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ENLARGED BOARD OF APPEAL – G1/19

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SUMMARY

Industry has benefitted from a decade of consistency in Europe regarding the patentability of inventions involving computer-implemented simulation. This has been achieved by applying the reasoning of EPO Board of Appeal decision T1227/05, which looked at the technical purpose of a claimed computer simulation to decide whether it had technical character.

CIPA supports the approach set out in T1227/05, and the significant body of case law which has followed this approach: claim features that serve a technical purpose have technical character and so contribute to the assessment of inventive step. We do not share the position of the Board in T0489/14, which is "*not fully convinced by the ... reasoning*" of T1227/05. On the contrary, based on legal considerations and practical experience, we submit that the Enlarged Board should uphold the approach of T1227/05.

Accordingly, we answer the questions in the referral as follows:

Question 1: Yes – following the rationale of T1227/05, a computer-implemented simulation which is performed for a technical purpose cannot be denied a technical effect.

Question 2: The relevant criterion is whether the simulation serves a technical purpose - again following T1227/05

Question 3: Claiming a simulation as part of a process for verifying a design may serve a technical purpose, and so support patentability as per T1227/05. However, we do not think this is the **only** way to serve a technical purpose (and our answers to Questions 1 and 2 are not affected).

Our detailed reasoning in support of the above answers is set out below, along with some additional comments and concerns.

1. LEGAL CONSIDERATIONS

1.1 Claim 1 of the patent application in T489/14 relates to modelling pedestrian crowd movement using computer-implemented simulation. Claim 1 of a fourth auxiliary request relates to the use of pedestrian movement simulation for designing a building structure.

1.1.1 T489/14 (reasons 7) sets out the following approach for assessing patentability: “*non-technical features are ... to be taken into account in the assessment of inventive step to the extent that they interact with the technical subject-matter of the claim to solve a technical problem or, equivalently, to bring about a technical effect (see G 1/04, OJ EPO 2006, 334, reasons 5.3; T 154/04, OJ EPO 2008, 46, reasons 5, under (F), and 13 to 15)*”. It is further added (reasons 11) that: “*in the Board's view, 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*”. The Board in T489/14 does not regard the claimed invention as providing such a technical effect.

1.1.2 This would normally lead to a refusal for lack of inventive step. However, T489/14 sees an “*evident analogy*” (reasons 14) with T1227/05, in which the claimed invention relates to the simulation of a circuit subject to $1/f$ noise. T1227/05 held (reasons 3.1): “*a procedural step may contribute to the technical character of a method only to the extent that it serves a technical purpose of the method*”. T1227/05 further held (reasons 3.4.2) that: “*simulation methods cannot be denied a technical effect merely on the ground that they do not yet incorporate the physical end product*”. Accordingly, the claimed invention in T1227/05 was found to be potentially patentable (the case was remitted for an assessment of obviousness).

1.2 T1227/05 in effect overturned an earlier case, T453/91, relating to the design (layout) of a computer chip. The claim in T453/91 was amended on appeal to recite a manufacturing step of “materially producing the chip so designed” and this led to allowance. T1227/05 explains this change as follows (reasons 3.4.2):

“The board in its present composition is persuaded that a circuit design method is not necessarily to be equated with a simulation method for testing a designed circuit under noise influences. Be that as it may, with regard to the general statements in T453/91, and especially its demand for the inclusion of a manufacturing step, it must be noted that the importance and assessment of industrial simulation methods are changing. For the reasons discussed in point 3.2 above, for an increasing number of fields in the engineering sciences ‘the application of numerical simulation is becoming a cost-effective alternative to expensive, experimental investigations consuming significant time and personnel resources. In many industrial branches numerical simulation has already evolved to a key technology’ (to quote for example from the website of the Computational Engineering faculty of Darmstadt Technical University, <http://www.ce.tu-darmstadt.de/res/gk-mso.en.php?language=en>). Even today, in some situations, technological progress demands developments whose performance and reliable operation can only be tested by simulation, where the real application environment is not directly available to the tester, as is the case for example with space travel”.

1.2.1 In T1227/05, the Board was “*persuaded that simulation of a circuit subject to $1/f$ noise constitutes an adequately defined technical purpose for a computer-implemented method, provided that the method is functionally limited to that technical purpose*” (reasons 3.1) and “*all features relevant to circuit simulation, including the steps expressed by formulae, contribute to the technical*

character” (reasons 4). However, the Board noted that an undefined technical purpose (e.g. simulation of a “technical system”) would not be acceptable, as the claims must identify clear features supported by the description which meet the technical character requirement (reasons 3.1.1).

