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**Datasheet for the decision
of 6 August 2025**

Case Number: T 1924/22 - 3.5.06

Application Number: 14715556.8

Publication Number: 3120294

IPC: G06K9/00, A61B5/11

Language of the proceedings: EN

Title of invention:
SYSTEM AND METHOD FOR MOTION CAPTURE

Applicant:
Telecom Italia S.p.A.

Headword:
Motion capture/TELECOM ITALIA

Relevant legal provisions:
EPC Art. 123(2), 84, 56, 111(1)
RPBA 2020 Art. 11, 12, 13

Keyword:
Amendment to appeal case - taken into account (yes)
Inventive step - main and auxiliary requests 1 and 2 (no)
Remittal to the department of first instance - (yes)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0

Case Number: T 1924/22 - 3.5.06

D E C I S I O N
of Technical Board of Appeal 3.5.06
of 6 August 2025

Appellant:
(Applicant)

Telecom Italia S.p.A.
Via Gaetano Negri, 1
20123 Milano (IT)

Representative:

Pietra, Giulia
Marchi & Partners S.r.l.
Via Vittor Pisani, 13
20124 Milano (IT)

Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted on 19 April 2022
refusing European patent application No.
14715556.8 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman M. Müller
Members: A. Teale
K. Kerber-Zubrzycka

Summary of Facts and Submissions

- I. This is an appeal against the decision dispatched on 19 April 2022 to refuse European patent application No. 14 715 556.8 for the reasons given in the communication of 21 March 2022, namely that the claims according to a main and first and second auxiliary requests contained added subject-matter, contrary to Article 123(2) EPC.
- II. Amongst others, the following documents were cited in examination proceedings:
- D1: Kundan S. Dere et al., "Projection and Interaction with Ad-hoc Interfaces on Non-planar Surfaces", 2013 2nd International Conference on Advanced Computing, Networking and Security, IEEE, 15 December 2013, pages 1 to 6, XP032551826, DOI: 10.1109/ADCONS.2013.41 [retrieved on 15 January 2014].
- D4: Jonas Fredriksson et al., "Real-time 3D Hand-Computer Interaction: Optimization and Complexity Reduction", Proceedings of the 5th Nordic conference on Human-computer interaction building bridges, NordiCHI 2008, 1 January 2008, pages 133 to 141, XP055165560, New York, New York, USA, DOI: 10.1145/1463160.1463175, ISBN: 978-1-59-593704-9.
- D7: US 2013/0324857 A1.
- III. A notice of appeal and the appeal fee were received on 6 June 2022, the appellant requesting that the decision be set aside and a patent granted.

- IV. With a statement of grounds of appeal, received on 8 August 2022, the appellant submitted amended claims according to new auxiliary requests 1 to 4. The appellant requested that the decision be set aside and a patent granted according to the main request in the decision, received on 10 March 2022, or said new auxiliary requests 1 to 4. The appellant also made an auxiliary request for oral proceedings as a videoconference or, as a further auxiliary request, in presence.
- V. In a communication dated 28 January 2025 the board set out its provisional opinion on the appeal. The independent system and method claims of all requests set out "at least two markers", but did not limit one of them to being a colour calibration marker, and consequently seemed to set out an undisclosed intermediate generalisation, contrary to Article 123(2) EPC. The board also had doubts regarding the clarity, Article 84 EPC, of the expression in the independent system and method claims of all requests "respective color markers" regarding whether the colours of the markers all had to be mutually different. Moreover the subject-matter of claims 1 and 14 of the main request seemed to lack inventive step, Article 56 EPC, in view of the combination of D1 and D7.
- VI. With a response received on 6 March 2025 the appellant filed amended claims and corresponding description pages according to new auxiliary requests 1 to 3, auxiliary requests 1 to 4 previously on file being withdrawn.
- VII. On 24 April 2025 the board issued a revised provisional opinion on the appeal. The board maintained its objection under Article 123(2) EPC against the main

request. The subject-matter of claims 1 and 14 of the main request seemed to lack inventive step, Article 56 EPC, in view of D1 and D7, whilst that of claims 1 and 13 of auxiliary request 2 appeared to lack inventive step in view of D1, D4 and D7.

