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**Datasheet for the decision  
of 26 November 2021**

**Case Number:** T 0489/14 - 3.5.07

**Application Number:** 03793825.5

**Publication Number:** 1546948

**IPC:** G06F17/50

**Language of the proceedings:** EN

**Title of invention:**

Simulation of the movement of an autonomous entity through an environment

**Applicant:**

Bentley Systems (UK) Limited

**Headword:**

Pedestrian simulation/BENTLEY SYSTEMS

**Relevant legal provisions:**

EPC Art. 56

RPBA Art. 12(4), 13(1), 13(3)

RPBA 2020 Art. 25(2), 25(3)

**Keyword:**

Inventive step - main request, first to fifth, seventh and eighth auxiliary requests (no)

Late-filed request - ninth, tenth and eleventh auxiliary requests (not admitted)

**Decisions cited:**

G 0001/19, T 0154/04, T 1083/16, T 1892/17

**Catchword:**

Application of decision G 1/19 to

- simulation methods (Reasons, point 2)
- design methods (Reasons, point 4)
- measurement methods (Reasons, point 7)



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Case Number: T 0489/14 - 3.5.07

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.07**  
**of 26 November 2021**

**Appellant:** Bentley Systems (UK) Limited  
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**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 26 August 2013  
refusing European patent application  
No. 03793825.5 pursuant to Article 97(2) EPC**

**Composition of the Board:**

**Chair** J. Geschwind  
**Members:** R. de Man  
P. San-Bento Furtado

## **Summary of Facts and Submissions**

- I. The appellant (applicant) filed an appeal against the examining division's decision refusing European patent application No. 03793825.5, published as international application WO 2004/023347.
- II. The examining division decided that the subject-matter of claim 1 of the then main request and of the first to third auxiliary requests lacked inventive step because the only feature making a technical contribution was the use of a computer.
- III. With its statement of grounds of appeal, the appellant replaced its requests with an amended main request and amended first and second auxiliary requests.
- IV. In a communication accompanying a summons to oral proceedings, the board expressed the preliminary opinion that the subject-matter of claim 1 of the main request and of the first and second auxiliary requests lacked inventive step.
- V. By letter of 9 March 2018, the appellant filed third, fourth and fifth auxiliary requests.
- VI. Oral proceedings were held on 11 April 2018, during which the possibility of a referral of questions to the Enlarged Board of Appeal was discussed. At the end of the oral proceedings, the Chair announced that the proceedings would be continued in writing.
- VII. In an interlocutory decision of 22 February 2019, the board referred the following questions of law to the Enlarged Board of Appeal:

"1. In the assessment of inventive step, can the computer-implemented simulation of a technical system or process solve a technical problem by producing a technical effect which goes beyond the simulation's implementation on a computer, if the computer-implemented simulation is claimed as such?

2. If the answer to the first question is yes, what are the relevant criteria for assessing whether a computer-implemented simulation claimed as such solves a technical problem? In particular, is it a sufficient condition that the simulation is based, at least in part, on technical principles underlying the simulated system or process?

3. What are the answers to the first and second questions if the computer-implemented simulation is claimed as part of a design process, in particular for verifying a design?"

VIII. In decision G 1/19 of 10 March 2021, the Enlarged Board of Appeal answered these questions as follows:

"1. A computer-implemented simulation of a technical system or process that is claimed as such can, for the purpose of assessing inventive step, solve a technical problem by producing a technical effect going beyond the simulation's implementation on a computer.

2. For that assessment it is not a sufficient condition that the simulation is based, in whole or in part, on technical principles underlying the simulated system or process.

3. The answers to the first and second questions are no different if the computer-implemented simulation is claimed as part of a design process, in particular for verifying a design."

