The technicality of making predictions

Claudia Nash & Christophe Saam

P&TS
INTELLECTUAL PROPERTY
NEUCHATEL
ZURICH

P&TS INTELLECTUAL PROPERTY NEUCHATEL ZURICH

The technicality of making predictions

Let's be clear – merely replacing crystal balls with processors performing complex calculations was never likely to result in a patented invention in Europe.
But when it comes to making reliable predictions – what exactly is patentable? And what do we need to consider when drafting patent applications for predictive methods?
More precisely, when are predictions performed by a processor considered to be "technical" under European patent law?

These questions were investigated in detail and discussed at great length for almost a decade in the context of two patent applications EP318698 and EP3183699 owned by Hitachi Energy AG. We are now pleased to announce that not only is this rather unpredictable saga now rapidly heading towards its happy conclusion.

While not exactly an emerging field, the case law on computer-implemented simulation methods evolved enormously over these past years, not least due to the ground-breaking decision G1/19. The recent T1557/20 and T0182/20 decisions of the EPO issued for the two Hitachi patent applications have made a significant contribution in clarifying the patentability of computer implemented prediction methods in light of G1/19.

The two Euro-PCT applications presented here claimed the priority of two Swiss patent applications, which had both been filed on the same day in August 2014. Ten years on, we are looking forward to the patents finally being granted.

Case 1:

Patent application number	**EP20150747459**
Publication number	**EP318698**
Appeal number	**T01557/20**

Case 2:

Patent application number	**EP20150750319**
Publication number	**EP3183699**
Appeal number	**T0182/20**

Both applications concern the prediction of a malfunction of a technical component based on the law of probability, i.e. mathematical methods. The key question in both cases being whether the steps of the prediction method could be considered as being technical.

Upon substantial examination both patent applications were refused by the EPO for lack of inventive step under Art 56 EPC on the basis that the computer as well as the technical components were notorious and the remaining features allegedly did not provide any technical effect and were therefore examined for obviousness. No prior art was cited in the search report.
In both cases we had addressed the objections of the examining division by limiting the general prediction method to specific type(s) of component(s), specific technical malfunctions and specific parameters to be measured. But even these limitations failed to convince the respective examination divisions of the technical character of the prediction method.
The applications were refused in February 2020 and in August 2019, respectively.
We appealed against both decisions on behalf of Hitachi Energy AG.

Pre G1/19

Case 1: T01557/20 (EP20150747459)

The examining division had held that calculating the probability of an unspecified malfunction in a generic mechanical or electrical component constituted a non-technical modelling and forecasting process, which was an abstract intellectual activity and therefore lacked technical character. It was concluded that any effect of the calculated probability depended in fact on human decision-making. Implementation on a generic computer was of course considered obvious. Since no further technical features were identified, the application was considered not inventive.
The auxiliary requests previously filed during examination were presented to the Board of Appeal. Initially, the Board was however reluctant to acknowledge a technical character of even the limited auxiliary requests and tended to follow the examining divisions prior assessment.

Case 2: T0182/20 (EP20150750319)

Similar to EP20150747459 the examining division for this applications had arrived at the conclusion that the claimed invention lacked technical features which were not generic and could be used in the assessment of the inventive step. The patent application had been refused on this basis.

Similar to T01557/20, the Board found in its preliminary assessment that predicting unspecified malfunctions of unspecified mechanical or electrical components based on unspecified parameters was not technical. Even a limitation to specific components, malfunctions and parameters was initially considered too broad to achieve a technical effect. In its preliminary opinion the Board found that not all of the listed parameters were suitable to predict the claimed malfunctions. For this reason, the Board doubted that the effect of predicting a malfunction was credibly achieved. A deletion of certain malfunctions and parameters was sufficient to address this issue.

Admittedly, prior to March 2021 the discussions around technical character of a predictive method performed by a generic computer were often cumbersome and sometimes even a little hazy.
And then the highly anticipated decision of the Enlarged Board of Appeal for G1/19 was published – shedding some much-needed light on the question of when claimed features are to be considered to contribute to the technical character of a claim.

G1/19

G1/19 is highly significant in that it finally defined the two-hurdle “COMVIK” approach as the standard method in the assessment of computer-implemented simulation methods.
Let’s take a step back to understand what this means.