1.2.2 T1227/05 further explains that (reasons 3.2.2):

“Simulation performs technical functions typical of modern engineering work. It provides for realistic prediction of the performance of a designed circuit and thereby ideally allows it to be developed so accurately that a prototype's chances of success can be assessed before it is built. The technical significance of this result increases with the speed of the simulation method, as this enables a wide range of designs to be virtually tested and examined for suitability before the expensive circuit fabrication process starts.

Without technical support, advance testing of a complex circuit and/or qualified selection from many designs would not be possible, or at least not in reasonable time. Thus computer-implemented simulation methods for virtual trials are a practical and practice-oriented part of the electrical engineer's toolkit. What makes them so important is that as a rule there is no purely mathematical, theoretical or mental method that would provide complete and/or fast prediction of circuit performance under noise influences”

1.3 CIPA supports the approach of T1227/05, which has been widely followed and represents a sensible, practical approach for assessing the patentability of this type of invention under the EPC. We think this approach could and should have been adopted in T489/14. Our submissions focus on assessing the patentability of computer-implemented simulations in accordance with the approach of T1227/05. We do not comment on the specific claims from the application of T489/14 because the questions referred to the Enlarged Board are more general in scope.

1.4 Although the Board in T489/14 (reasons 15) “agrees with the appellant that decision T 1227/05 supports his case ... the Board is not fully convinced by the decision's reasoning”. In particular, T489/14 has two main doubts concerning T1227/05 (reasons 15):

“First, although a computer-implemented simulation of a circuit or environment is a tool that can perform a function “typical of modern engineering work”, it assists the engineer only in the cognitive process of verifying the design of the circuit or environment, i.e. of studying the behaviour of the virtual circuit or environment designed. The circuit or environment, when realised, may be a technical object, but the cognitive process of theoretically verifying its design appears to be fundamentally non-technical.

Second, the decision appears to rely on the greater speed of the computer-implemented method as an argument for finding technicality. But any algorithmically specified procedure that can be carried out mentally can be carried out more quickly if implemented on a computer, and it is not the case that the implementation of a non-technical method on a computer necessarily results in a process providing a technical contribution going beyond its computer implementation (see e.g. decision T 1670/07 of 11 July 2013, reasons 9).”

1.4.1 Regarding the first doubt, namely that “the cognitive process of theoretically verifying its design appears to be fundamentally non-technical”, T1227/05 already addresses this issue (reasons 3.2.1): “while the invention may be preceded by a mental or mathematical act, the

claimed result must not be equated with this act. The present claims relate to a simulation method that cannot be performed by purely mental or mathematical means, not to the thought process that led to that simulation method.” Thus T1227/05 gives explicit reasons why the claimed simulation method is **not** a purely mental act (in effect, not a cognitive process, as argued in T489/14).

1.4.2 CIPA supports the approach of T1227/05 as a better reflection of technical reality than that of T489/14. Typically, a design is created and then tested by performing a machine-based simulation relating to the operation of the design. This may become an iterative process, in which the simulation results are used to update the design, which may then be subject to further simulation. Importantly, there is often a distinction between the design phase (which may be cognitive), and the simulation phase (which is computer-implemented and not cognitive). Accordingly, we think the first doubt expressed by T489/14 regarding T1227/05 is misplaced.

1.4.3 Regarding the second doubt expressed in T489/14, we do not accept the premise of this doubt, namely that T1227/05 relies on *“the greater speed of the computer-implemented method as an argument for finding technicality”*. T489/14 does not cite any portion of T1227/05 in support of this premise, and indeed, we can find no such support. On the contrary, T1227/05 itself explicitly cautions (reasons 3.2.5): *“a mere speed comparison is not a suitable criterion for distinguishing between technical and non-technical procedural steps”*.

1.4.4 In summary, we think both of the doubts expressed in T489/14 regarding T1227/05 are rebutted by convincing arguments already provided in T1227/05 (but not acknowledged in T489/14).

1.5 The doubts expressed in T489/14 concerning T1227/05 do not seem to go to the heart of the difference between these two decisions, which is that T1227/05 sees a technical effect in a simulation (implicit from *“simulation methods cannot be denied a technical effect”*), whereas T489/14 does not see a technical effect in such a simulation. According to T1227/05 (reasons 3.3): *“the computer program ... has the potential for a technical effect going beyond basic hardware/software interaction in a standard computer. Loaded onto a computer it provides for automatic simulation and evaluation of noise-affected circuits”*. T1227/05 therefore has a broader understanding of “technical effect” than T489/14.