- IX. In a communication accompanying a second summons to oral proceedings, the board (in a different composition) expressed the preliminary opinion that the subject-matter of claim 1 of the main request and of the first to fifth auxiliary requests lacked inventive step.
- X. By letter of 26 October 2021, the appellant filed seventh to eleventh auxiliary requests. It made no comments on the main request and first to fifth auxiliary requests.
- XI. Second oral proceedings were held on 26 November 2021. At the end of the oral proceedings, the Chair announced the board's decision.
- XII. The appellant's final requests were that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request or, in the alternative, of one of the first to fifth and seventh to eleventh auxiliary requests.
- XIII. Claim 1 of the main request reads as follows:

"A computer-implemented method of modelling pedestrian crowd movement in an environment, the method comprising:

simulating movement of a plurality of pedestrians through the environment, wherein simulating movement of each pedestrian comprises:

providing a provisional path (9) through a model of the environment from a current location (6) to an intended destination (7);

providing a profile for said pedestrian;

determining a preferred step (11<sub>2</sub>'), to a preferred position (12<sub>3</sub>'), towards said intended destination based upon said profile and said provisional path, wherein determining said preferred step comprises determining a dissatisfaction function expressing a cost of taking a step comprising a sum of an inconvenience function expressing a cost of deviating from a given direction and a frustration function expressing a cost of deviating from a given speed;

defining a neighbourhood (29) around said preferred position (12<sub>3</sub>');

identifying obstructions in said neighbourhood, said obstructions including other pedestrians (21) and fixed obstacles (25);

determining a personal space (24) around said pedestrian;

determining whether said preferred step (11<sub>2</sub>') is feasible by considering whether obstructions (21, 25) infringe said personal space over the course of the preferred step (11<sub>2</sub>')."

XIV. Claim 1 of the first auxiliary request differs from claim 1 of the main request in that "environment" has been replaced with "building structure".

XV. Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request in that the following text has been inserted after "providing a profile for said pedestrian,":

"said profile including a preferred walking speed;

determining a preferred instantaneous walking speed by adding said preferred walking speed to a value of walking speed noise;"

and in that "a cost of deviating from a given speed" has been replaced with "a cost of deviating from the preferred instantaneous walking speed".

XVI. Claim 1 of the third auxiliary request differs from claim 1 of the second auxiliary request in that the following text has been added at the end of the claim:

"and

displaying the simulated movement as a sequential set of snapshots showing the current position of each pedestrian in the model as it progresses over time."

XVII. Claim 1 of the fourth auxiliary request differs from claim 1 of the third auxiliary request in that the text before "providing a provisional path" has been replaced with:

"A method of designing a building structure, the method comprising:

- providing a model of said building structure;
- simulating movement of a plurality of pedestrians through said building structure using a computer, wherein simulating movement of each pedestrian step comprises:"

and in that the following text has been added at the end of the claim:

"and

- revising said model of said building structure in dependence upon movement of the pedestrians."



XVIII. Claim 1 of the fifth auxiliary request differs from claim 1 of the third auxiliary request in that the following text has been inserted before "and displaying the simulated movement":

"if the preferred step is not feasible, then:  
determining a region in which to seek a compromise step, wherein determining the region in which to seek the compromise step comprises adapting step parameters for determining said region in dependence upon memory of past conditions; and  
determining whether at least one compromise step is feasible;"

XIX. Claim 1 of the seventh auxiliary request differs from claim 1 of the first auxiliary request in that the following text has been added at the end of the claim:

"wherein providing said profile for said pedestrian comprises:  
basing said profile on a set of measured attributes."

XX. Claim 1 of the eighth auxiliary request differs from claim 1 of the first auxiliary request in that the following text has been inserted after "providing a profile for said pedestrian":

", said profile including one or more continuous distribution functions for one or more corresponding attributes, the one or more attributes including preferred speed, each of the continuous distribution functions describing empirically-established attributes of real population samples which have been measured".

XXI. Claim 1 of the ninth auxiliary request differs from claim 1 of the first auxiliary request in that the following text has been added at the end of the claim:

"; and

generating timers associated with the pedestrian established experimentally from measurements, the timers including waiting times for the pedestrian."

