GJE Intellectual Property

Computer Simulations: Strategy for Patents

Introduction

The patentability of computer simulations has recently been in the spotlight in Europe. On 10 March 2021, the Enlarged Board of Appeal (which is the highest court of appeal at the EPO) issued its decision in case G 1/19 confirming that computer simulations are patentable at the EPO. This document is intended as a practical guide to help you understand whether your computer simulation might be patentable in Europe in view of the recent developments at the EPO.

A key conclusion of G 1/19 was that, while a model used in a simulation is inherently non-technical, the model can contribute to technicality (and hence form part of the assessment of inventive step) in the case where the outcome of the simulation is used in a technical manner. This does not mean that the steps of implementing the outcome from the simulation in a real-world system or process to solve a technical problem need to be claimed; the invention can be claimed as a simulation only as long as the claims are (at least implicitly) restricted to the use of the simulation in the technical manner. This closely parallels the principles established with regard to AI and machine learning-based inventions, and indeed to mathematical methods and computer programs generally.

Although G 1/19 has provided some much-needed clarity concerning the patentability of computer simulations, this is still a complex area for applicants to navigate. Depending on the purpose of the simulation, there can be a subtle interplay between different factors that determine whether patent protection is available. We will firstly explore some of the key indicators to consider before reviewing some examples of applications filed in this area.

Key Indicators of patentability in Europe

Is there a technical effect?

In Europe, the question of whether a computer-implemented innovation is patentable requires an assessment of whether the innovation produces a 'further technical effect' that goes beyond the normal technical effects of operating a computer (e.g. transistor switching). If a technical effect is not produced then the innovation will be found to be unpatentable for lacking an inventive step over a general purpose computer. However, there is no precise definition of the term 'technical'. This is by design to take account of the ever-changing nature of technological developments. Indeed, in G 1/19 the Enlarged Board even noted that the meaning of this term needs to be kept open to allow for further technological development and that it would never be possible to give an exhaustive list of criteria for technicality. This leaves applicants wondering whether their particular innovation will fall foul of this rule or not.

For computer-implemented processes we normally look for an improvement in the operation of a device or a particular process, and this could be an efficiency improvement, increased security or enhanced usability - to name but a few examples. However, in the case of simulations, the outcome of the simulation is more abstract and usually does not itself produce a real-word effect. Further action is often needed to cause the actual improvement in the operation of a device or process.

The EPO has recognised that simulations can be an important part of processes classically considered to be technical, such as manufacturing. Moreover, under current EPO practice simulations should not be denied a technical effect just because they precede real-life production or do not include a manufacturing step. Simulations should be protectable on their own; there is no need to protect the simulation within the context of a design process. This is important for applicants that offer design services through simulation, for example – in this case the applicant may never produce the simulated component themselves, as their deliverable is the finished design for their client to manufacture.

A *key question* is whether the purpose of the simulation is technical

It is instructive to consider who came up with the simulation and why. Was the simulation produced to assist an engineer, for example in analysing the efficacy of a process or the operation of a device? Will the simulation help lead to an improvement in the operation of this process or device? These are indicators that the simulation will be considered to have technical character through its application in improving the process or device.

Alternatively, are the benefits of the simulation more abstract? For example, are the benefits subjective to the user or are they appreciated only in non-technical fields such as education, commerce and retail? These are indicators that the simulation will be considered to lack technical character as it is applied in non-technical fields.

Technical vs Non-technical Simulations

The G 1/19 decision treats all simulations as equal in that the Enlarged Board stated that, irrespective of whether the entity being simulated is technical or non-technical, the simulation itself is non-technical. Simulation of a technical system per se is therefore not sufficient to obtain the technical character necessary to show an inventive step because this technicality is not transferred across to the simulation itself. Conversely, simulation of a non-technical system does not automatically disqualify the simulation from patentability.

Therefore, according to the G 1/19 decision, there is no such thing as a 'technical' simulation – all simulations are non-technical. This is strikingly similar to the position taken by the EPO on AI and machine learning algorithms which are classified as mathematical methods and hence are inherently non-technical.

This means in principle it is possible to get a European patent for a simulation of a non-technical system. However, it may be harder to achieve in practice for many non-technical systems/processes because of an additional hurdle that must be cleared for a simulation to be found patentable - namely, demonstrating that the outcome of the simulation is used in a technical context. This could be framed as asking whether the simulation is being performed for a technical purpose.

Taking the example of a weather system, which is considered inherently non-technical, whether or not improved weather forecasting contributes to the technical character of an invention depends on how the simulation is used. If the simulation is used, for example, to improve the forecasting of a value of a financial product, it does not contribute to the technical character of the invention. However if the simulation is used to automatically open or close window shutters on a building or operate wind turbines, it may well contribute to the technical character of the invention. Again, this is very similar to the EPO's treatment of AI and machine learning algorithms.