1.5.1 This broader interpretation may arise because T1227/05 considers technical purpose – e.g. a simulation may be used for the evaluation of noise-affected circuits. The simulation then provides a technical effect by advancing this technical purpose. CIPA supports this focus on technical purpose because it better reflects the general motivation of the patent system to support technological development. Furthermore, it is easy to regard a technical purpose as providing a technical solution to a technical problem, which then maps into the broader EPO approach to patentability.

1.5.2 In contrast, we think it is harder to reconcile the narrower interpretation of technical effect in T489/14 with the EPC. Thus T489/14 is ultimately based on the mental act exclusion of Article 52(2) EPC (because it regards simulation as purely part of a cognitive process). However, we see no evidence that the mental act exclusion of Article 52(2) EPC was ever intended to exclude patents for computer-implemented simulations of well-defined technical systems which are used as part of the mainstream development of technological devices and technical processes.

1.6 In summary, CIPA supports the approach of T1227/05, whereby features that serve a technical purpose contribute to the assessment of inventive step, and we do not support the doubts expressed in T489/14.

2. THE REFERRED QUESTIONS AND ANSWERS

2.1 Simulation

Before commenting on the specific questions referred by T489/14, we note that the term “simulation” may be applied to a very wide range of systems and methods (see the examples provided below in section 5 of this Brief). In other words, simulations (and the way in which simulations are used) go far beyond the pedestrian simulator of T489/14 or the circuit noise testing system of T1227/05. We therefore urge the Enlarged Board to be very cautious about answering the referred questions in general terms for all simulations in order to avoid the risk that such answers have unintended and potentially damaging consequences.

2.2 Question 1

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?

2.2.1 CIPA has concerns about the premise of Question 1. As already quoted above, T489/14 reasons 7 states: “*non-technical features are ... to be taken into account in the assessment of inventive step to the extent that they interact with the technical subject-matter of the claim to solve a technical problem or, equivalently, to bring about a technical effect*”. In this statement, it seems that solving a technical problem and producing a technical effect are alternative (but equivalent) paths to contributing to inventive step. However, according to Question 1 they are presented as **cumulative** requirements: a technical system or process must solve a technical problem **by producing a technical effect**. The implication is that features which solve a technical problem, but without necessarily producing a technical effect, cannot contribute to patentability – this appears to be inconsistent with the legal position set out in reasons 7 of T489/14.

2.2.2 Furthermore, as described above, current practice is based on the technical purpose criterion of T1227/05. We think framing Question 1 in a manner that does not reflect current practice is unhelpful.

2.2.3 Notwithstanding the above concerns, we answer Yes to Question 1 in accordance with the rationale of T1227/05, namely that a computer-implemented simulation which is performed for a technical purpose cannot be denied a technical effect.

2.3 Question 2

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?

2.3.1 Again we refer to the rationale of T1227/05: the relevant criterion is whether the computer-implemented simulation serves a technical purpose.

2.4 Question 3

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?*

2.4.1 Claiming a simulation as part of a process for verifying a design may serve a technical purpose, and so support patentability as per T1227/05. However, we do not think this is the **only** way to serve a technical purpose – see some of the examples in section 5 below on simulations. For the avoidance of doubt, our answers to Questions 1 and 2 are not affected by Question 3.

2.5 Inadmissibility

As noted above, we have significant concerns about the format of Question 1. Firstly, the wording seems inappropriately general for the specific issues that are raised by the patent application of T489/14, and secondly the wording does not reflect or even recognise the current approach of T1227/05, which is the decision that T489/14 is seeking to overturn. Accordingly, it can be doubted whether Question 1 would, in fact, settle a fundamental point of law, since a direct answer to Question 1 would shed no light on the “technical purpose” approach of T1227/05. In these circumstances, we think Question 1 could be regarded as inadmissible (and likewise Questions 2 and 3 which are dependent on Question 1).

3. PRACTICAL CONSIDERATIONS

3.1 The approach of T1227/05, which issued in 2006, has been widely adopted for the examination of computer simulation inventions, and has been incorporated into both the Guidelines (G II 3.3.2) and the Case Law of the Boards of Appeal (I.A.2.4.3f). The UK courts followed T1227/05 in *Halliburton v Comptroller-General of Patents* [2011] EWHC 2508 (Pat) (and other more recent decisions). The German Federal Court of Justice had already adopted this approach, prior to T1227/05, in the *Logikverifikation* decision, December 1999 (see T1227/05, reasons 3.4.2).

3.2 EPO Examiners have followed T1227/05 without apparent difficulty, and accordingly many European patents have been granted for computer simulation inventions; likewise, many European patent applications are pending for such cases. These patents (and patent applications) will have supported associated commercial activity, such as licences, assignments, and so on.