XXII. Claim 1 of the tenth auxiliary request reads as follows:

"A method of controlling movement of an entity through an environment, the method comprising:

providing a provisional path through a model of the environment from a current location to an intended destination;

providing a profile for said autonomous entity;

determining a preferred step, to a preferred position, towards said intended destination based upon said profile and said provisional path, wherein determining said preferred step comprises determining a dissatisfaction function expressing a cost of taking a step comprising a sum of an inconvenience function expressing a cost of deviating from a given direction and a frustration function expressing a cost of deviating from a given speed;

defining a neighbourhood around said preferred position;

identifying obstructions in said neighbourhood, said obstructions including other entities and fixed obstacles;

determining a personal space around said autonomous entity;

determining whether said preferred step is feasible by considering whether obstructions infringe

said personal space over the course of the preferred step; and

the entity taking the preferred step."

XXIII. Claim 1 of the eleventh auxiliary request differs from claim 1 of the tenth auxiliary request in that "an entity", "said autonomous entity", "other entities" and "the entity" have been replaced with "a robot", "said robot", "other robots" and "the robot", respectively.

XXIV. During the second oral proceedings, the appellant confirmed that it had no further comments on the main request and the first to fifth auxiliary requests. The appellant's arguments in respect of the seventh to eleventh auxiliary requests, where relevant to the decision, are discussed in detail below.

## **Reasons for the Decision**

### *1. The application*

The invention relates to a computer-implemented simulation of the movement of a pedestrian crowd through an environment.

Pages 11 to 56 of the published application describe a mathematical model of individual pedestrians and an algorithm for simulating their movement through an environment. This is followed, on pages 56 to 70, by the description of a design system which performs the simulation. This system, shown in Figure 21, allows the user to build a model of an environment by creating it or importing a design from a computer-aided-design (CAD) source (page 58, lines 28 to 32). During the execution of the simulation, a sequential set of

snapshots is displayed which shows the current position of each pedestrian in the modelled environment. These simulation results can be analysed either online, i.e. while the simulation is running, or offline after the simulation has finished and the results have been recorded (page 60, line 18, to page 61, line 5).

The main purpose of the simulation is its use in a process for designing a venue, as shown in Figure 22 and described on pages 65 to 70. Essentially, the designer creates or imports an architectural venue design, specifies the constituents of a pedestrian population that is typical for the venue being designed, and performs a number of simulations of pedestrian flows which the designer can specify at a high level (in terms of sources (entrances), sinks (exits) and supply rate). The simulation results are then examined and the design is revised if necessary.

In addition to the use of the simulation method for designing venues, page 3, lines 17 to 19, of the description also mentions its use for troubleshooting flow problems, operational management, setting and implementing safety standards and quality control. These purposes are not separately elaborated upon elsewhere in the application.

*Main request*

2. *Inventive step*

2.1 Claim 1 of the main request relates to a computer-implemented method of modelling pedestrian crowd movement in an environment. The method simulates a plurality of pedestrians as they move through the environment. For each pedestrian, a "preferred step" is

determined on the basis of a pedestrian-specific profile, a provisional path through a model of the environment and certain "dissatisfaction", "inconvenience" and "frustration" cost functions, and it is also determined whether the step is feasible in view of obstructions in the neighbourhood of the pedestrian and the pedestrian's personal space.

2.2 In its interlocutory decision, the board considered the first and second referred questions to be relevant to its assessment of inventive step in the subject-matter of claim 1 of the main request:

"A negative answer to the first question would mean that the subject-matter of claim 1 of the main request lacks inventive step over a known general-purpose computer. The same would apply if the answer to the second question includes criteria which the Board concludes are not fulfilled in the present case." (Reasons, point 25)

This is because the board had come to the view that, in the present case, an inventive step could not be based on the claimed simulation's implementation on a general-purpose computer (Reasons, points 3 to 8). It therefore had to be determined whether the claimed computer-implemented simulation of crowd movement, in particular the provision of information about the movement of simulated pedestrians through a modelled environment, qualified as a technical effect (Reasons, point 9).

One reason why the board was not convinced that the provision of information about the movement of simulated pedestrians through a modelled environment in the claimed method could constitute a technical effect

was that the provision of such calculated information had no direct link with physical reality, such as a change in or a measurement of a physical entity (Reasons, point 11).

- 2.3 The order of decision G 1/19 answers the first question in the affirmative, i.e. a computer-implemented simulation of a technical system or process that is claimed as such, i.e. on its own, can, for the purpose of assessing inventive step, solve a technical problem by producing a technical effect going beyond the simulation's implementation on a computer.

