substantive changes were consequently made with respect to the original version of the claims and the main request therefore fulfils the requirement of Article 123(2) EPC.

3. Main request - Novelty (Article 54 EPC)

3.1 The subject-matter of claim 1 is new in view of document D1.

3.2 Like the present invention, document D1 is concerned with the provision of an improved fall detection system. It is undisputed by the appellant that document D1 discloses the preamble of claim 1, namely a:

> fall detection system for detecting a fall of a monitored person (see the abstract), wherein said fall detection system comprises:
> - at least one infrared source (see page 624, section 2: IR "laser") and at least one depth infrared sensor (see page 624, section 2: "IR camera"), wherein said infrared source is provided to irradiate said monitored person with a predetermined infrared dot pattern which is detectable by said depth infrared sensor in order to generate an image of said infrared dot pattern (see page 624, section 2); and
> a control unit which:
> - comprises an image-processing unit which is configured to generate at least one identification

point which is located in the area of the head of said monitored person on the basis of said infrared dot pattern and to add it to said image received from said depth infrared sensor (see page 624, section 2: "3D location of 21 joints", figures 1 and 2); and
- comprises a fall-processing unit which is configured to receive at least a first and a second said image of said infrared dot pattern from said image-processing unit at a different time within a predetermined time interval, wherein said identification points on said images comprise a vertical Y-position (see pages 625 to 627, section 3.2: "velocity algorithm").

3.3 Document D1, however, does not disclose the characterising portion of claim 1:

said fall processing unit is further configured to detect a fall if, for the identification point which is located in the area of the head, the extent of change in said Y-position between a first and a said second image exceeds a predetermined minimum threshold value.

3.4 The above characterising feature of claim 1 leaves no room for interpretation. It is clearly and unambiguously to be understood such that the detection of a fall is exclusively based on the identification point which is located in the area of the head. The examining division's assumption in the decision under appeal that claim 1 did not exclude that the other joints disclosed in D1 are taken into consideration in the detection of a fall, is therefore not correct (see point 2.6 of the reasons for the decision under appeal).

3.5 The examining division further based their novelty assessment on the erroneous assumption that the fact that document D1 did "not exclude the detection of a fall by the sole movement of the head because the threshold may be set such as the head is the most relevant joint and will set the alarm even by its own movement" would be sufficient to show that the characterising feature is disclosed by D1 (see the last paragraph of point 2.1 as well as point 2.5 of the reasons for the decision under appeal).

3.6 The correct question to answer would rather have been that of whether the person skilled in the art can directly and unambiguously derive the characterising feature from the disclosure of D1. The board is convinced that this is not the case.

Document D1 in section 3.2 discloses a "velocity algorithm" that determines the average vertical velocity $v_{jointavg}$ across twenty detected joints and across N frames (see in particular the last two formulae on page 626 of D1). Only if the average velocity $v_{jointavg}$ is less than the threshold of -1 m/s, is a fall detected.

Consequently, in the context of the "velocity algorithm" described in D1, a detection of a fall is not based on a change in Y-position of the identification point in the area of the head. Rather, the "velocity algorithm" of D1 always compares the averaged vertical velocity across twenty joints with a single threshold.

Document D1 also does not contain any direct and unambiguous disclosure that would lead the skilled

person to believe that the detection of a fall was possible by considering the change in Y-position of a (single) identification point in the area of the head.

In particular, D1 does not disclose an adjustment of the threshold such that the head becomes the most relevant joint and the effect of other joints on the detection of a fall is thus removed. As has been set out under point 3.4 above, the mere theoretical possibility that the threshold might be adjusted such that the head becomes the critical identification point in the detection of a fall, is not an appropriate criterion for the assessment of novelty.

3.7 The subject-matter of claim 1 is therefore new with regard to document D1 in the sense of Article 54 EPC. The same applies to the independent method claim 14, which comprises features corresponding to those of claim 1.

4. Main request - Inventive step (Article 56 EPC)

4.1 The subject-matter of claim 1 also involves an inventive step in view of document D1.

4.2 Starting from D1 as the closest prior art document and taking into account the distinguishing feature (see point 3.3 above), the board agrees with the appellant that the objective technical problem is that of how to provide a more simple and reliable fall detection system with reduced false positive detection.

4.3 Modifying the fall detection system of D1 such as to include a fall processing unit which is configured to detect a fall if, for the identification point which is located in the area of the head, the extent of change

in said Y-position between a first and a said second image exceeds a predetermined minimum threshold value, is not obvious to the person skilled in the art.

As was argued by the appellant, document D1 in section 3.2 ("Velocity Algorithm") discusses problems of the "velocity algorithm" in "a few cases" (see last paragraph of page 626 to second paragraph of page 627) but does not provide an indication towards the claimed solution according to the characterising feature.

To overcome these problems, D1 rather suggests lowering the threshold in order to detect falls on stairs and further using a different algorithm, while the only other algorithm disclosed in D1 is the "position algorithm" described in section 3.1 of D1. The "position algorithm" calculates the normal distance from tracked joints to the ground or a reference level. A fall is detected when all tracked joints have a normal distance from the reference level that is smaller than a threshold. The "position algorithm" consequently neither discloses nor implies the distinguishing feature of claim 1.

In order to reduce false positive detections, D1 in section 4 further discloses the validation of a fall by using a microphone and a voice recognition system, thereby rendering the system more complex.

In conclusion, the disclosure of D1 does not contain any indication to implement a fall processing unit configured to detect a fall if, for the identification point which is located in the area of the head, the extent of change in said Y-position between a first and a said second image exceeds a predetermined minimum threshold value, nor does this solution form part of

the common general knowledge of the skilled person. No further prior art was cited during the first instance proceedings.

4.4 The subject-matter of claim 1 is therefore not rendered obvious by the available prior art and consequently involves an inventive step in the sense of Article 56 EPC. The same applies to the independent method claim 14, which comprises features corresponding to those of claim 1.

5. Final remarks

5.1 Given that the subject-matter of claims 1 and 14 of the main request is new and involves an inventive step in the sense of Articles 54 and 56 EPC and considering that the further requirements of the EPC are also fulfilled, the board had to accede to the appellant's main request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent based on the main request with:

Claims:
No. 1 to 15 filed in electronic form on 10 March 2017;

Description:
Pages 1 to 21 as originally filed;

Drawings:
Sheets 1/3 to 3/3 as originally filed.

The Registrar: The Chairman:

U. Bultmann R. Lord

Decision electronically authenticated