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Via email

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Amicus curiae brief concerning G 1/19
Patentability of computer-implemented simulation methods
Underlying decision: T 489/14 (Pedestrian simulation/CONNOR)

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Dear Chairman and Members of the Enlarged Board of Appeal,

The Boards of Appeal of the European Patent Office (EPO) have developed a well-balanced and consistent framework for the assessment of patentability for computer-implemented inventions (CIIs), as is evidenced by the analysis of the Enlarged Board of Appeal in its decision G 3/08. Computer-implemented simulations, or more precisely computer-implemented simulation methods, form a subset of computer-implemented methods, and are thus to be treated in line with the principles developed for CIIs. The application of these principles led to the decision T 1227/05 (Schaltkreissimulation I/Infineon Technologies) of December 13, 2006, where the deciding Board came to the conclusion that a numerical simulation of a noise-affected circuit described by a model solves a technical problem and is thus eligible for patent protection. The referral decision's criticism on this approach is unjustified, and does not have any legal basis in the European Patent Convention, which – following the systematics of Article 52 (2) and (3) EPC – calls for a narrow approach to any exclusion from patentable subject-matter.

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Deviating from the EPO's well-established approaches would also fundamentally contradict principles developed by national jurisdictions. For example, in Germany, in several landmark decisions the Federal Court of Justice applied an approach similar to the EPO's inventive step assessment of computer-implemented methods. More specifically, in its decision "*Logikverifikation*" of December 13, 1999 (BGH, X ZB 11/98), the Federal Court of Justice dealt with and confirmed patentability of claims relating to computer-implemented simulation methods.

Even more, excluding special technical processes, such as computer-implemented simulation methods, from patentability contradicts the objectives of the European Union. The European Union is currently investing (and has already invested) billions of Euros to counter deficits in the digitalization of domestic industry and to make Europe one of the leading economic locations for digitalization. In many areas of technology, digitalization involves the use of computer-implemented simulation methods. For example, computer-implemented simulations play a decisive role in improving traditional industrial processes or products, and are likewise irreplaceable for designing future systems, e.g. to model applications of artificial intelligence, or the conduct of autonomous vehicles.

Consequently, the well-established "two hurdle approach" seems to be fully appropriate for assessing inventive step of all kinds of computer-implemented methods, irrespective of whether they refer to simulations or other processes. Hence, particularly referral question 1 and the second question within referral question 2 should be answered with "yes". For referral question 3, which we understand to refer to the subgroup of design verification processes within the more general category of computer-implemented simulation methods, the same answer should be given.

In detail:

I. Computer-implemented simulation methods in the European economy

In general, computer-based simulation methods are of utmost importance for the European economy. Industrial design of products, buildings, machines, systems etc. becomes a more and more complex task. Hence, constructing physical prototypes for evaluating design properties is oftentimes impractical due to high costs and large construction time requirements, and contradicts the requirements of an efficient use of natural resources. In specific cases, physical prototyping is even technically impossible when it comes for example to the evaluation of design properties of nuclear reactors, possibly dangerous and/or harmful chemical reactions or effects to the human body of medical agents.

In addition, new economic developments are increasingly taking place in the digital sector. The most prominent representatives here are artificial intelligence (AI) systems which often require the use of computer-implemented simulations. For example, in the field of “*generative designs*”, for optimizing shapes or configurations of constructive elements, AI systems are trained with known element properties. In the course of a numerical simulation cycle, the AI systems aim at optimizing parameters (shape, structure, etc.) to fulfill specific constraints, like robustness or weight, of the constructive elements. Without the use of computer-implemented simulations, such highly-effective optimization processes would not be possible. To give some practical examples for the use of generative designs, steel beams for skyscrapers have been optimized with respect to bearing load and weight, or roll bars for race cars with respect to robustness and air flow characteristics.

For the further development of AI systems, the European Commission is increasing its annual investments in AI by 70% under the research and innovation program Horizon 2020. It will reach EUR 1.5 billion for the period 2018-2020¹. Future applications, such as fully autonomous vehicles,

¹ See <https://ec.europa.eu/digital-single-market/en/artificial-intelligence>

will not become reality without the use of computer-based simulation methods, as one could not replicate the complexity of a metropolis as a test environment in the physical world.