With respect to the second question, the order only states that for that assessment it is not a sufficient condition that the simulation is based, in whole or in part, on technical principles underlying the simulated system or process.

The Enlarged Board refrained from giving an exhaustive list of criteria for assessing whether a computer-implemented simulation solves a technical problem by producing a technical effect that goes beyond the simulation's implementation on a computer, but it did give further guidance.

- 2.4 In point 88 of its decision, the Enlarged Board considered that a direct link with external physical reality was not always necessary. On the one hand, technical contributions could be established by features within the computer system. On the other hand, there were many examples in which potential technical effects, which could be distinguished from direct technical effects on physical reality, had been considered in the course of the technicality/inventive-

step analysis. Moreover, the notion of technicality had to remain open.

2.5 With respect to potential technical effects, the Enlarged Board added that if claimed data or data resulting from a claimed process was specifically adapted for the purpose of controlling a technical device, the technical effect that would result from this intended use of the data could be considered "implied" by the claim; however, this argument could be made only if the data had no other relevant uses, since otherwise the technical effect was not achieved over substantially the whole scope of the claimed invention (G 1/19, points 94 and 95).

2.6 The Enlarged Board also dealt with the argument that "virtual or calculated technical effects" which were not achieved through an interaction with physical reality, but were calculated so as to correspond closely to "real" technical effects of physical entities, should be treated as technical effects for the purpose of assessing inventive step (using the COMVIK approach).

The Enlarged Board distinguished such "virtual or calculated" effects from potential technical effects which necessarily became real technical effects, for example when a computer program or a control signal for an image display device was put to its intended use (G 1/19, point 97).

It explained that calculated information reflecting the status or physical properties of a physical object was, first and foremost, mere data which could be used in many ways. In exceptional cases it could have an "implied technical use" which could be the basis for an

"implied technical effect". A claim with no (implied) limitation to a technical use would routinely raise concerns with respect to the principle that the claimed subject-matter had to be a technical invention over substantially the whole scope of the claim (G 1/19, point 98; see also points 124 and 128).

- 2.7 Hence, in the case of a computer-implemented invention, a technical effect relevant for the assessment of inventive step exists if the features of the claim directly achieve a (real) technical effect on physical reality (including both external physical reality and the "internal" physical reality of the computer system in which the invention is implemented).

In addition, an "implied" technical effect relevant for the assessment of inventive step is present if the claimed invention or the data produced by it necessarily achieves a real technical effect when it is put to its intended (and only relevant) use.

In contrast, merely providing calculated data which corresponds closely to technical effects of physical entities is not a technical effect relevant for the assessment of inventive step.

- 2.8 It follows that the data produced by the method of claim 1, which reflects the behaviour of a crowd moving through an environment, does not contribute to a technical effect for the purpose of assessing inventive step. Indeed, the potential use of such data is not limited to technical purposes, as it can be used in computer games or presented to a human for obtaining knowledge about the modelled environment, to give just two examples of non-technical uses that are within the scope of the claim.



2.9 The subject-matter of claim 1 of the main request therefore lacks inventive step (Article 56 EPC).

*First, second, third and fifth auxiliary requests*

3. *Inventive step*

3.1 The first auxiliary request replaces the term "environment" in claim 1 with "building structure". The amendments made to claim 1 in the second auxiliary request merely concern the non-technical simulation steps. These amendments do not affect the board's inventive-step reasoning for the main request, which therefore still applies to the first auxiliary request.

3.2 The features added to claim 1 of the third auxiliary request relate to how the results of the non-technical simulation are displayed to the user and thus to a non-technical presentation of information.

3.3 The amendments made to claim 1 in the fifth auxiliary requests merely concern the non-technical simulation steps, and again do not affect the board's inventive-step reasoning.

3.4 Hence, the subject-matter of claim 1 of the first, second, third and fifth auxiliary requests lacks inventive step (Article 56 EPC).

