

## The Future of Protecting Computer-Implemented Methods of Simulation under the European Patent Convention

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*A Technical Board of Appeal of the European Patent Office has referred legal questions to the Enlarged Board of Appeal concerning the patentability of simulations of technical systems or processes. The case is pending under the designation G 1/19. These questions ask in particular whether a computer-implemented simulation of a technical system or process can solve a technical problem which, under European patent law, is a prerequisite for establishing inventive step. This encompasses the question whether such simulations can produce a technical effect that goes beyond the implementation of the simulation on the computer. Depending on the answer from the Enlarged Board of Appeal, a significant impact on the patentability of such simulations might have to be expected. This article explains why there are good reasons computer-implemented simulations of technical systems or processes should be treated in the same way as any other computer-implemented invention with regard to the assessment of inventive step. Finally, applicants are given a recommendation for drafting European patent applications in consideration of referral G 1/19.*

*Eine Technische Beschwerdekammer des Europäischen Patentamts hat der Grossen Beschwerdekammer Rechtsfragen betreffend die Patentierbarkeit von Simulationen technischer Systeme und Verfahren vorgelegt. Die Sache ist unter dem Aktenzeichen G 1/19 anhängig. Gestellt wird insbesondere die Frage, ob eine computerimplementierte Simulation eines technischen Systems oder Verfahrens eine technische Aufgabe lösen kann, was nach europäischem Patentrecht Voraussetzung für das Vorliegen einer erfinderischen Tätigkeit ist. Dies umfasst die Frage, ob derartige Simulationen eine technische Wirkung hervorbringen können, die über die Implementierung der Simulation auf dem Computer hinausgeht. Abhängig von der Antwort der Grossen Beschwerdekammer sind heftige Auswirkungen auf die Patentierbarkeit derartiger Simulationen zu erwarten. Dieser Artikel stellt Gründe dar, weshalb computerimplementierte Simulationen technischer Systeme oder Verfahren bei der Prüfung auf erfinderische Tätigkeit in gleicher Weise wie jede andere computerimplementierte Erfindung behandelt werden sollten. Abschliessend wird Anmeldern ein Ratschlag zum Abfassen europäischer Patentanmeldungen in Anbetracht der Vorlagefrage G 1/19 an die Hand gegeben.*

*Une chambre de recours technique de l'Office européen des brevets a soumis à la Grande Chambre de recours des questions juridiques concernant la brevetabilité des simulations de systèmes et de procédés techniques. L'affaire est pendante sous le numéro de référence G 1/19. La question de savoir si une simulation assistée par ordinateur d'un système ou d'un procédé technique peut résoudre un problème technique a en particulier été posée, ce qui constitue une condition préalable à l'existence d'une activité inventive en vertu du droit européen des brevets. Ceci inclut la question de savoir si ces simulations peuvent produire un effet technique qui va au-delà de la mise en œuvre de la simulation sur l'ordinateur. En fonction de la réponse de la Grande Chambre de recours, on peut s'attendre à de forts effets sur la brevetabilité de ces simulations. Cet article énonce les raisons pour lesquelles les simulations de systèmes ou de procédés techniques mises en œuvre par ordinateur devraient être traitées de la même manière que toute autre invention mise en œuvre par ordinateur lors de l'examen de l'activité inventive. Enfin, les déposants recevront des conseils pour la rédaction des demandes de brevet européen compte tenu de l'affaire G 1/19.*

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## I. The legal framework and general relevance of the case

With its decision T 0489/14<sup>1</sup> of 22 February 2019, the Technical Board of Appeal 3.5.07 (TBA) of the European Patent Office (EPO) referred legal questions to the Enlarged Board of Appeal (EBA) concerning the patentability of simulations of technical systems or processes. The case is being handled under the designation G 1/19, and at the time of writing this article no summons to oral proceedings has yet been issued. Once the EBA has decided on the case, it will be remitted to the referring TBA to decide on the merits while being bound to the opinion expressed by the EBA in answering the referred legal questions. The President of the EPO has decided that, in view of the potential impact of the referral, all proceedings before EPO examining and opposition divisions in which their decision depends entirely on the outcome of the referral will be stayed *ex officio* until the EBA issues its decision<sup>2</sup>.

Numerous *amicus curiae* briefs<sup>3</sup> were submitted to the EBA by industry, professional bodies and associations, and individual persons, all of them generally advocating a favourable approach to the patentability of computer-implemented simulations of technical system or processes. The author himself was involved in drafting one of those *amicus curiae* briefs<sup>4</sup>. The number of *amicus* briefs indicates in particular, in comparison with other referral cases, the importance of this case to the patent community, which may also be due to the comparably large number of patents and patent applications directed to computer-implemented inventions<sup>5</sup>. A negative decision could also impact the validity and therefore the assertability of granted European patents in the relevant field of technology.