VIII. In a letter dated 1 August 2025 the appellant submitted further arguments.

IX. In a submission dated 4 August 2025 the appellant requested that, should the board regard none of the requests on file as allowable, that the case be remitted to the examining division, so that inventive step could be considered by two instances of the EPO, even if this did not serve procedural economy.

X. At the oral proceedings, held as a videoconference on 6 August 2025, the appellant requested that the decision under appeal be set aside and that a patent be granted according to the main request in the decision, received on 10 March 2022, or according to one of auxiliary requests 1 to 3 submitted with the letter of 6 March 2025. The appellant also requested remittal of the case to the examining division if the board deemed that the application could not be granted based on any of the requests on file. The board announced its decision to admit auxiliary request 3, filed with the letter of 6 March 2025, into the appeal proceedings and, at the end of the oral proceedings, its decision on the appeal.

XI. The application is being considered in the following form:

Description:

all requests: pages 1 to 7 and 14 to 46, as published in WO 2015/139750 A1, and

main request: pages 8 to 13 and 13a, received 2 February 2021.

Auxiliary request 1: pages 8 to 13 and 13a, received on 6 March 2025.

Auxiliary request 2: pages 8 to 13 and 13a, received on 6 March 2025.

Auxiliary request 3: pages 8 to 13 and 13a, received on 6 March 2025.

Claims:

Main request: 1 to 15, received on 10 March 2022.

Auxiliary request 1: 1 to 15, received on 6 March 2025.

Auxiliary request 2: 1 to 14, received on 6 March 2025.

Auxiliary request 3: 1 to 13, received on 6 March 2025.

Drawings (all requests):

Pages 1/7 to 7/7, as published in WO 2015/139750 A1.

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

"A motion capture system (100) comprising: a wearable device (102) suitable for being fitted on at least a part of the body of a user (101), said wearable device (102) comprising at least two markers (202, 203, 204, 205, 206, 207, 208) having respective marker colors; a video camera (103) suitable for acquiring a sequence of color frames of a scene comprising said wearable device (102), said at least two markers (202, 203, 204, 205, 206, 207, 208) being visible in said sequence of color frames; a range camera (104) suitable for acquiring a sequence of depth frames of said scene; and a processing unit (105) configured to process said sequence of color frames received from said video

camera (103) and said sequence of depth frames received from said range camera (104) for reconstructing three-dimensional positions of said at least two markers, said processing comprising: processing at least one depth frame of said sequence of depth frames for identifying a portion of at least one color frame of said sequence of color frames comprising only pixels representing said wearable device (102) and searching said at least two markers (202, 203, 204, 205, 206, 207, 208) in said at least one color frame based on said respective marker colors, said search being confined to said portion of said at least one color frame comprising only pixels representing said wearable device (102); and to capture a motion of said part of the body of said user (101) on the basis of a sequence of said three-dimensional positions of said at least two markers (202, 203, 204, 205, 206, 207, 208)."

XIII. Claim 1 of auxiliary request 1 differs from that of the main request in the insertion, after the expression "respective marker colors", of the expression "different from each other".

XIV. Claim 1 of auxiliary request 2 differs from that of the previous request in the addition, after the expression "different from each other", of the expression "said at least two markers (202, 203, 204, 205, 206, 207, 208) comprising a color calibration marker (202) whose marker color is white".