3.3 Accordingly, there has been widespread adherence to T1227/05 for a prolonged period of time. In these circumstances, there is a strong incentive to maintain the status quo: changing the law as advocated by T489/14 would potentially invalidate existing patent rights and cause significant commercial disruption and loss of value. Furthermore, it would undermine the positive reputation of the EPO for providing consistent and considered judgements.

3.4 We note that in contrast to the steady position of the EPO, the US has been subject to various court decisions which appear to have significantly increased the scope of patentability (e.g. *State Street*) and then to significantly contract the scope of patentability (e.g. *Bilski* and *Mayo*). These shifts in the boundary of patent-eligible subject matter in the US have caused much uncertainty, and the current position is still regarded as problematic (not least by the Court of Appeal of the Federal Circuit, see *Athena Diagnostics, Inc. et al. v. Mayo Collaborative Services, LLC*, July 2019). There are now legislative attempts in the US to remedy the situation, and there is the possibility of greater alignment with Europe. Accordingly, this would be a particularly unfortunate time for Europe to perform a *volte-face* and change the existing, settled approach to

computer simulations – something that could only lead to increased uncertainty and commercial difficulty.

3.5 A further reason for maintaining the status quo is to preserve alignment with national law (such as the UK and German national decisions identified above). If the Enlarged Board were to overturn T1227/05, there is no certainty this change would be followed by the various courts. For example, all policy arguments appear to be in favour of the approach of T1227/05 (although T489/14, reasons 16, criticises T1227/05 for taking policy arguments into account, it does not dispute the validity and significance of those policy arguments).

3.6 Thus if T1227/05 were to be overturned, this might lead to applicants filing computer simulation cases in national offices rather than at the EPO. We can say with certainty that such divergence between the EPO and national courts is not an intended outcome of the EPC (in contrast, there can be no such certainty that the approach of T489/14 represents an intended outcome of the EPC compared to the approach of T1227/05).

3.7 In conclusion, we think the legal arguments in T489/14 fall a long way short of justifying reconsideration of the approach taken in T1227/05, and this conclusion applies *a fortiori* in view of the strong practical and policy arguments in favour of maintaining the status quo.

4. OTHER MATTERS

4.1 Article 52(1) EPC

T489/14 states that the revision of the EPC in 2000 has not “materially changed” the provisions of the EPC relevant to this referral. We do not agree. Article 52(1) EPC states: “European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application”, where the underlined wording was added by EPC 2000.

4.1.1 The new wording originates from Article 27 of the WTO TRIPS agreement, i.e. externally to the European patent system. Therefore, although the amendment to Article 52(1) EPC generally conforms to previous practice within the EPO, its external origins indicate that it should not be regarded as a mere codification of this previous practice.

4.1.2 There is a credible argument that for any invention, the **only** relevant criterion is whether the invention lies in a **field of technology** (subject of course to the additional statutory criteria of Article 52(1) EPC, namely novelty, inventive step, and industrial application). A computer-implemented simulation is considered to be an invention within the context of Article 52(2) EPC by virtue of the machine implementation. If such a simulation lies in a field of technology, it cannot be excluded from patentability for some perceived lack of technical effect, because that would be contrary to the express intention of Article 52(1) EPC.

4.1.3 We believe that T1227/05 is fully consistent with this approach to Article 52(1) EPC, and note that it incorporates the following quote (taken from paragraph 1.2 above): “in many industrial branches numerical simulation has already evolved to a key **technology**” (emphasis added). In contrast, the approach of T489/14 does not take into consideration, and indeed appears to conflict with, Article 52(1) EPC.

4.2 Closest Prior Art

In T489/14, both the Examining Division and the Board took a conventional computer as the closest prior art. This is despite the fact that the patent application itself cites a paper from Nature magazine, and additional citations were submitted during prosecution as third party observations.

4.2.1 The use of a conventional computer as the closest prior art might be reasonable when there is little or no prospect of the other claim features contributing to the solution of a technical problem (for example, in some financial business method applications). However, in other situations, e.g. computer simulations of electrical circuits or drill bits or industrial processes, features other than the computer often **do** contribute to the solution of a technical problem.

4.2.2 In this latter situation, we think the use of a conventional computer as the closest prior art is distinctly unhelpful, since it provides no insight into the real contribution or innovation that has been made with respect to the state of the art. For this type of case, the assessment of patentability is much more credible and reliable if the closest prior art is a plausible starting point for the inventors.