Is there a link to a physical entity in the real world?

EPO case law has developed such that the ability to show a link between the simulation and a real-world physical entity is helpful when seeking to demonstrate the technical character of the simulation. However, this is not a prerequisite and it is possible to gain technical character without such a link. This often arises in the context of user interfaces, particularly those in virtual reality where

simulations are used to provide a mechanism for a user to interact with a virtual world. User interface mechanisms can gain technical character if they objectively assist the user in providing input – for example, reducing the time taken to enter input for all classes of user and all usage patterns.

The G 1/19 decision provided useful guidance here in that it stated that a "technical effect going beyond the simulation's straightforward or unspecified implementation on a standard computer system" is sufficient to realise an inventive step (subject, of course, to the prior art). It is not necessary for there to be a direct link to a physical entity in the real world to show such a technical effect, but there is no doubt that it will likely be easier to show a technical effect in cases where such a link exists.

Returning to the example of the weather forecasting simulation and its use in controlling a shutter, although the actual steps of using the improved forecast to control a physical entity (the shutter) need not be claimed, the purpose must be limited and at least implicit from the wording of the claim. For this reason it is important to think carefully about how the invention is framed within the patent application to ensure the right scope of protection is being sought.

Framing the invention

The controllable factor with probably the largest impact on the probability of getting a simulation patented at the EPO is the framing of the invention at the drafting stage. It is critical to draft applications that emphasise the technical aspects of a simulation and deemphasise the non-technical aspects, particularly business method aspects.

Consider the example of a simulation of payments made via a payment network. The objective of such a simulation could be framed as better understanding what fraudulent payments looks like to facilitate improved detection of fraud. This framing would run the risk of triggering a business method type objection at the EPO because the term 'payment' typically brings to mind financial operations performed by people, all of which does not sound particularly technical.

Alternatively, the same simulation could be framed as a simulation of network events in a computer network with the objective of understanding what a 'normal' network event looks like. The events can be described in terms of message payloads and routing instructions rather than payments and bank accounts, enabling more technical vocabulary to be introduced.

Fraudulent events can be described as 'outlier' or 'unauthorised' network events. This framing is less likely to cause the EPO to raise a business method type objection. Additionally, focussing on these more technical aspects of the simulation tends to result in more fruitful discussions with inventors when it comes to drawing out all possible technical aspects of the simulation.

The business method objection is often the main stumbling block at the EPO for simulations. Our experience is that there is more wiggle room for simulations that have a mental act, mathematical method or scientific theory aspect to them as it is usually easier to demonstrate that such simulations concretely solve a technical problem compared to business methods. The presence of these aspects in a claim to a simulation is not immediately problematic, as long as it is clear that a technical problem is being solved using the simulation, and that the simulation provides a technical effect beyond the technical effect of the simulation per se. It would seem prudent to include the technical purpose in the claim if possible. At the very least ensure that the technical purpose is in the description when drafting the application as the EPO's strict rules relating to added subject matter mean that it will not be possible to introduce the technical purpose after filing of the application.

In G 1/19 the Enlarged Board confirmed that a broad patent claim concerning the calculation of technical information with no limitation to specific technical uses would raise concern that the claimed subject matter is not technical over substantially the whole scope of the claim. It must therefore be clear from the claim alone what the intended technical purpose is for the simulation. Additionally, this technical purpose must be achieved across the entire claim scope to avoid non-technical embodiments being captured.

Examples of technical and non-technical indicators

The following indicators can be used as a guide when determining whether a simulation is potentially patentable at the EPO.

