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Datasheet for the decision of 18 November 2015

Case Number: T 2025/11 - 3.4.03

Application Number: 03798645.2

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IPC: G09B23/28

Language of the proceedings: EN

Title of invention:
DEVICE AND METHOD FOR GENERATING A VIRTUAL ANATOMIC ENVIRONMENT

Applicant:
Surgical Science Sweden AB

Headword:

Relevant legal provisions:
EPC 1973 Art. 54(1), 56

Keyword:
Novelty (no) - main request
Inventive step (no) - first and second auxiliary request

Decisions cited:

Catchword:

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Case Number: T 2025/11 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 18 November 2015

Appellant: (Applicant)	Surgical Science Sweden AB Haraldsgatan 5 413 14 Göteborg (SE)
Representative:	Awapatent AB P.O. Box 11 394 404 28 Göteborg (SE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 5 April 2011 refusing European patent application No. 03798645.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	R. Bekkering
	C. Heath

Summary of Facts and Submissions

I. The appeal is against the refusal of application No. 03 798 645 for lack of an inventive step, Article 56 EPC (auxiliary request) over documents:

D1: US 5 771 181 A, and

D2: US 6 336 812 B.

II. A summons to oral proceedings appointed for 18 November 2015 was issued by the board, provided with an annexed communication in which a provisional opinion of the board on the matter was given.

In particular, the appellant was informed that it appeared that the subject-matter of claim 1 according to the main and the auxiliary request lacked novelty in the sense of Article 54(1) EPC 1973 over document

D3: WO 96/16389 A

corresponding to the US application cited in document D1 in the passage referred to in the decision under appeal.

III. At oral proceedings before the board, the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the following application documents:

Main request:

Claims 1 to 11 filed as "AUXILIARY REQUEST 1" with letter of 16 October 2015;

First auxiliary request:

Claims 1 to 9 filed as "AUXILIARY REQUEST 2" with letter of 16 October 2015;

Second auxiliary request:

Claims 1 to 9 filed as "AUXILIARY REQUEST 2" at the oral proceedings on 18 November 2015.

IV. Claim 1 according to the main request reads as follows:

"*A method for generating a virtual anatomic environment (4) for use in a computer based visual simulation of minimally invasive surgery, comprising the steps of:*
providing a main virtual anatomic environment (1),
wherein said main virtual anatomic environment (1) is a 3-D model of an internal area of a living being,
selecting a local anatomic environment (2) from a predefined library (3) comprising a set of two or more separately modelled local anatomic environments (2),
wherein said local anatomic environments (2) are 3-D models of a local internal area of a living being,
arranged to represent anatomic variations of said local internal area,
including the selected local anatomic environment (2) in said main anatomic environment (1) to form said virtual anatomic environment (4),
thereby allowing generation of different virtual environments in which simulations may be performed."

V. Claim 1 according to the first auxiliary request reads as follows:

"*A method for generating a virtual anatomic environment (4) for use in a computer based visual simulation of minimally invasive surgery, comprising the steps of:*
providing a main virtual anatomic environment (1),
wherein said main virtual anatomic environment (1) is a 3-D model of an internal cavity (5) of a human, such as an abdominal cavity or a chest cavity,
selecting a local anatomic environment (2) from a predefined library (3) comprising a set of two or more separately modelled local anatomic environments (2),
wherein said local anatomic environments (2) are 3-D models of a local internal area of a living being, arranged to simulate different arrangements of arteries, veins and ducts (7) around an organ (6) arranged in said internal cavity (5), such as a gall bladder or a heart,
including the selected local anatomic environment (2) in said main anatomic environment (1) to form said virtual anatomic environment (4),
thereby allowing generation of different virtual environments in which simulations may be performed."

VI. Claim 1 according to the second auxiliary request corresponds to claim 1 of the first auxiliary request, with the following feature added at the end of the claim:

"*during simulation, providing a projection of the virtual anatomical environment corresponding to picture information which in a real situation is caught by a camera.*"

VII. The appellant submitted in substance the following arguments:

Document D3 related to a medical surgery simulator and provided more details regarding the visual simulation. In D3, a user could choose to simulate one of a variety of different pathological conditions. A simulation was performed on the selected 3-D model, and the simulation was visualized (projected) on a visual background made of video images. This was a well-known approach where parts of the anatomy which were not included in the 3-D model (i.e. not part of the simulation) were visualized using video images to provide a more realistic impression.