5. SIMULATIONS

We have a particular concern about the generality of the referred questions in T489/14, including that the term “simulation” is used in a wide variety of situations that extend far beyond the specific contexts of T489/14 and T1227/05. Since the questions put to the Enlarged Board merely refer to “simulation”, the answers to these questions could have consequences across this wide spectrum of technologies that make use of computer simulation (such as artificial intelligence) – possibly leading to unexpected, unintended and/or unsuitable outcomes.

We note that a “simulation” may denote:

- i) the act of simulating,
- ii) the outcome (results) of performing the simulating
- iii) a system which has been set up to perform (or is currently performing) the simulating

We provide here examples of computer-implemented simulations from a range of contexts and motivations; these are intended to be illustrative rather than comprehensive. We think the position of T489/14 that such simulations are all purely part of a cognitive design process is unrealistic.

a) a computer-implemented traffic simulation may be used to investigate how changing the timing and phasing of different traffic lights impacts the flow of traffic through a town or city. The investigation might (for example) be performed to optimise the general setting of the traffics lights, perhaps with variations according to time of day and the day of the week, and/or to address special circumstances – e.g. road works, heavy traffic flows for a major sporting event, and/or to facilitate the movement of emergency vehicles in response to an accident.

This simulation investigates not the internal operations of the traffic lights, but rather how traffic (in effect, the environment) responds to different operational settings of the traffic lights, and how these operational settings can be varied for different desired results. In most cases, this information cannot be obtained other than by simulation – i.e. it is generally not practical (and potentially dangerous) to perform tests using operational traffic lights controlling real-time traffic flows (and it is certainly not possible to gain this information from a purely cognitive process, such as suggested by T489/19).

b) a computer-implemented simulation may be used to determine a route for inserting a medical instrument into the brain for performing a clinical procedure at a given location in the brain, such as for deep brain stimulation. The chosen route should ideally have a short path length, enter the brain approximately normal to the skull, and must avoid important physiological structures, such as major blood vessels.

Clearly performing this route determination be based on physical trial and error (rather than simulation) would be much more dangerous for the patient. Note also that it is not possible to add a final step to the claimed invention of performing the insertion according to the route determined by the simulation (analogous to the approach in T453/91 of adding a final manufacturing step to the claim), because this would then run foul of the surgical exclusion of Article 53(c) EPC.

c) cloud computing systems generally include a virtualization layer to simulate the underlying computer hardware. In particular, the virtualization layer acquires underlying physical resources, such as processors and memory, and packages them as virtualised resources for use by applications and operating systems (which may be unaware that they are running on such virtualized resources rather than directly on the physical hardware).

In this case the simulation of the virtualization layer is not used for design purposes but rather to decouple the application software from the hardware for enhanced operational performance (such as to help scalability).

d) a CAD/CAM system provides a model, i.e. simulation, of a product. This model may be used for simulating operation of the product, but there are many other alternative or additional uses of such a model, for example, for designing packaging for the product, for working with the supply chain to source suitable components for the product, for setting up a manufacturing line for the product, and so on.

e) an AI system is used to simulate human intelligence. In particular, the main focus of AI systems is not to simulate the specific neurological processing of the human, but rather to simulate the **outputs** of such processing for a given set of inputs. For example, an AI facial recognition system might be used to confirm that the face of a person presenting a passport matches the face shown in the passport itself. This can be considered as reproducing (simulating) the work previously performed by human immigration officers.

In fact, many AI systems are implemented on a neural network platform, which can be considered as a high level simulation of the human brain; moreover, convolutional neural networks have been developed, in essence to analyse different scale lengths within an image, something that again draws inspiration from (simulates) the human brain.

f) a computer-implemented flight simulator provides simulations of flying an aeroplane, including a realistic interface for pilots, such as simulated cockpit controls and instrumentation, as well as visual and dynamic feedback. These simulations may encompass normal or abnormal operation of the aeroplane, atmospheric conditions, geographical approaches for airports, and so on. Such a simulator models the operation of the aeroplane, but the motivation is primarily to train pilots on how best to fly the aeroplane, rather than to test or verify the operation of the aeroplane itself. It is clearly much safer and more practical to provide this training on a simulator than in a real aeroplane.

g) a real-time data communications program may receive and transmit data and network control messages. A computer-implemented simulation may involve running the program in a test harness that automatically generates incoming data and network control messages and monitors the outgoing messages. Such a simulation might be used in some cases to test or verify the data communications program. Note the program being tested may represent the actual implementation, i.e. functional (production) software (not merely the simulation of some such implementation). In other cases, the simulation might be used, for example, to determine the most effective hardware configuration to be used with the data communications program.



Simon Davies
Chair, Computer Technology Committee
Chartered Institute of Patent Attorneys