## II. The underlying appeal case

The underlying case is an appeal against a first-instance refusal of European patent application No. 03793825.5. The idea underlying the invention is to provide a method of simulating the movement of people through a building. The result of the simulation could be used to design a building appropriately to allow for the suitable movement of pedestrians through the structure. In the first-instance decision, the examining division refused the patent application on the grounds that the claimed invention lacked an inventive step within the meaning of Articles 52(1) and 56 of the European Patent Convention (EPC)<sup>6</sup> because the simulation did not contribute to the technical character of the invention.

In the appeal stage, the applicant filed six requests for claims, namely a main request and five auxiliary requests as fallback solutions in case the higher-ranking requests were refused.

Claim 1 of the main request and the first and second auxiliary requests related to the computer-implemented simulation of the movement of an autonomous entity through an environment.

Claim 1 of the third auxiliary request was limited to a method of designing a building structure comprising a step of simulating the movement of pedestrians through the building structure.

<sup>1</sup> Available at: <[www.epo.org/law-practice/case-law-appeals/pdf/t140489ex1.pdf](http://www.epo.org/law-practice/case-law-appeals/pdf/t140489ex1.pdf)>.

<sup>2</sup> Cf. the notice from the European Patent Office dated 10 April 2019 concerning the staying of proceedings due to referral G 1/19, OJ EPO 2019, A35, available at <[www.epo.org/law-practice/legal-texts/official-journal/2019/04/a35.html](http://www.epo.org/law-practice/legal-texts/official-journal/2019/04/a35.html)>.

<sup>3</sup> Available at: <[www.epo.org/law-practice/case-law-appeals/eba/pending/g1-19.html](http://www.epo.org/law-practice/case-law-appeals/eba/pending/g1-19.html)>.

<sup>4</sup> Namely, the one filed by the Chamber of German Patent Attorneys (Patentanwaltskammer), available *ibid*.

<sup>5</sup> Note that in 2018, two out of the two top three fields of technology chosen for European patent applications were clearly software-related (cf. the statistics available at <[www.epo.org/about-us/annual-reports-statistics/annual-report/2018/statistics/patent-applications.html#tab3](http://www.epo.org/about-us/annual-reports-statistics/annual-report/2018/statistics/patent-applications.html#tab3)>).

<sup>6</sup> Cf. T 0489/14, 2, IV.

Claim 1 of the fourth auxiliary request, in contrast to claim 1 of the third auxiliary request, contained a further limitation which related to revising a determined model of the building depending on the movement of the pedestrians.

Claim 1 of the fifth auxiliary request, in contrast to claim 1 of the third auxiliary request, contained a further limitation specifying details of intermediate data processing steps for determining the result of the simulation.

### III. The applicable approach to the assessment of inventive step

Under the established case law of the Boards of Appeal of the EPO<sup>7</sup>, an inventive step can be based only on the technical part of an invention, i.e. on those features that contribute to the solution of a technical problem; features that cannot be considered as contributing to the solution of any technical problem by providing a technical effect have no significance for the purpose of assessing inventive step<sup>8</sup>. A technical character of a claim feature results either from the physical features of an entity or (for a method) from the use of technical means so as to utilize the forces of nature<sup>9</sup>. While an invention as a whole may possess technical character (for example, by merely claiming that the method is executed by a computer), it may nevertheless legitimately include both technical and non-technical features<sup>10</sup>. In practice, any non-technical feature is neglected in the assessment of inventive step. For a computer-implemented method comprising only non-technical method steps this means that the claimed method is, under the applicable legal approach, reduced to a method of using a well-known general-purpose computer for processing data, without any further consideration of the kind of data which may be defined in the claim wording.

The implementation of a non-technical method on a computer is considered to be a straightforward programming exercise, which the skilled person will conceive without exercising inventive skill. Notably, it is not sufficient, for the purpose of having non-technical claim features considered in the assessment of inventive step, to define that they are executed on a general-purpose computer. Rather, a technical effect has to be achieved by the invention, which goes beyond the normal physical interactions that occur when operating a computer (such as electric currents flowing through the processor).

As a general guideline, Article 52(2) EPC provides a non-exhaustive list of fields of art which are considered to be non-technical, namely:

- (a) discoveries, scientific theories and mathematical methods;
- (b) aesthetic creations;
- (c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers;
- (d) presentations of information.