Technical – Potentially Patentable	Non-Technical – Likely Not Patentable
Simulating the behaviour of a defined class of technical items, or specific technical processes, under technically relevant conditions *e.g. simulating noise in an electronic circuit*	Simulating non-technical processes *without solving a technical problem* *e.g. simulating marketing campaigns, administrative schemes for transportation of goods*
Simulated calculation of technical parameters linked to the function of an object for a technical purpose. *e.g. simulating the wear of a piston in an engine*	Simulated calculation of technical parameters based on human decisions *e.g. simulating the performance of a vehicle in response to design choices inputted by a user as part of the simulation*
Simulation provides a direct link with the physical world *e.g. the output or result of the simulation is used to influence manufacturing decisions*	Simulation is purely abstract *e.g. the simulation is performed for academic purposes*
A virtual process which leads to a real-world technical effect *e.g. simulating the flow of air around an aeroplane wing and using the virtual results to change the design of the wings of aeroplanes*	A purely virtual process with no link to the real world *e.g. simulating the interaction of air molecules in a wind tunnel but without immediate application of the results*
Simulations based on an EPC exclusion that provide a real-world effect or purpose beyond the simulation itself *e.g. simulating a user's interaction with a product and adjusting a characteristic of the product based on the simulation, where the change modifies the user's interaction with the product*	Simulations based on an EPC exclusion that do not provide a real-world effect or purpose beyond the simulation itself *e.g. simulating the sales of a product in a new market*
Human-based simulations with a technical use and solving a technical problem *e.g. simulating the behaviour of a driver in a car and designing a rear-view mirror that improves the driver's field of view*	Human-based simulations relying on conscious activity within the human brain *e.g. simulating the behaviour of bidders at an auction*
Natural-based simulations with a technical aim, effect or purpose *e.g. simulating operation of wind turbines based on weather conditions*	Natural-based simulations with no purpose *e.g. simulating the weather without immediate application of the results in a technical process*

Existing case law – T 1227/05 (Infineon)

T 1227/05 has been arguably the most important simulated-related case law produced by the EPO. While the Enlarged Board in G 1/19 did not expressly disagree with this decision, the applicability of one of the key legal precedents set by T 1227/05 has been reduced by G 1/19.

T 1227/05 concerned the simulation of noise in electronic circuits and provided a solution that made use of random numbers in the circuit simulation to effectively simulate 1 / f noise. This decision is most often referenced for establishing the principle that a simulation of an adequately defined class of technical item can, in principle, be the subject of a granted European patent, as long as the claims are scoped accordingly.

A key point established in T 1227/05 is the rationale that simulation of a technical entity can confer technical character on the simulation itself. This is perhaps best expressed in Reasons 3.1.1 of T 1227/05 where the presiding Board stated:

"However, a circuit with input channels, noise input channels and output channels whose performance is described by differential equations does indeed constitute an adequately defined class of technical items, the simulation of which may be a functional technical feature."

The Enlarged Board did not disagree with this position in G 1/19, but did relegate it as applying only in 'exceptional circumstances', stating:

"In the Enlarged Board's view, calculated numerical data reflecting the physical behaviour of a system modelled in a computer usually cannot establish the technical character of an invention... even if the calculated behaviour adequately reflects the behaviour of a real system underlying the simulation. Only in exceptional cases may such calculated effects be considered implied technical effects..."

G 1/19 has therefore shifted emphasis from asking 'is what is being simulated technical' to 'is the outcome of the simulation being used in a technical context'. It is now of less relevance whether a technical or non-technical process is being simulated – instead, what matters is whether the outcome of the simulation is used to solve a technical problem.

Simulation patent examples

It is instructive to take a detailed look at some of the patents to simulations that have actually been examined by the EPO in this area in recent years. This can give some indication of the kind of thing that examiners at the EPO have considered to meet the requirements of patentability. We will also look at whether these types of simulations likely remain patentable (or not) in view of the decision issued in G 1/19. The patent numbers have been removed in the following review.

EP1: Simulation of Analog and Radio Frequency Circuits– granted in 2012

Prior to G 1/19 at least, the only detailed example given in the EPO Guidelines for Examination for a patentable computer-implemented simulation was the numerical simulation of the performance of an electronic circuit. This followed from T 1227/05 as discussed above, an influential decision reached in 2006. EP1 is another example of a method for simulating an electronic circuit. Although the end product is not claimed, the simulation forms an essential part of a fabrication process that precedes actual production. The rules of the simulation were directed by technical considerations regarding the functionality and manufacture of the circuit.

According to G 1/19 it is not a sufficient condition for patentability that the simulation is based, at least in part, on technical principles underlying the simulated system. Amongst other things, the claims must also contribute to solving a technical problem. Provided that the patent application is correctly framed with reference to solving this problem and limited to a specific technical purpose, we expect simulations of technical systems, such as electronic circuits to remain patentable in Europe.

EP2: Medical Procedure Simulation– granted in 2018

EP2 provides various examples relating to the simulation of a medical procedure. The procedure is practised using a tool and a mock-up of the human anatomy. A virtual environment is displayed to the user including a virtual version of the tool and the anatomy so that the user can experience what the procedure would look like in reality during the simulation.

Facilitating better education is not considered a technical purpose in the eyes of the EPO and so a computer simulation claimed at this level would not be patentable in Europe. However, EP2 goes beyond this objective by overcoming a specific technical challenge faced when performing the simulation. In particular, it is important to ensure the tactile perception by the user within the physical environment is consistent with that in the virtual environment. The invention in EP2 is directed to a specific solution for maintaining this consistency by eliminating any geometric mismatch between the physical environment and the virtual environment. In so doing, the invention provides an improved user input mechanism, which is something that the EPO has long acknowledged to make a technical contribution. Software that enables an improved physical interaction between a device and its user is generally considered patentable at the EPO because it solves a clearly defined technical problem. We can look to the 'swipe to unlock' feature from an iPhone as another example of this.