It is also up to the European Patent Organization to ensure that inventions in the digital field remain patentable such that the provision of an adequate protection of related inventions is ensured. These inventions cannot be classified as merely mental or abstract ideas; rather, these developments are inextricably connected to the physical world, as is evidenced by the afore-mentioned examples (nuclear reactor, medical agents, steel beams, roll bars, autonomous vehicles, etc.).

II. Specific comments on referral questions

In the following, we comment on the three referral questions formulated in T 489/14. We thereby take into account how the assessment of patent-eligibility and of inventive step of computer-implemented inventions is handled both by the EPO and in the German jurisdiction. Particularly, denying a technical effect of a computer-implemented simulation method of a technical system or process, and thus answering referral question #1 and the second question within referral question 2 with “no”, would fundamentally contradict the EPO’s well-established principles how to assess patentability of CIIs and landmark decisions of the German Federal Court of Justice.

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?*

1. The application underlying the decision T 489/14 concerns the computer-implemented simulation of pedestrian crowd movement in an environment, e.g. in a building structure.

Apparently, the reasoning of the Board of Appeal essentially comprises the following two major points:

- 1) In short, the Board in charge criticises that the simulation of the present application allegedly lacks a “*direct link with physical reality*” (cf. T 0489/14, page 15, point 11).
- 2) The Board points to decision T 1227/05 (Schaltkreissimulation I/Infineon Technologies) of December 13, 2006 in which the deciding Board came to the conclusion that a numerical simulation of a noise-affected circuit described by a model solves technical problems and hence would support the present case. However, the Board in charge considers the reasoning given in T 1227/05 not persuasive. In the Board’s view, a circuit, when realised, might indeed be a technical object, but the cognitive process of theoretically verifying its design appeared to be fundamentally non-technical (cf. T 489/14, page 15, point 15).

The Board’s approach boils down to a situation where only claims that recite the result of the teaching in the physical world, e.g. the construction of the building, the manufacture of the circuit, etc. could include patentable subject-matter. This view seems to be based on an understanding of a technical teaching, which is outdated since a very long time:

2. For example, in Germany the Federal Court of Justice already recognized in its famous “*Rote Taube*” decision of 1969 (BGHZ 52, 74, 76 = GRUR 1969, 672) that a technical teaching cannot be bound to presence of objects of the physical reality. In this decision, the term technical teaching was characterised as “*a teaching to methodically utilize controllable natural forces to achieve a causal, perceivable result*” (see also G 1/08, point 3 of the reasoning). In the same decision, the Federal Court of Justice came to conclusion that “*this definition of the term technical teaching is not static, but can be modified if required by technological development and a thereto adapted patent protection*”. Hence, if one were to establish a requirement that a claimed teaching needs to recite the physical presence of

objects, one would apply an understanding of a technical teaching that might have been appropriate in the late 1960s, but that is no longer in line with today's – oftentimes computer-implemented – inventions. The fact that such an understanding cannot be applied for all times had been explicitly addressed by the German Federal Court in Justice.

More specifically, in its decision “*Logikverifikation*” of December 13, 1999 (BGH, X ZB 11/98), which is also referred to in the referral decision, the German Federal Court of Justice confirmed that claims relating to numerical simulations do not need to recite a manufacturing step or the like in order to qualify as a technical teaching. In that decision, the German Federal Court of Justice ruled that “*if a teaching for a program for data processing equipment is characterised by a knowledge which is based on technical considerations, there is therefore a demarcation criterion which is also accepted elsewhere and which promotes a uniform patent law practice for Europe and which allows the determination of the necessary technical character of a teaching for a program for data processing equipment*” (see reasons, II.4.g), our translation). A similar reasoning is provided in decision BGH X ZB 1/15 – “*Flugzeugzustand*” in which it was found that – like computer programs – mathematical methods, which were excluded from patentability as such, were patentable if they solved a specific technical problem by technical means.

It is also to be noted that – in contrast to the Board's one-sided remark in the referring decision drawing attention to some criticism in the literature of 2006 (cf. T 489/14, point 46) – the decision “*Logikverifikation*” has been consistently relied upon by the German case law since almost two decades. The decision has been cited in at least 28 further decisions of the German Federal Court of Justice as well as the German Federal Patent Court over the last 20 years. Thus, the principles that were laid down in this decision are clearly well-established nowadays. In addition, this case also exemplarily shows that the referring Board's motivation to deviate from the principles of T 1227/05 – lack of “*direct link with physical reality*” – is unjustified: A method for verifying a logical circuit is inextricably linked to the

physical reality, since its computer-based simulation requires the digital/numerical simulation of a physical circuit.