*Fourth auxiliary request*

4. *Inventive step*

4.1 In claim 1 of the fourth auxiliary request, the simulation method of claim 1 of the third auxiliary

request is claimed as part of a design process. The claim includes a step of revising a designed model in dependence upon the simulated movement of pedestrians through the modelled building structure. The description of the application makes it clear that the revising step may be performed by a human designer operating a CAD program (see e.g. page 70, lines 7 to 9, of the published application).

- 4.2 According to the order of decision G 1/19, the answers to the first and second questions are no different if the computer-implemented simulation is claimed as part of a design process, in particular for verifying a design.

The Enlarged Board considered that a design process was normally a cognitive activity (G 1/19, point 143). It saw no need for the application of special rules if a simulation was claimed as part of a design process (point 144).

- 4.3 Since the added revising step may be carried out by a human, an inventive step in the subject-matter of claim 1 still cannot reside in the implementation of the method on a computer.

- 4.4 In addition to producing data reflecting the behaviour of a crowd moving through an environment, now as an intermediate result, the method of claim 1 produces data representing a (revised) model of a building structure.

- 4.5 The board notes that data representing a model of a building structure may be used for a variety of non-technical purposes, for example in a video game, and therefore has no "implied technical use".

For this reason alone, the claimed simulation still does not contribute to a technical effect.

4.6 The board also notes that the simulation does not influence the designed model in any technical manner, since the claim leaves it entirely up to the human designer as to how to revise the model "in dependence upon movement of the pedestrians". This is another reason why the simulation in the context of claim 1 of the fourth auxiliary request does not contribute to a technical effect.

4.7 Hence, the subject-matter of claim 1 of the fourth auxiliary request lacks inventive step (Article 56 EPC).

*Seventh and eighth auxiliary request*

5. Claim 1 of the seventh auxiliary request adds to claim 1 of the first auxiliary request that providing a profile for a pedestrian comprises "basing said profile on a set of measured attributes".

Claim 1 of the eighth auxiliary request adds to claim 1 of the first auxiliary request that the profile for a pedestrian includes "one or more continuous distribution functions for one or more corresponding attributes, the one or more attributes including preferred speed, each of the continuous distribution functions describing empirically-established attributes of real population samples which have been measured".

6. *Admission into the appeal proceedings*

- 6.1 The seventh and eighth auxiliary requests were submitted in preparation for the second oral proceedings before the board and in response to point 85 of decision G 1/19, which states that technical effects can occur at the input of a computer-implemented process and that technical input may consist of a measurement.
- 6.2 Since the statement of grounds of appeal was filed and the first summons to oral proceedings was notified before the date of entry into force of the revised Rules of Procedure of the Boards of Appeal (RPBA 2020), the admissibility of these requests is to be assessed under Articles 12(4) and 13 RPBA 2007 (see Article 25(2) and (3) RPBA 2020 and decision T 1083/16, Reasons 2.2).
- 6.3 Strictly speaking, decision G 1/19 did not create a new situation as far as the board's objections are concerned. In its communication accompanying the first summons to oral proceedings, the board had already expressed the preliminary view that the computer-implemented simulation as claimed in the first auxiliary request did not make a technical contribution beyond its obvious implementation on a computer. In general, it is not part of the board's duties to make suggestions as to how a lack of inventive step or technicality could be remedied, and when the board - or the Enlarged Board - effectively does so, this does not give a party the right to have new requests admitted into the appeal proceedings.
- 6.4 Nevertheless, the board recognises that these appeal proceedings are exceptional in that questions were

referred to the Enlarged Board of Appeal which have led to a decision clarifying an area of patent law in which conflicting case law could at least have been perceived to exist. Moreover, the seventh and eighth auxiliary requests give the board an opportunity to examine the further ramifications of the decision.

6.5 Since the amendments made are also relatively minor and do not raise new issues, the board admits the seventh and eighth auxiliary requests into the appeal proceedings under Article 13(1) and (3) RPBA 2007.

7. *Inventive step*

7.1 The appellant submitted that the features added to claim 1 of the seventh and eighth auxiliary requests ensured that the claimed invention used measured data as input data. The Enlarged Board had pointed out that technical effects could occur at the input of a computer-implemented process and that technical input could consist of a measurement. Moreover, it had been recognised in decision T 1892/17, Reasons 2.1.4, that a simulation based on measurements did not produce a purely virtual effect. The added features had the effect of providing a more accurate simulation.