As far as a claim feature relates to one of the above fields of art without producing a technical effect, e.g. by interaction with another technical claim feature, it is not considered to contribute to inventive step<sup>11</sup>.

### IV. Reasons for the referral to the Enlarged Board of Appeal

The referring TBA based its reasoning for referring the legal questions on an alleged impending divergence in case law because it intended to diverge from existing case law<sup>12</sup>, and on that basis asked the EBA for clarification of which approach should be applied.

<sup>7</sup> Cf. V. VALLONE, Patentierung von computerimplementierten Simulationen, sic!, 2019, 12, 659–674, 664 et seq., offering a comprehensive account of case law handed down by the EPO Boards of Appeal as well as national courts.

<sup>8</sup> Cf. T 0489/14, reasons No. 7, with reference to T 641/00, OJ EPO 2003, 352, reasons Nos. 4–6 and G 3/08, reasons Nos. 12.2.1 and 12.2.2.

<sup>9</sup> Cf. T 0489/14, reasons No. 11 with reference to G 2/07, reasons No. 6.4.2.1.

<sup>10</sup> See Case Law of the Boards of Appeal, chapter I.D.9.1.1 with reference to T 641/00, OJ EPO 2003, 352 and T 1543/06, available at <[www.epo.org/law-practice/legal-texts/html/caselaw/2016/e/clr\\_i\\_d\\_9\\_1\\_1.htm](http://www.epo.org/law-practice/legal-texts/html/caselaw/2016/e/clr_i_d_9_1_1.htm)>.

<sup>11</sup> Cf. T 0489/14, reasons No. 7, with reference to G 1704, OJ EPO 2006, 334, reasons No. 5; T 154/04, OJ EPO 2008, 46, reasons Nos. 5, under (F), and 13 to 15.

<sup>12</sup> Cf. T 0489/14, reasons No. 19.

The referring TBA is of the opinion that a technical effect requires, at a minimum, a direct link with physical reality, such as a change in or a measurement of a physical entity<sup>13</sup>. For a computer-implemented simulation this will generally mean that any simulation which does no more than outputting calculation result will almost certainly not produce a technical effect and therefore lack inventive step.

For the case to be decided, the TBA argues that some of the steps of the method defined by claim 1 according to all requests are to be considered non-technical. In particular, the referring TBA opined that the claimed invention pertained to no more than a mere calculation without utilizing any force of nature<sup>14</sup>.

On the other hand, a well-known decision from the existing case law, namely T 1227/05, confirmed that a numerical simulation of a noise-affected circuit described by a model featuring input channels, noise input channels and output channels and a system of differential or algebraic differential equations was a technical feature because it related to an “adequately defined class of technical items” (see T 1227/05, reasons Nos. 3.1 and 3.1.1). The referring TBA, however, doubted this reasoning and viewed the simulation of the circuit to be a cognitive process and thus as a rule or method for performing a mental act under Article 52(2)(c) EPC, which it calls “fundamentally non-technical”<sup>15</sup>.

Applying the rationale behind T 1227/05 to the case at hand, one may arrive at a finding diverging from the referring TBA’s opinion concerning the technical character of the relevant method steps, so that it is clear that the referring TBA intends to diverge from existing case law. Therefore, it followed the appellant’s suggestion to refer the relevant legal questions to the EBA to seek clarification on the approach to be applied.

## V. The referred legal questions

The following questions 1 to 3 were referred to the EBA<sup>16</sup>:

Question 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?

Question 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 as such?

Question 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?

## VI. Discussion of a potential reply to the referred questions

In the following, possible answers to the referred questions are suggested which may be considered to form a favourable<sup>17</sup> outcome from the point of view of applicants and patentees<sup>18</sup>.

### 1. Question 1

Question 1 relates to computer-implemented simulations, i.e. simulation methods executed on a computer, and exclusively relates to simulations of a technical system or process so that a non-technical context is logically excluded. Any reference in the questions relating to the computer-implemented simulation being claimed “as such” may be interpreted to mean the simulation of a technical system or process taken by itself without any direct physical link to the actual system or process, as required in the referring TBA’s view for establishing an inventive step. In other words, “as such” implies a closed

<sup>13</sup> Cf. T 0489/14, reasons No. 11.

<sup>14</sup> Ibid.

<sup>15</sup> Cf. T 0489/14, reasons No. 15.

<sup>16</sup> See T 0489/14, order.

<sup>17</sup> Dissenting opinion: V. VALLONE, Patentierung von computerimplementierten Simulationen, sic!, 2019, 12, 659–674, 673 et seq., discussing approaches to answering the referred legal questions without actually providing specific answers to them.