One of the important features of the invention was that the 3-D model on which simulation was performed (the "*virtual anatomical environment*") was formed by including a selected local anatomical environment in a main anatomical environment. It was important to note that the main environment, the local environment, and their combination (the virtual anatomical environment) were all 3-D models.

In D3, each pathological condition would require a complete 3-D model, and as noted by the Board it would appear that these would be modelled and stored as separate models. However, there was nothing in D3 to suggest that these 3-D models were then combined with another 3-D model (e.g. a "*main anatomical environment*" according to the invention). In particular, it was noted that the background landscape in D3 (i.e. the video images) could never combine with a selected 3-D model to form a total model on which the simulation was performed. Moreover, D3 referred to different pathological conditions, which was not the same as the anatomical variations of claim 1.

In fact, D3 seemed to provide an excellent example of an application where the invention could be useful. By implementing the invention in D3, the models of each different pathological condition would be divided into a main anatomical environment (e.g. an internal cavity) and a local anatomical environment (e.g. including ducts and arteries). Such a separation according to the invention would enable a more efficient modelling process and more effective storage of models, by avoiding redundant modelling and storage of model portions shared by several anatomical variations.

The objective technical problem could be formulated as "*how to improve the modelling process and storage of models*". The "*person skilled in the art*" in this context was considered to be a surgeon and a simulation software programmer working together. Starting from D3, and faced with this problem, there was no reason to believe that a person skilled in the art would arrive at the present invention. The different conditions in D3 were likely to be considered as fundamentally different by a surgeon, as they typically would be present in different individuals. Thus, a programmer would be unlikely to receive any input suggesting that the different models might in fact have some portions in common.

Claim 1 according to the first and second auxiliary request further defined the separation of the main environment providing a model of an internal cavity and a local environment providing a model of veins and arteries surrounding an organ in the cavity, which was clearly not disclosed in D3.

Therefore, the invention according to claim 1 of all requests was novel and involved an inventive step over the cited art.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 Amendments

Claim 1 as amended is based on claims 1 and 2 as originally filed and on the original description (cf page 8, lines 12 to 18; page 9, lines 5 to 8).

Accordingly, claim 1 as amended complies with Article 123(2) EPC.

2.2 Novelty

According to the decision under appeal the subject-matter of claim 1 did not involve an inventive step over document D1 in combination with document D2. Having regard to document D1, the difference was argued to be in substance that in the claimed device the local anatomic environments are modelled separately. The decision under appeal refers in particular to column 2 of D1 listing a number of system criteria, in which reference is made to a US patent application corresponding to document D3 stated to describe a

comprehensive system embodying the foregoing criteria (cf column 2, lines 10 to 50).

Document D3 is concerned with a computer based visual simulation of minimally invasive surgery with tactile force feedback when instruments are manipulated (cf page 5, line 8 to page 7, line 27). This corresponds to what is addressed in the application (cf page 6, line 36 to page 7, line 15).

Document D3 uses multiple visual planes to display the simulation imagery. In the preferred embodiment, three planes are identified:
the "*Graphics Display*" is of the dynamics engine generated model;
the "*Display Video*" is of the background plane; and
the "*Display Overlays*" is layered on top of both of the foregoing (cf page 20, line 25 to page 21, line 4; figures 4 and 5).

Simulation for visual displays may comprise "*multilayer*" background "*landscape*" video information that may be actual photographic data digitized and stored in laser disc, electronic or other memory. The multilayer arrangement provides means to provide a sense of depth in the two-dimensional display through relative movement and interaction with computer graphic anatomical objects in the layers, such as organs (cf page 3, line 24 to page 4, line 4).

More particularly, "*A mock endoscope 11 is inserted within model 12 by user 13. Within model 12 there are a plurality of sensors (not shown) that respond to the position of the tip (not shown) of the endoscope 11 and which transmit corresponding signals via conventional transmission linkages 14 to computer 15. Computer 15*

responds thereto by accessing storage 16 via conventional transmission linkage 17 to retrieve from conventional storage 16 a plurality of electrical indicia representing the view which would be observed from the relative location of the endoscope tip during a real operation. Such indicia are conducted to video display 18 by conventional connections represented by arrow 19" (page 14, line 19 to page 15, line 3). Moreover, "*Since movement of the endoscope is sensed by the aforementioned sensors, movement results in a corresponding change in the image shown on the screen 18 of the video device. Thus, a complete cycle is developed from hand-action 20 to resultant image 18 to new hand-action to another essentially instantly changed image, with computer 15 translating each variation in the mock endoscope to the precise image which would be viewed in real operation. Accordingly, there is portrayed for the user a realistic visual representation of the internal landscape that would be seen if a real-life procedure were being performed*" (page 15, lines 12 to 22).