XV. Editorial amendments aside, claim 1 of auxiliary request 3 differs from that of the previous request in that the following features have been added at the end:

"wherein said processing unit (105) is configured to identify said portion of said at least one color frame

comprising only pixels representing said wearable device (102) by: identifying said color calibration marker (202) in said at least one color frame, based on its shape; determining a two-dimensional position of a centre of said color calibration marker (202) in said at least one color frame and a depth of said centre of said color calibration marker (202) in said at least one depth frame; identifying in said at least one depth frame a cluster of pixels whose depth is substantially the same as said depth of said centre of said color calibration marker (202) and determining a centroid of said cluster; constructing a segmentation solid around said centroid of said cluster, said segmentation solid having shape and size suitable for containing said wearable device (102) when fitted on said at least a part of said body of said user (101), independently of the current position of said at least a part of said body of said user (101); and identifying said portion of said at least one color frame comprising only pixels representing said wearable device (102) as a portion of said at least one color frame formed by pixels included in said segmentation solid."

Auxiliary request 3 comprises a further two independent claims: 12 (method) and 13 (computer program product). The method features of claim 12 correspond to the apparatus features of claim 1, and claim 13 refers to the method of claim 12.

Reasons for the Decision

1. The admissibility of the appeal

In view of the facts set out at points I, III and IV above, the appeal fulfils the admissibility requirements under the EPC and is consequently admissible.

2. Summary of the invention

2.1 The application concerns capturing the motion of at least a part of the human body, such as the hand, for instance for monitoring the progress of a neurodegenerative disease, such as Parkinson's disease; see page 7, lines 2 to 7.

2.2 As shown in figure 1, the invention uses a wearable device (102), for example a glove (see figures 2a/2b), comprising a white colour calibration marker (202) and one or more coloured markers (203-207). The movement of the markers is captured by two cameras: a video camera (103) which captures a sequence of colour frames, and a range camera (104) which records a sequence of depth frames of the same scene. The outputs of the two cameras are fed to a processing unit (105) which reconstructs the three-dimensional (3D) positions of the markers and thus the body part and sends this information to a display (160); see page 14, line 23, to page 16, line 11.

2.3 The application acknowledges that optical motion capture systems, such as the "Kinect" sensor, for tracking a coloured glove in gaming applications were

known in the prior art; see page 2, line 23, to page 4, line 27. These systems suffered from the drawbacks that their accuracy was limited and their performance depended on the ambient lighting; see page 5, lines 14 to 28.

- 2.4 The invention seeks to capture the motion of a hand in real time with a sufficient accuracy that kinematic quantities, such as the range, velocity, acceleration and frequency, of hand movements can be derived.
- 2.5 The depth information from the depth frames is used to isolate a validity area within the colour frames, the coloured markers being searched for based on their colours exclusively within said validity area; see page 7, lines 23 to 27. According to the paragraph bridging pages 11 and 12, the 3D positions of the markers are determined by processing a colour frame and a corresponding depth frame.
- 2.6 The white colour calibration marker in the centre of the palm (202) of the glove is used in a colour calibration step to compensate for the ambient illumination; see page 17, lines 20 to 22, and page 18, lines 8 to 10. There is also at least one second marker (203-207) for each fingertip whose movement is to be captured; see page 17, lines 23 to 27. The markers on the fingertips (203-207) have different colours from each other and the palm marker (202).
- 2.7 Figure 3 illustrates three functional steps (blocks) carried out by the processing unit: acquiring the colour and range frames to calculate the 3D trajectory of the markers (301); calculating kinematic quantities relating to the user's movements (302) and providing a

quantitative evaluation of the user's motor skills (303); see page 19, lines 9 to 27.

2.8 Figure 4 concerns the "first block" (301), comprising frame acquisition (402), brightness calibration (403), segmentation (404) to derive a "validity area" considered to be part of the hand (see figure 5 and page 24, line 4, to page 27, line 31), colour calibration (405; see figure 6 and page 28, line 9, to page 32, line 27), colour correction (406) and detection of marker positions by locating "color blobs" (408); see figure 7, page 19, line 31, to page 24, line 1, and page 33, line 22, to page 37, line 27.

2.9 The details of the second and third "blocks" are not material to a decision in this case.

3. The board's understanding of the expression "Color calibration marker"

As explained in the oral proceedings, the board does not understand the expression in the independent system and method claims of auxiliary requests 2 and 3 "said at least two markers [...] comprising a color calibration marker [...] whose marker color is white" as implying a colour calibration step. The expression merely requires that one of the at least two markers has a marker colour that is white.