To fulfill the patentability criteria under the EPC, an invention must, amongst other criteria, at least
(i) be technical and not fall under the “non-inventions” listed in Art 52 EPC, and
(ii) be inventive (Art 56 EPC). Neither of the terms “technical” nor “inventive” are clearly defined in the EPC. As a result, these criteria are often subject of intense debates during written and oral proceedings.

Following the two-hurdle approach, these two criteria are examined separately.
First, the technical features, which are either technical itself or which contribute to the technical character of the claim, are distinguished from clearly non-technical features. If technical features are present, the first “eligibility” hurdle is overcome and the inventiveness of the claimed subject matter is then evaluated in a subsequent step.

Since the mere presence of only one technical feature, for example a generic computer, is sufficient to surmount this first eligibility hurdle, computer-implemented invention pass this test by definition. The emphasis in the patentability assessment has now been shifted to the second “inventiveness” hurdle, in which only the technical features are examined.

If at least one of the technical features identified in the first step is non-obvious, i.e. this technical feature does not merely follow plainly or logically from the prior art but goes beyond the normal progress of technology, the claimed invention passes the second hurdle.
It is therefore crucial to establish which features contribute to the technical character of the invention and can in fact be considered in the inventive step assessment. G1/19 provided much needed guidance on what kind of features we can consider here.
While the COMVIK approach was already well established for computer-implemented inventions in general prior to 2021, G1/19 clarified that this approach should also be followed when assessing simulations implemented by computers.

G1/19 found that it is not decisive whether a simulated system or process is technical or not, but that it is relevant whether the simulation of a system or process does in fact contribute to the solution of the technical problem (G1/19, point120). If it does, it is considered to have a further technical effect. Depending on whether a model or algorithm used for the simulation contributes to any technical effect achieved by the claimed simulation invention, it may or may not be taken into account in the inventive step assessment (G1/19 point121). It is however important to bear in mind, that only those technical effects which are explicitly mentioned or at least implied in the claims can be considered in this technicality assessment.

Therefore, models or algorithms for simulations may be considered in the assessment of the inventive step, provided the claimed invention is limited to stated or implied technical effects.
If the claimed process results in a set of numerical values, it depends on how these values are further used to decide whether they result in a technical effect (G1/19, point124). Interestingly, whether the data are used as a result of human intervention or as past of an automated process was not considered to be relevant.
The features which contribute to the technical character are determined on the basis of the technical effects actually achieved. In its decision the Enlarged Board explained that a direct link of the claimed features with an external physical reality is not necessarily required in order to demonstrate the technical effect of a feature and thereby the technical character of a claim (G1/19, points87 and 88).

Post G1/19

T01557/20 and T0182/20 continued
Following this landmark G decision, the two Boards of appeal reconsidered the assessment of the technicality of the predictive method. Since the concerns of both applications were of a similar nature, it was decided to treat both appeal cases, T1557/20 and T0182/20, in the same oral proceedings held on 24 October 2023.

Decision T01557/20
Abbreviated version of the accepted first claim with highlights added:

> *"Method for predicting a malfunction of a transformer as an electrical component of a unit, said transformer having coils surrounded by oils of cooling fans, the malfunction being an insulation defect, the method comprising the steps of:*
> *measuring by a sensor of the component a current value of a parameter of the component, said parameter including one of the following parameters: temperature of the coils, vibration of the cooling fans if the coils are surrounded by cooling fans, oil condition or temperature of the oil if the coils are surrounded by oil;*
> *……*
> *in an apparatus (10), determining a conditional probability distribution of the parameter of the component for the future point in time given the current value of the parameter based on the current value of the parameter (S4);*
> *….;*
> *…..,*
> *predicting the malfunction of the component on the basis of the conditional probability for the malfunction at the future point in time given the current value of the parameter."*