Provided is, thus, a visual three-dimensional model of an internal area of a living being.

Document D3, uses this prior art method to produce a background landscape and overlays a visual simulation of the immediate work area including specific organs and anatomy to be worked on (cf page 3, line 24 to page 6, line 18; page 16, line 19 to page 19, line 23; figures 4 and 5).

The immediate work area, such as tissue or an organ, is represented by a three-dimensional model based on a lattice representing tissue, composed of a tessellated mesh based on a deformable spring model (page 9, lines

24 to 27; page 12, lines 14 to 20; page 13, lines 13 to 14; page 37, lines 19 to 25).

Accordingly, in D3 also three-dimensional models are provided of local internal areas of a living being.

The lattices are included in vignettes, which are stored in memory. When a vignette is recalled from memory, the lattice is transformed so that the visualization of the model overlays the background (cf page 30, lines 20 to page 31, line 2).

A local anatomic environment is, thus, included in a main anatomic environment to form a virtual anatomic environment.

Moreover, the system of D3 provides for the selection between skills practice and diagnostic practice.

In the skills practice, procedures such ligation, dividing and joining may be selected. In addition, the provision for random system selection is included. For instance in the category mobilization, a variety of mobilizations is selectable. The system then proceeds to a simulation of the selected procedure (cf page 21, line 5 to page 24, line 16; figure 6).

In the diagnostic practice, the user can select between normal and pathological conditions. If the user selects the normal condition, the system proceeds to the presentation of simulated landscape views of selected internal scenes of a normal patient. If the user selects the pathological condition, the particular type of pathology can be selected and the system proceeds to the presentation of simulated landscape views of the selected pathological condition. Alternatively, the

system may randomly present one of a number of stored pathologies (cf page 24, line 17 to page 27, line 21; figure 7).

Accordingly, in D3 the visual simulation of the different local internal areas, such as organs or tissue, for use in the skills or diagnostics practice, with corresponding different pathologies, are modelled separately from each other and separately from the background landscape. Moreover, the different local internal areas are stored and, thus, selectable from a "*library*".

Accordingly, document D3 discloses, using the terminology of claim 1:
- a method for generating a virtual anatomic environment for use in a computer based visual simulation of minimally invasive surgery, comprising the steps of:
- providing a main virtual anatomic environment, wherein said main virtual anatomic environment is a 3-D model of an internal area of a living being (ie background landscape),
- selecting a local anatomic environment (eg simulated organ) from a predefined library comprising a set of two or more separately modelled local anatomic environments (eg "*a number of stored pathologies*"),
- wherein said local anatomic environments are 3-D models of a local internal area of a living being, arranged to represent anatomic variations of said internal area (ie different pathologies),
- including the selected local anatomic environment (eg simulated organ) in said main anatomic environment (background landscape) to form said virtual anatomic environment,

- thereby allowing generation of different virtual environments in which simulations may be performed.

2.3 The appellant essentially argued that in the invention the 3-D model on which simulation was performed (the "*virtual anatomical environment*") was formed by including a selected local anatomical environment in a main anatomical environment. The main environment, the local environment, and their combination (the virtual anatomical environment) were all 3-D models.

In contrast, in document D3, after a user had chosen to simulate one of a variety of different pathological conditions, a simulation was performed on the selected 3-D model, and the simulation was visualized (projected) on a visual background made of video images. Accordingly, in D3, each pathological condition required a complete 3-D model. There was nothing in D3 to suggest that these 3-D models were then combined with another 3-D model (e.g. a "*main anatomical environment*" according to the invention). Moreover, the different pathological conditions in D3 were not the same as the anatomical variations of claim 1.

2.4 In the board's judgement, however, the background landscape in D3 provides a three-dimensional model of an internal area of living being. As discussed above, in D3, movement of the endoscope results in a corresponding change in the image shown (cf page 15, lines 12 to 19). Although in D3 the images may be based on digitized actual photographic data, the collection of digitized images provides a three-dimensional representation of the internal landscape. Provided is, thus, a visual 3-D model of the internal landscape. Furthermore, as discussed above, a selected three-dimensional model representing a local internal

environment corresponding to eg a particular pathological condition is provided overlaying the background landscape. Accordingly, in D3 the background landscape in fact is a 3-D model which is combined with a selected 3-D model of a local environment to form a total model on which the simulation is performed.