4. Document D1

4.1 The examining division, in its summons to oral proceedings dated 11 August 2021, raised novelty and inventive step objections starting from D1; see points 3 to 6.

4.2 The board notes that D1 relates to using a Microsoft "Kinect" sensor (see abstract, lines 14 to 15) as a depth camera to capture the positions of the fingertips of a glove worn by the user, each fingertip having a coloured marker; see page 4, paragraph bridging left and right columns. The present application acknowledges that the "Kinect" device comprises a range camera and an RGB (red green blue) camera; see page 3, line 28, to page 4, line 1. The system of D1 projects a light pattern onto a background pre-distorted according to the topology of the background, so that it appears undistorted to the user; see abstract. Figure 3 shows an interaction module flowchart in which, having acquired a depth map and RGB image of a scene, the pixels having depth values above a threshold are discarded; see second step and page 2, figure 2. The board understands this to achieve the "background subtraction", illustrated in figure 4, leaving pixels from the "foreground". Returning to the flowchart of figure 3, in the third step pixels lying outside the HSV (meaning "Hue Saturation Value") range of interest are discarded, leaving foreground pixels in the HSV range of interest. Figure 9a/b shows an example of a "Paint" application in which the user wears a glove having one red fingertip serving as a pointer. The system tracks the trajectory of the pointer to project an image of a drawing; see page 5, left column, last paragraph.

4.3 The board takes the view that the "background subtraction" disclosed in D1 (see figure 2 and page 2, right column, lines 5 to 10) to leave pixels not "above object_threshold values" (see figure 3, fourth step), which can be termed the "foreground", falls under processing at least one depth frame of said sequence of depth frames (see figure 2) for identifying a portion

of at least one colour frame (the "foreground") of said sequence of color frames comprising pixels (not "only pixels", as claimed) representing said wearable device. The "foreground" in D1 is understood to define an area where pixels representing the wearable device can be found.

- 4.4 In the terms of claim 1 of the second auxiliary request, D1 discloses a motion capture system comprising: a wearable device (see abstract, lines 16 to 17; "colored fingertip gloves") suitable for being fitted on at least a part of the body of a user (hand), said wearable device comprising a marker (figure 9a/b fingertip of glove) having a respective marker color; a video camera (implicit in Kinect sensor) suitable for acquiring a sequence of color (RGB) frames of a scene comprising said wearable device, said marker being visible in said sequence of color frames; a range camera (implicit in Kinect sensor) suitable for acquiring a sequence of depth frames of said scene; and a processing unit (page 4, left column, 5th line from bottom; "i7 computer") configured to process said sequence of color frames received from said video camera and said sequence of depth frames received from said range camera for reconstructing three-dimensional positions of said at least one marker, said processing comprising processing at least one depth frame of said sequence of depth frames for identifying a portion of at least one colour frame of said sequence of color frames comprising pixels representing said wearable device and searching said marker in said at least one color frame based on said respective marker color (see figure 3, fifth step); and to capture a motion of said part of the body of said user on the basis of a sequence of said three-dimensional positions of said marker.

5. Inventive step, Article 56 EPC, auxiliary request 2
- 5.1 In view of the above analysis, the subject-matter of claim 1 of auxiliary request 2 differs from the disclosure of D1 in the following features:
 - a. said wearable device comprises at least two markers having respective marker colours different from each other, the marker colour of one of said markers being white,
 - b. said processing comprising processing at least one depth frame of said sequence of depth frames for identifying a portion of at least one colour frame of said sequence of color frames comprising only pixels representing said wearable device, said search being confined to said portion.
- 5.2 Features "a" and "b" solve separate, unrelated problems; each could be implemented on its own. Hence the board considers the contributions of differences "a" and "b" to inventive step separately.
- 5.3 Difference "a" solves the problem of tracking more than one body part, for example more than one finger. As stated above, this seems to be hinted at in D1 and would anyway have been implemented by the skilled person as a matter of usual design, for instance to recognise different hand gestures, such as a "pinch" gesture.
- 5.4 The appellant has argued that D1 does not disclose or suggest the glove having a white calibration marker. As set out above, the board construes the reference to a "colour calibration marker [...] whose marker color is

white" as merely implying a white marker. The board regards white as an obvious design choice having no unexpected advantage. As claim 1 is not understood to imply a colour calibration step, the fact that white could sometimes aid colour calibration does not make the choice of white inventive.