Post-G 1/19, we would expect EP2 to be granted as the outcome of the simulation is used in a user interface mechanism. The simulation outcome therefore has a further technical use – namely the control of the simulator.

EP3: Lens Simulation – granted in 2020

This patent is directed to a device for simulating the effect of a lens on a person's vision. A lens can be modelled and the effect of that lens on an actual image of the real world can be simulated. This can be used by opticians to demonstrate the effect of a particular lens without a person needing to try it on, and without needing to physically construct the lens. This was achieved by providing a wearable device that could capture a view of the real world, and a depth sensor that could determine distances to different objects. The simulated image is displayed by the wearable device. Under T 1227/05, the process of simulating the effect of different lenses for the wearer can be considered a technical purpose. Although the benefit of having an image correctly focused on the wearer's retina are experienced solely in the mind of the user, there is also a real world optical process that is being simulated and the selection of the correct lens can be objectively measured.

Even though no real-world effects are claimed, the simulation claimed directly leads to a real-world technical effect in terms of improving the focus of the light for the wearer. We expect that EP3 would still be found patentable in view of G 1/19, but for different reasons. The simulation of a lens would be unlikely to provide technical character, given that the principles of T 1227/05 are now applicable in 'exceptional cases' only. However, the outcome of the simulation in this case is used in the generation of an image on a display – we would expect this provide the further technical use required by G 1/19 for patentability.

EP4: Simulating a Commercial Entity – abandoned in 2011

This application was explicitly directed towards a method for simulating a commercial entity, the method comprising modelling the behaviour of a financial framework describing the commercial entity. The first sentence of the application stated "The present invention relates to a simulator, and in particular, but not exclusively to a business simulator." These were clear pointers that the simulation was not directed to a technical purpose.

The process being simulated was a business method, which is inherently non-technical in the eyes of the EPO. Although G 1/19 makes clear that this does not bar the simulation from being the subject of a granted European patent, we expect that simulation of a non-technical process will tend to make it more difficult to show that an outcome of the simulation is used in a technical context. Indeed, in the case of EP4 the outcome of the simulation did not result in any real-world technical effects, for example in terms of improving the operation or efficiency of a tangible technical system or process.

In assessing the patentability of the application, the examiner wrote:

"The solution defined in the claims relates to the introduction of a business simulator for training and educational purposes, which simulates experience of managing a business by modelling the commercial entity's behaviour and displaying the flow of values around the business environment as a result of the simulation... The method as described above considered on its own does not have technical character as it employs no technical means, causes no technical effect and solves no technical problem. No technical considerations which reflect considerations regarding the technical implementation of the method are included within the method. Thus, when this method is considered independently from the remaining technical aspects of the claim, it defines subject-matter which is, under Article 52 (2) and (3) EPC, not regarded as patentable within the meaning of Article 52(1) EPC.

The application does not describe any technical interaction between the technical aspects presented in 3.3 and the non-technical aspects in such a way as to provide a resulting combination that has a different technical character to that defined by the clearly technical aspects alone. "

The application therefore fell squarely into the sort of computer-implemented inventions that are not patentable in Europe. After these comments were made by the examiner, and seemingly with no way of overcoming these issues, the applicant subsequently abandoned the application.

G 1/19 maintained that it is not decisive whether or not the simulated system or process is technical, and so the fact that it was a commercial entity being modelled does not preclude patent protection being available. However, it is relevant whether the simulation contributes to the solution of a technical problem. In this case, no such problem was solved. This type of simulation therefore remains unpatentable in Europe.

Conclusion

The patentability of computer simulations in Europe undoubtedly remains a challenging area of law. There is no single rule that can be applied in a straightforward manner to all cases to answer whether a simulation is potentially patentable. The key message is that computer simulations are on an equal footing with other types of computer-implemented invention in Europe and can therefore be patented to the same extent as other categories of computer-implemented invention. The key to patenting a simulation is demonstrating that the simulation serves a technical purpose.

In view of the inherent difficulties in obtaining patent protection in this area we advise that legal advice is sought at an early stage (ideally prior to drafting a patent application or filing in Europe) if protection is sought in Europe for a computer simulation. At GJE we have extensive experience of helping our clients navigate the complex issues relating to the patentability of computer-implemented inventions in Europe and we would be very happy to assist you in this regard.

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