It is noted in this respect that since the different pathologies are modelled in the local 3-D model overlaying the background landscape, the appellant's contention that in D3 each pathological condition would require a complete 3-D model and, thus, excessive amounts of storage is unfounded.

Moreover, as to the appellant argument that anatomic variations as defined in claim 1 could not be equated with different pathological conditions as referred to in D3, it is noted that in the board's judgement the general expression "*anatomic variations*" may include variations as a result of pathological conditions as addressed in document D3.

2.5 Accordingly, the subject-matter of claim 1 of the main request is not new over document D3, Article 54(1) EPC 1973.

2.6 The appellant's main request is, therefore, not allowable.

3. First auxiliary request

3.1 Amendments

Claim 1 according to the first auxiliary request defines with respect to the above claim 1 according to the main request that the main virtual anatomic

environment is a 3-D model of an "*internal cavity (5) of a human, such as an abdominal cavity or a chest cavity*" and that the local anatomic environments are 3-D models of a local internal area of a living being, "*arranged to simulate different arrangements of arteries, veins and ducts (7) around an organ (6) arranged in said internal cavity (5), such as a gall bladder or a heart*".

These amendments are based on claim 5 as originally filed.

Accordingly, claim 1 as amended complies with Article 123(2) EPC.

3.2 Novelty

As discussed above, document D3 concerns the simulation of minimally invasive surgery, typically involving the use of eg an endoscopic instrument. Such an endoscopic instrument is typically inserted in an internal cavity of a human. The background landscape provided in document D3, which provides the precise image which would be viewed in real operation when using the endoscope, thus, is a three-dimensional model of an internal cavity of a human.

Accordingly, this feature is also known from document D3.

Document D3, does however not explicitly mention that the local anatomic environments are 3-D models of a local internal area of a living being, "*arranged to simulate different arrangements of arteries, veins and ducts (7) around an organ (6) arranged in said internal cavity (5), such as a gall bladder or a heart*".

In particular, although in D3 the local anatomic environments overlay the background landscape and are, thus, also within the cavity, and represent different organs or tissue with different pathologies, D3 does not mention that 3-D models of a local internal area of a living being are arranged to simulate different arrangements of arteries, veins and ducts around an organ arranged in the internal cavity.

Accordingly, the subject-matter of claim 1 according to the first auxiliary request is new over document D3 in the sense of Article 54(1) EPC 1973.

3.3 Inventive step

Since, however, common pathological conditions of organs typically diagnosed or treated with endoscopic or minimally invasive surgical instruments, such as the gall bladder and heart, concern the arteries, veins and ducts around the organ, it would be obvious to a person skilled in the art, tasked with providing realistic virtual environments for training purposes in D3, to arrange the 3-D models in D3 to simulate different arrangements of arteries, veins and ducts around an organ.

The subject-matter of claim 1 according to the first auxiliary request, therefore, lacks an inventive step in the sense of Article 56 EPC 1973.

3.4 The appellant's first auxiliary request is, therefore, not allowable either.

4. Second auxiliary request

4.1 Amendments

Claim 1 according to the second auxiliary request defines with respect to the above claim 1 according to the first auxiliary request the further step of "*during simulation, providing a projection of the virtual anatomical environment corresponding to picture information which in a real situation is caught by a camera.*"

This amendment is based on the originally filed description (cf page 1, lines 28 to 31).

Accordingly, claim 1 as amended complies with Article 123(2) EPC.

4.2 Inventive step

It is the object of document D3, and indeed typically of any simulation concerning endoscopy and minimally invasive surgery, to provide a projection, ie an image of the virtual anatomical environment corresponding to picture information, which in a real situation is caught by a camera (cf page 15, lines 20 to 22).

Therefore, this additional feature is already known from document D3.

For the rest, the same applies as for claim 1 according to the first auxiliary as laid down above.

Accordingly, the subject-matter of claim 1 according to the second auxiliary request also lacks an inventive step in the sense of Article 56 EPC 1973.

4.3 The appellant's second auxiliary request is, thus, also not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Eliasson

Decision electronically authenticated