- 5.5 Hence difference "a" would have been obvious to the skilled person starting from D1.
- 5.6 Limiting the search for the markers to "only pixels representing [the] wearable device" speeds up the search of markers itself but at the price of the time necessary to segment out the wearable device. The total time taken is not necessarily reduced. The board understands the limitation to improve the detection of colour markers because the marker colour occurring in places other than on the wearable device (e.g. the screen) will not be mistakenly detected as a colour marker. In the board's understanding, D1 addresses the same problem when it limits the search for the marker colour to the detected foreground; see, for instance, figure 3. The board thus takes difference "b" to solve the problem of improving the accuracy with which colour markers are detected. The board considers it to be obvious to solve that problem by further limiting the search for the pixels in the colour images relating to the markers and, in particular, by limiting that search to precisely the object of interest, i.e. the wearable device. In this respect, the board also notes that D1 stresses the importance of an accurate fingertip detection (see page 4, left column, item 1) and that claim 1 does not go beyond stating the goal of limiting the search to pixels relating to only the wearable device and contains no features as to how this is to be achieved.

- 5.7 The appellant argued in the oral proceedings that D1 did not disclose tracking the wearable device, in particular segmenting out individual fingers in the image. Moreover the approach in D1 relied upon red not being used on the screen, as, for instance, was the case in figures 9a/b, showing lines in grey, cyan and magenta on the screen.
- 5.8 The board is not persuaded by these arguments, since the system known from D1 must track the red marker in order to "paint" lines on the projected image; see figures 9a/b. By tracking the red finger marker, the system of D1 implicitly tracks the wearable device, i.e. the glove. The skilled person would have also been aware that the marker and part of the projected image could be the same colour, making it all the more necessary to distinguish between the wearable device and the projected image. Indeed, in the case shown in figures 9a/b of D1, the board regards it as unlikely that the skilled person would have accepted not being able to use the colour red in the projected image. Furthermore, claim 1 does not exclude part of the colour frames being the same colour as one of the at least two marker colours, for instance red.
- 5.9 Hence the board finds that difference "b" would also have been obvious starting from D1.
- 5.10 It follows that the subject-matter of claim 1 does not involve an inventive step, Article 56 EPC, in view of D1 alone.

6. Inventive step, Article 56 EPC, main request and auxiliary request 1
 - 6.1 Interpreting claim 1 of these requests in the light of the description, in other words that "respective" implies "different" and that a white calibration marker is always present, claim 1 of these requests sets out the same subject-matter as that of auxiliary request 2.
 - 6.2 On this interpretation, the board finds that claim 1 of the main request and auxiliary request 1 lacks inventive step, Article 56 EPC, for analogous reasons to those set out above for auxiliary request 2.
7. The admittance of new auxiliary requests 1 to 3 into the proceedings
 - 7.1 The independent claims of new auxiliary requests 1 and 2 contain amendments to those of the main request filed in response to objections by the board under Articles 84 and 123(2) EPC which were raised for the first time in the board's (first) preliminary opinion, namely the clarifications that the respective marker colours were "different from each other" and "said at least two markers comprising a color calibration marker whose marker color is white". The board accepts that its new objections constituted exceptional circumstances, justifying admittance of the new requests, especially as auxiliary request 2 addresses both of the board's objections, Article 13(2) RPBA 2020.
 - 7.2 The independent claims of new auxiliary request 3 are based on those of auxiliary request 4 filed with the grounds of appeal, amended by insertion of the two mentioned features of new auxiliary request 2.