<sup>18</sup> The possible answers have been adopted from the amicus curiae brief submitted by the Chamber of German Patent Attorneys (Patentanwaltskammer) for case G 1/19, available at <[www.epo.org/law-practice/case-law-appeals/eba/pending/g1-19.html](http://www.epo.org/law-practice/case-law-appeals/eba/pending/g1-19.html)>.

simulation system running on a computer, with the simulation itself imitating something technical from the outside world.

A simulation of a technical system or process of the real world may be considered as technical because of having the capability to solve a technical problem, producing a technical effect that goes beyond the implementation of the simulation on a computer. A simulation is a frequently used engineering tool that models a physical system in order to produce the result of gaining insight into the technical behaviour of the system before the real system is manufactured in order to e.g. confirm feasibility or functionality, avoid dangerous situations or save physical resources. A simulation therefore functions as a tool for achieving a technical effect in the real world.

The above-mentioned result of the simulation, which clearly is a technical effect in the physical world, i.e. the production of a technical effect that goes beyond the implementation of the simulation on a computer, may be considered to even pass the direct link to the physical-world criterion which the referring TBA would like to become a necessary condition. While it is well-established that this traditional condition is a sufficient criterion, it should not be made a necessary criterion to avoid the risk of a wide-ranging preclusion of modern digital technologies from patentability.

As a result, the answer to question 1 should be YES.

## 2. Question 2

An interpretation of question 2 in the light of the above will result in the following re-wording of question 2, which forms the basis for the following discussion: "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?"

Again, the term "as such" is understood to refer to computer-implemented simulations of real-world technical systems or processes. Considering the affirmative answer to question 1 above, the answer to the second half of question 2 should also be a clear YES, considering that the question itself requires that the simulation is related to a technical system or process of the real world.

## 3. Question 3

Question 3 has to be seen as a special case of questions 1 and 2. In consequence, no other answer than YES should be given. Whether the design contributes to the simulation or not is irrelevant as long as the underlying computer-implemented simulation has been judged to be eligible by itself for patent protection applying the same set of rules as for any other computer-implemented invention. However, any claimed step relating to a design process may provide an additional basis for a technical effect produced by the claimed subject matter.

## VII. Potential implications of the answers to be given

From the above, it is clear that the answers to be given by the EBA may, if they deviate from the above proposal, have a severe impact on the patentability of claims directed to computer-implemented methods of simulation (even) of technical systems or processes. This impact will also have retroactive effect for already granted European patents which might then have to be considered or – upon request – have to be declared to be invalid.

A resulting objection of lack of inventive step could be overcome possibly only by reciting, in the claim itself, further steps linking the claimed simulation with the real world. An example might be that a further step would have to be defined in the claim which states that a product is designed or a machine is controlled on the basis of the result (i.e. the output) of the simulation. This would, however, be associated with a huge loss in achievable scope of protection because infringement of such a claim would be limited to the specific case of using the result of the simulation. Also, many producers of simulation tools do not produce software that includes such a step as part of the software code. In many cases, such a step is conducted by the user on the basis of his or her own mental activity. Thus, there exists the danger that only the end user, and therefore in many cases the potential customer of the patentee, will be the only person who can be made liable for direct patent infringement. Additionally, including such a step in the claim wording will be associated with additional burdens concerning clarity and enablement (sufficiency of disclosure) under Articles 83 and 84 EPC.



In addition to the above proposal for answering the referred questions, the author therefore promotes the view that computer-implemented simulations of technical systems or processes should not be treated differently from any other computer-implemented inventions concerning the requirement of inventive step. An indirect technical effect which can be achieved by applying the result of the simulation to the real world and which generally already entails technical considerations by the skilled person concerning the details of the simulation and hence consideration of technical principles underlying the simulated system or process within the meaning of question 2 should be sufficient for establishing inventive step. Some solace for applicants and patentees may be drawn from the fact that the President of the EPO also submitted comments which, in the end, confirm this view<sup>19</sup>, even though his opinion is not binding for the EBA.

Nevertheless, applicants will be well-advised to include in patent applications relating to any kind of software (and not only simulation software) explanations concerning a technical effect achieved by the invention, which under the approach applied by the EPO has to be a credible technical effect<sup>20</sup>. If possible, additional disclosure concerning an application of the result of the simulation in the physical world should also be included, to be able to appropriately amend the claims, in particular in the event the EBA gives a strict answer to the referred legal questions. This will be helpful not only in the case of a negative outcome of case G 1/19 but in any case pending before the EPO, so as to provide a broader basis for arguing inventive step.