7.2 The board first notes that, even if the added features credibly improved the accuracy of the simulation, this alone could not establish a technical contribution made by the simulation. As the Enlarged Board stated in point 111 of its decision, whether a simulation contributes to the technical character of the claimed subject-matter does not depend on the quality of the underlying model or the degree to which the simulation represents "reality".

7.3 Claim 1 of the seventh auxiliary request does not include an actual step of measuring but only specifies that the attributes of the pedestrian profile have been measured, i.e. obtained by some measurement in the past. It is questionable whether this feature has a limiting effect, since whether data has been generated by a measurement or by some other method is not a property of the data itself.

However, for the sake of argument, the board will interpret claim 1 of the seventh auxiliary request as including a step of generating the attributes of the pedestrian profile by means of measurements, and it will assume that these measurements are carried out using technical means (and not just by observing and counting pedestrians passing through various building structures).

7.4 With this interpretation, the method of claim 1 consists of a technical step of measuring attributes of pedestrians to provide pedestrian profiles followed by the (computer-implemented but otherwise) non-technical simulation method of claim 1 of the first auxiliary request.

The question to be answered is whether the technical step and the simulation method are not merely juxtaposed, the output of the measuring step serving as an input for the simulation method, but interact to produce a combined technical effect (see decision T 154/04, OJ EPO 2008, 46, Reasons 5, under (F)). An interaction may be present, for example, if the combination amounts to an indirect measurement of a specific physical entity by means of measurements of another physical entity (see G 1/19, point 99). This is in line with decision T 1892/17, which found that the

simulation features interacted with the technical features of the claim to contribute to a specific technical effect (see Reasons 2.1.4).

- 7.5 The method of claim 1 provides information about the movement of simulated pedestrians through a modelled building structure. Since the calculated information is neither used in a further step of the method nor specifically adapted for the purposes of an intended technical (and only relevant) use, it has to be investigated whether the information represents a measurement of a physical entity.

The modelled building structure does not correspond to a building structure that was measured, whether directly or through measurement of its physical effects on other physical entities. In fact, the modelled building structure need not correspond to any existing building structure.

Nor does the calculated information about the movement of simulated pedestrians represent a direct or indirect measurement of any of the real pedestrians (or other physical entities) that were measured in the process of generating the pedestrian profiles. The group of simulated pedestrians does not necessarily correspond to the set of measured entities, as their profiles need only be "based" on a set of measured attributes. For example, the value for the "preferred walking speed" attribute in each pedestrian profile may have been randomly drawn from a probability distribution derived from a statistical analysis of actual measurements of a large number of individuals (as described on page 15, lines 10 to 19, of the description). In this case, none of the modelled pedestrians corresponds to any of the pedestrians involved in the measurements.

Hence, in the present case no physical entity (or process) can be identified which could potentially be measured by the method of claim 1 in the sense that its physical status or some physical property is described by information calculated on the basis of data obtained by a direct or indirect physical interaction with the entity.

It therefore does not need to be determined whether the information calculated by the method of claim 1 - essentially the trajectories of simulated pedestrians moving through a modelled environment - is of the kind that could describe such a technical status or properties.

7.6 Since the technical step of measuring attributes of pedestrians cannot independently support an inventive step and does not interact with the other features of the claim to provide a combined technical effect, the subject-matter of claim 1 of the seventh auxiliary request lacks inventive step (Article 56 EPC).

7.7 The features added to claim 1 of the eighth auxiliary request essentially describe that values of attributes in the pedestrian profiles are randomly drawn from (continuous) probability distributions derived from a statistical analysis of actual measurements. Hence, the subject-matter of claim 1 of the eighth auxiliary request lacks inventive step for the same reasons (Article 56 EPC).

*Ninth auxiliary request*

8. Claim 1 of the ninth auxiliary request adds to claim 1 of the first auxiliary request the step "generating



timers associated with the pedestrian established experimentally from measurements, the timers including waiting times for the pedestrian".