In short, the invention concerns calculating a malfunction, specifically an insulation defect, of a transformer, by measuring a defined set of parameters and by calculating, using the law of probability, the probability of a malfunction at a future point in time based on the measured state of the parameters.
Regarding the question of the technical character of the claim, the Board drew the following conclusions:

i. Measurements:
In line with G1/19, point19, performing a measurement has a technical character. (T01557/20, point8)

ii. Choice of Parameters:
The Board held that technical consideration and knowledge are employed when choosing

specific parameters to be measured for predicting the specified malfunction. The choice of the parameters therefore contributes to the technical character of the claim. It was further clarified, that it is not necessary for these technical considerations to be explicitly mentioned in the description in order to acknowledge the technicality of the claim based thereon. (T01557/20, point8)

iii. (iii) Mathematical steps:
With regards to the mathematical steps performed as part of the claimed method, according to G1/19 (point124, 128) these may provide a technical effect if a technical use is at least implicitly specified in the claim. Interestingly, in this specific case the Board held that the steps of the claimed mathematical method could potentially also be used for non-technical purposes (T01557/20, point12). The fact that the calculations were based on measurements taken on a technical entity, in this case the transformer, was seemingly not sufficient to limit the implicit use of the method.

However, the Board found that, since the claimed prediction method involves measuring a specific physical entity, in this case the transformer, at a first point in time and inferring the state of this physical entity, in this case its probability of failure, at another point in time is similar to the example provided for an indirect measurement in G1/19, point99 (T01557/20, point13). In this G1/19 example measurement of a physical entity at one location is obtained from measurement of another physical entity at another location.

The Board therefore held that the claimed prediction method is also an indirect measurement of the physical state of a transformer, albeit at a different point in time as opposed to at a different location. According to G1/19, point99 indirect measurements are related to a physical reality and therefore have a technical character (T01557/20, points11 and 13).

For this reason the mathematical steps performed for predicting the future probability of malfunction of the transformer contribute to the technical character of the claimed invention and have to be considered in the assessment of the inventive step.

Moreover, it was emphasized that a causal link between the parameters measured and the specific malfunction is required to demonstrate a credible estimate of the future physical state. Only such a credible estimate could be considered an indirect measurement. Arbitrary speculative models and algorithms that are not grounded in reality are not considerable credible for predicting the future state of the component and can therefore not be considered as indirect measurements. (T01557/20, point 13.2)

Decision T0182/20

Abbreviated version of the accepted first claim with highlights added:

"Computer implemented method for predicting a malfunction of at least one mechanical and/or electrical component, comprising:

1. At the component, measuring with a sensor a current value (a(t0)) of a parameter (a) of the component,
2. Transmitting over a communication network said current value (a(T0)) to a server;
3. Determining a conditional probability distribution … for the parameter (a) for a future point in time …. given said current value …. of the parameter (a), ….
4. At the server, determining a conditional probability …. for a malfunction at the future point in time …. given said current value … of the parameter (a), based on:

….
and on
….,
and wherein

one of the components is a gas turbine, wherein a single malfunction of the gas turbine is a bearing defect, and one or any combination of the following parameters is used for predicting the single malfunction of the gas turbine:
…; or

one of the components is a transformer, and the single malfunction of the transformer is one of an insulation defect, or a cooling system defect of the transformer, and one or any combination of the following parameters is used for predicting the single malfunction of the transformer:
….l; or

one of the components is a diesel engine, and the single malfunction of the diesel engine is a bearing defect, and one or any combination of the following parameters is used for predicting the single malfunction of the diesel engine:
…. ."

In its decision T0182/20 the Board followed the reasoning of T01557/20 outlined above.
In summary, besides server-based processing, the following features were considered as technical:

i. Measuring specific parameters (according to G1/19, points 85 and 99)
ii. The choice of parameters (see above)
iii. The use of these measurements to predict specific malfunctions in particular components
iv. The mathematical calculations performed in steps 3 and 4 due to the fact that the calculated numerical data credibly reflect a reality of a specific component (see above)

In both cases the Boards of Appeal concluded that all the features of the respective claims 1 as accepted contribute to the technical character of the invention and had to be examined for inventive step.
We consider these decisions as an important extension to the G1/19 key decision, as it demonstrates in a very concise manner how to apply G1/19 to inventions comprising predictive mathematical models.

Both cases were remitted to the respective examination divisions. Having performed a further search and examination of all technical features of the independent claims, the examining divisions arrived at the conclusion, that both remitted patent applications meet the criteria of patentability under the EPC.