## Summary

*Referral G 1/19 to the Enlarged Board of Appeal of the European Patent Office asks legal questions concerning patentability with respect to the inventive step of computer-implemented simulation of technical systems or processes. The questions are basically directed to asking whether such simulations can produce a technical effect which is required to establish inventive step under European patent law. The referral is therefore highly relevant to the future of patenting such simulations under the European Patent Convention. The author puts forward answers to all referred questions which are drafted in the spirit of the previous decision T 1227/05, which applies, contrary to the referring Technical Board of Appeal, a lenient approach to the patentability of such simulations. If the Enlarged Board of Appeal decides to answer the referred questions more strictly, harsh consequences for many European patent applications and patents relating to simulations of technical systems or processes have to be envisaged, ranging potentially from objections of lack of inventive step to objections of lack of enablement and lack of clarity. Applicants should take this into consideration now when drafting European patent applications, for example, by including additional disclosure concerning a technical effect and real-world application of the simulation result so as to be in a better position to encounter such objections.*

## Zusammenfassung

*Die Vorlage G 1/19 an die Grosse Beschwerdekammer des Europäischen Patentamts stellt Fragen betreffend die Patentierbarkeit computerimplementierter Simulationen technischer Systeme oder Verfahren in Bezug auf die erfinderische Tätigkeit. Die Fragen zielen im Wesentlichen darauf ab, ob derartige Simulationen eine technische Wirkung hervorbringen können, was nach Europäischem Patentrecht erforderlich ist, um eine erfinderische Tätigkeit zu bewirken. Die Vorlage ist daher hoch relevant für die Zukunft der Patentierung derartiger Simulationen nach europäischem Patentrecht. Der Verfasser zeigt eine beispielhafte Antwort auf alle gestellten Rechtsfragen auf, die dem Geist der früheren Entscheidung T 1227/05 folgt und im Gegensatz zur vorliegenden Technischen Beschwerdekammer einen grosszügigen Ansatz zur Patentierbarkeit derartiger Simulationen anwendet. Wenn die Grosse Beschwerdekammer entscheiden sollte, die Vorlagefragen strenger zu beantworten, drohen harsche Folgen für viele Simulationen technischer Systeme oder Verfahren betreffend europäische Patentanmeldungen und Patente, die von Einwänden mangelnder erfinderischer Tätigkeit bis zu Einwänden mangelnder Ausführbarkeit und mangelnder Klarheit reichen können. Anmelder sollten dies bereits*

<sup>19</sup> Available as part of the public file inspection for the case to be decided at: <register.epo.org/application?number=EP03793825&lng=en&tab=doclist> (filed on 29 August, 2019; cf. page 14, para. 45).

<sup>20</sup> Cf. Case Law of the Boards of Appeal, chapter I.D.9.1.5 with reference to numerous decisions from the case law, available at <www.epo.org/law-practice/legal-texts/html/caselaw/2016/e/clr\_i\_d\_9\_1\_5.htm>.

*jetzt beim Verfassen europäischer Patentanmeldungen bedenken, z.B. indem zusätzliche Offenbarung betreffend eine technische Wirkung und Anwendung des Simulationsergebnisses in der realen Welt geschaffen wird, um sich in eine bessere Ausgangslage zur Erwidern auf solche Einwände zu begeben.*

## Résumé

*La saisine de la Grande Chambre de recours de l'Office européen des brevets dans l'affaire G 1/19 soulève des questions concernant la brevetabilité de la simulation assistées par ordinateur de systèmes ou de procédés techniques en ce qui concerne l'activité inventive. Les questions visent en particulier à déterminer si ces simulations peuvent produire un effet technique, ce qui est requis par le droit européen des brevets pour admettre une activité inventive. La saisine est donc très pertinente pour le futur brevetage de ces simulations dans le cadre du droit européen des brevets. L'auteur présente une réponse exemplative à toutes les questions juridiques soulevées, qui suit l'esprit de la décision antérieure T 1227/05 et qui, contrairement à la Chambre de recours technique de renvoi, suit une approche généreuse de la brevetabilité de telles simulations. Si la Grande Chambre de recours décidait de répondre plus strictement aux questions de la saisine, ceci aurait de lourdes conséquences pour de nombreuses demandes de brevet européen et de brevets relatifs à des simulations de systèmes ou de procédés techniques concernant des objections relatives au défaut d'activité inventive, à de réalisabilité ou de clarté. Les déposants devraient déjà en tenir compte lors de la rédaction des demandes de brevet européen, par exemple en procédant à une divulgation supplémentaire concernant un effet technique et l'application du résultat de la simulation dans le monde réel, afin de se mettre dans une meilleure situation pour répondre à telles objections.*