3. Turning back to the jurisprudence of the EPO Boards of Appeal, there are various examples which show that technical considerations can be present outside of an object of the physical reality:
 - For example, following T 769/92 (OJ EPO 1995, 525), the necessity for technical considerations in the design of a computer implemented method or system is sufficient for the programming features of the method or system to solve a technical problem or achieve a technical effect. In particular, in T 769/92, the deciding Board reasoned that the implementation of a user interface in the form of a “transfer slip” was not merely an act of programming but required technical considerations on the part of the programmer before programming could start; it therefore provided a technical contribution to the art (see reasons 3.7 and 3.8). Moreover, in T 769/92 the Board states that the very need for such technical considerations “*imply[d] the occurrence of an (at least implicit) technical problem to be solved (Rule 27 EPC [1973]) and (at least implicit) technical features (Rule 29 EPC [1973]) solving that technical problem*” (see reason 3.3).
 - In T 625/11, the deciding board reasoned that a claimed method for establishing a limit value for a nuclear reactor by simulation had technical character despite not requiring implementation.
 - Similarly, in T 471/05, the deciding board reasoned that a claimed method for designing an optical system had technical character without requiring the optical program to be actually produced since the optics design program itself is inherently technical (e.g., must run on computer hardware).

Thus, it is our view that a “direct link with physical reality” requirement is not only not necessary to provide technical character in the case of

computer simulations but would also conflict with existing case law of the EPO's Boards of Appeal.

4. In contrast, the EPO's well established "two hurdle" approach (see T 641/00 (Two identities/COMVIK)), wherein an invention consisting of a mixture of technical and non- technical features and having technical character as a whole is to be assessed with respect to the requirement of inventive step by taking account of all those features which contribute to said technical character provides an appropriate and sufficient criteria for assessing inventive step. This approach should thus be applied to today's computer-implemented inventions – without any further restrictions for specific kinds of subgroups of such inventions.
5. In view of the above, we respectfully suggest answering question #1 with "yes".

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?*

1. Concerning the first question within referral question 2, we believe that it is to be assessed based on the facts of the case at hand whether a computer-implemented simulation method claimed (as such) solves a technical problem.
2. Most importantly, the systematics of the law – which laid down a closed list of exclusions from inventions in Article 52(2) EPC and clarified that the exclusions only concern applications/patents related to such subject-matter "as such" (Article 52(3) EPC) – calls for a narrow interpretation of any exclusion. There was clearly no intention of the legislator to exclude computer-implemented simulations or methods that deal with evaluating of design properties of a simulated entity "as such" from patent protection. To the contrary, legislator's intention was to prevent that algorithms, such as

sorting algorithms or the like that solely rely on mathematical principles, can be claimed outside a specific technical context, since such principles should be freely usable by everybody.

3. Hence, it is to be assessed whether a computer-implemented method – and therefore also computer-implemented simulation methods as a subgroup thereof – is claimed in a concrete technical context. The claim does not need to recite any feature or step that directly links the outcome of the claimed teaching with physical reality.

A technical context is given in particular if the claimed computer-implemented method is based on technical parameters. When, for example, voltage, current strength, temperature, weight, size or other physical parameters are used for performing a simulation, this is a clear indication that technical considerations are taken into account, that the given context is technical and that solving a technical problem is addressed.

A further indication may be provided by answering the question “who is faced with the problem underlying the invention?”. In other words, one may assess whether the skilled person confronted with the objective technical problem to be solved by the claimed subject-matter is a technically skilled person. Such an assessment is supported by Article 52(1) EPC which states that European patents shall be granted for any inventions, in all fields of technology, i.e. in areas where technically skilled persons operate.

4. Concerning the second question within referral question 2, following the principles of the COMVIK-approach regarding “mixed-type inventions” (comprising technical and non-technical features), it is sufficient when at least parts – explicitly represented by claim features – of the claimed simulation method rely on technical principles.
5. As a result, we respectfully suggest answering the second question within referral question 2 with “yes”.

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?*

Also for a computer-implemented simulation claimed as part of a design verification process, questions 1 and 2 shall be answered with “yes”. If the computer-implemented simulation is considered technical (see above comments on questions 1 and 2), the same should be true for a claim directed to verifying a design.



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