9. *Admission into the appeal proceedings*

9.1 Like the seventh and eighth auxiliary requests, the ninth auxiliary request was submitted in preparation for the second oral proceedings before the board and in response to point 85 of decision G 1/19, which states that technical effects can occur at the input of a computer-implemented process and that technical input may consist of a measurement.

9.2 Although the amendments made in the ninth auxiliary request are again relatively minor, they do create clarity issues at least *prima facie*.

In particular, the feature "the timers including waiting times for the pedestrian" create doubt as to the intended meaning of the term "timer". An amount of waiting time is not one of its normal meanings.

Moreover, none of the other steps of claim 1 refers to "timers" or "waiting times", and it is therefore *prima facie* not clear from the claim what role the "timers" or "waiting times" are intended to play in the simulation process.

9.3 The amendments were taken from page 70, lines 28 to 33, of the description, which mentions waiting times for entities (i.e. pedestrians) buying a ticket from a vending machine, getting information from an information booth, or consulting a bulletin board. Hence, the idea behind this amendment is again that the values of certain parameters of the simulation are

based on measurements. Therefore, the ninth auxiliary request *prima facie* does not overcome the objection of lack of inventive step for the reasons given in point 7. above.

- 9.4 In view of the new clarity objections to which the amendments give rise and the lack of any prospect of this request overcoming the inventive-step objection, the board decides not to admit the ninth auxiliary request into the appeal proceedings (Article 13(1) and (3) RPBA 2007).

*Tenth and eleventh auxiliary requests*

10. Claim 1 of the tenth auxiliary request is directed to a method of controlling movement of an "autonomous entity" through an environment. The method simulates a single entity as it moves through the environment. A "preferred step" is determined on the basis of an entity profile, a provisional path through a model of the environment and certain "dissatisfaction", "inconvenience" and "frustration" cost functions, and it is determined whether the step is feasible in view of obstructions in the neighbourhood of the entity and the entity's personal space. The claim further includes the step of "the entity taking the preferred step".

In claim 1 of the eleventh auxiliary request, the term "(autonomous) entity" has been replaced with "robot".

11. *Admission into the appeal proceedings*

- 11.1 The tenth and eleventh auxiliary requests were submitted in preparation for the second oral proceedings before the board and in response to point 85 of decision G 1/19, which states that

technical effects can also occur at the output of a computer-implemented process and that technical output may exist as a control signal used for controlling a machine.

11.2 For the reasons given in point 6.3 above, the mere fact that decision G 1/19 mentions a control signal as an example of technical output is not a compelling reason for admitting the tenth and eleventh auxiliary requests into the appeal proceedings.

11.3 Unlike the amendments in the seventh and eighth auxiliary requests, the amendments made in the tenth and eleventh auxiliary requests substantially change the nature of the claimed invention. Claim 1 of the main request and of the first to fifth, seventh and eighth auxiliary requests is directed to a method of simulating pedestrian crowd movement through an environment by simulating the individual movement of a plurality of pedestrians. In claim 1 of the tenth and eleventh auxiliary requests, a step of a single controllable entity or robot is "simulated", or rather calculated, on the basis of human-like criteria such as "personal space".

11.4 Claim 1 of both requests is based on the original independent claim 37, which is directed to a method of controlling movement of an entity through an environment, and the sentence on page 75, line 32, to page 76, line 1, which mentions that the methods described in the application "may be adapted for controlling and navigating entities, such as a robot".

The original independent claim 37 was dropped at an early stage (before the application entered into the

European phase) and was not present in any of the requests refused by the examining division.

11.5 Hence, the tenth and eleventh auxiliary requests represent a switch of the claimed invention to subject-matter which, although present in the originally filed claims, was deliberately not prosecuted in the first-instance proceedings. The board considers that such a switch cannot be made at the appeal stage and therefore does not admit these requests into the appeal proceedings under Articles 12(4) and 13(1) and (3) RPBA 2007 RPBA.

12. Since none of the requests admitted into the appeal proceedings is allowable, the appeal is to be dismissed.

## Order

### **For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chair:



S. Lichtenvort

J. Geschwind

Decision electronically authenticated