- 7.3 The board stated in its communication of 28 January 2025 (point 7.5) that then auxiliary request 4 contained many new features relating to identifying the first marker in a colour frame, apparently based on original claim 6. These features - as a limitation of original claim 1 - were found to be obvious over common general knowledge in the WO-ISA, which was endorsed in the first European examination report. Otherwise, these features were not discussed during examination. It did not seem procedurally economical to introduce these features at this late stage of the proceedings. Consequently the board was not inclined to admit auxiliary request 4 into the appeal proceedings.
- 7.4 With a response, dated 6 March 2025, the appellant submitted new auxiliary requests 1 to 3, withdrawing auxiliary requests 1 to 4 currently on file.
- 7.5 The mentioned new features of auxiliary request 4 filed with the statement of grounds of appeal were maintained in new auxiliary request 3 and consequently do not fall under the remit of Article 13(2) RPBA. As they were only filed on appeal, the question arises whether they should have been submitted before the examining division (Article 12(6) RPBA).
- 7.6 In the WO-ISA, dependent claim 6 was found to lack an inventive step with only very cursory arguments. In its response to the first European examination report endorsing the WO-ISA, the applicant argued that the examining division's inventive step objection to claim 1 was incorrect. In its subsequent examination reports, the examining division only addressed deficiencies under Articles 84 and 123(2) EPC. In its annex to the summons to oral proceedings, the examining division also raised a novelty objection to claim 1 (of

the still sole request) vis-à-vis D1. Dependent claim 6 was stated to lack inventive step, but with no specific reasoning; see points 5 to 5.5 of the annex to the summons. In its response to the summons, the applicant argued why the examining division's novelty objection was incorrect and only addressed the objections under Articles 84 and 123(2) EPC by way of amendment. Given the state and the focus of the examination proceedings, the board accepts that, up until that point, the applicant did not have occasion to amend independent claim 1 using the features of claim 6. The board also considers that the applicant's indication that it would not be present at the oral proceedings before the examining division does not change that conclusion. Therefore, the board concludes that Article 12(6) RPBA, first sentence, does not prevent admittance of auxiliary request 4 as filed with the grounds of appeal.

7.7 Nonetheless, admittance of auxiliary request 4 was at the board's discretion according to Article 12(4) RPBA. The board notes that inventive step had only been cursorily discussed during examination and therefore considers that that auxiliary request 4 constituted a reasonable fallback position in any future discussion on inventive step that might have been had once the objections in the decision under appeal had been overcome. The same applies *mutatis mutandis* to present auxiliary request 3.

7.8 Hence, in view of its considerations under Articles 12(4) and (6) RPBA regarding auxiliary request 4 as filed with the grounds of appeal and under Article 13(2) RPBA regarding present auxiliary request 2, the board admitted auxiliary request 3 into the appeal proceedings.

8. Remittal, Articles 111(1) EPC and 11 RPBA

8.1 The board finds that the claims according to auxiliary request 3 overcome the reasons for refusal and the objections under Articles 84 and 123(2) EPC raised by the board in points 8.6 and 9 of the provisional opinion of 28 January 2025, and otherwise comply with Article 123(2) EPC regarding added subject-matter and Article 84 EPC regarding clarity. The amendments also overcome the above inventive step objection which depends on the fact that claim 1 of the higher ranking requests lacks any details on the claimed segmentation procedure. Claim 1 of auxiliary request 3 now sets out such details.

8.2 In view of the fact that inventive step has not been decided upon in examination and said features (from original claim 6) have not been examined or discussed in any detail, the board finds that there are special reasons for remitting the case to the examining division for further prosecution, Article 11 RPBA.

Order

For these reasons it is decided that:

The decision under appeal is set aside. The case is remitted to the examining division for further prosecution.

The Registrar:

The Chairman:



L. Stridde

M. Müller

Decision electronically authenticated