This document includes some recent decisions of the EPO in 2023 with regards to software related inventions and shows relevant extracts from the respective decisions.

T 2177/19 () of 1.6.2023

European Case Law Identifier: ECLI:EP:BA:2023:T217719.20230601

SECURELY RENDERING ONLINE ADS IN A HOST PAGE

Inventive step - (yes)

Application number: 11832927.5
IPC class: G06Q 30/00, G06Q 50/00, G06Q 30/02, G06F 17/30
Applicant name: Microsoft Technology Licensing, LLC

Board: 3.4.03

https://www.epo.org/law-practice/case-law-appeals/pdf/t192177eu1.pdf

Claim 1 according to the main request reads as follows (labelling "(A)", "(B)", ... and highlighting/[deleted: strike]-[deleted: through] of amendments with respect to claim 1 of the main request discussed before the examining division were inserted by the board):

(A) A computer-based method (200) for rendering online ads on a page, the method comprising:

(B) creating a first inter-frame communication channel comprising a first communication channel between a first cross-domain frame and a host page, where the first cross-domain frame comprises content from a first domain different than a domain of the host page (206); and

(C) creating a second inter-frame communication channel comprising a secure second communication channel that passes data [deleted: between] from the first cross-domain frame to the host page and then to a second cross-domain frame in the host page,

(D) wherein the second cross-domain frame comprises content from [deleted: a] the [deleted: second] first domain [deleted: different than the domain of the host page (210)],

(E) wherein content from the first cross-domain frame communicates a request to interact with the second cross-domain frame in order to initiate an interactive ad with the second cross-domain frame,

(F) including passing ad content from the first cross-domain frame to the second cross-domain frame as an animation.

1. The invention as claimed

1.1 The aim of the invention is to propose a system for securely serving online ads on a host webpage, while allowing for rich media functionality of the online ads ("interactive animations"), but not allowing undesirable attacks by malicious third parties (paragraph [0009] of the description of the application). Furthermore, the proposed systems provides a better ad provider experience when webpage hosts update their content, as the ad content can be integrated relatively seamlessly with the webpage content as intended, for example, inside a secure box that is separated from the host page content.

1.2 For rendering online ads on a webpage, a first inter-frame communication channel ("first iFrame channel") is created (paragraph [0010]). The first inter-frame communication channel comprises a first communication channel between a first cross-domain frame (e.g. for securely hosting ad content) and a host page. The first cross-domain frame comprises content (e.g. ad content from an ad syndicator) from a domain that is different from that of the host page. Furthermore, a second inter-frame communication channel ("second iFrame channel") is created, which comprises a second communication channel between the first cross-domain frame and a second cross-domain frame (e.g. for hosting additional ad content from the same or a different ad owner or syndicator) in the host page.

1.3 Communication takes place between the two cross-domain frames such that interaction between two ads can take place as an animation. Content from the first cross-domain frame is passed to the second cross-domain frame, such that content of the two cross-domain frames is the same, i.e. the second cross-domain frame comprises content from the first cross-domain frame (and vice versa, cf. paragraph [0037]).

2. Main Request

…

2.2 Technicality

2.2.1 Advertisements as such are considered non-technical. However, in the present context the advertisement is an ad on a webpage in the form of a digital web content ("html script", see paragraph [0022] of the description of the application). Ads according to the general understanding of the skilled person in the context of webpages are concepts which are e.g. realised as webpage programming code, digital pictures, film clips or computer animation. **These technical implementations of ads are considered technical.** Features (E) and (F) relate to communicating requests and creating an interactive ad in the form of a (computer) animation (such as an ad that drops a burger bun top from the first frame onto a burger in the second frame, then drops the burger and bun top from the second frame to a bottom bun in a third frame, cf. description, paragraph [0038]). Therefore, these features also have to be considered **entirely technical** **even if the purpose (advertisement) is non-technical.**

2.2.2 Consequently, the **Board is of the opinion that all the features of claim 1 are technical.**

2.3 Closest prior art

The examining division has chosen D1 as closest prior art document. However, D1 is silent about placing ads ozn a website. The board agrees with the appellant that D1 is a less suitable spring-board for the problem and solution approach than document D3 and therefore considers this document as closest prior art. D2 is more remote.

2.4 D3

2.4.1 D3 discloses (see Figures 4 and 5; paragraphs [0031] to [0032] and [0037] to [0038]) that ad content generated by an ad owner (404) is inserted into an IFrame (408) in a host webpage (406) published by a website host (402). The ad owner (404) has only access to content inside the IFrame (408) and is barred from interacting with the webpage (406). A communication channel (410) is created between the IFrame (408) and the host webpage (406) to support the ad functionality.

FORMULA/TABLE/GRAPHICFORMULA/TABLE/GRAPHIC D3

2.4.2 In the embodiment of Figure 5 additional codes (502, 504) are loaded into the IFrame (408) and webpage (406), respectively. The codes allow only "white-listed" actions, i.e. filters out not allowed action thus providing increased security against malicious actions (phishing etc.). In this way a modified communication channel is created.

2.5 D1

2.5.1 D1 teaches two separate IFrames (116 and 118) and communication between the IFrames (Figures 2, 4, 10, 11, paragraph [0035]).

FORMULA/TABLE/GRAPHIC D1

2.6 Difference

2.6.1 The appellant argued that the non-modified communication channel and the modified communication channel had to be considered one and the same channel and not two separate (first and second) channels. In addition, nothing in D3 disclosed or taught to create an additional communication channel. Therefore, D3 failed to disclose a second communication channel. Furthermore, D1 and D3 were silent about animations.

2.6.2 The board agrees with this assessment. Therefore, D3 fails to disclose features (C) to (F) at least in part.

2.7 Effect - problem

2.7.1 The **differences have the effect** of

(i) (features (C) and D)): **secured and interactive cross domain data exchange between two cross-domain frames;**

(ii) (features (E) and (F)): **allowing an interactive animation of the online ad within several ad-spaces in the host webpage, but not allowing undesirable attacks by malicious third parties.**

2.7.2 The appellant formulated the technical problem to be solved as "how to securely serve an online ad on a host webpage, while allowing for an interactive animation of the online ad within several ad-spaces in the host webpage, but not allowing undesirable attacks by malicious third parties" (see the letter of 22 February 2023, page 8, last paragraph).

2.7.3 The board partially agrees with this formulation, but reformulates the problem to be solved more specifically in view of effects (i) and (ii) as "**providing an animated, secured and interactive cross domain data exchange between two cross-domain frames in order to improve flexibility and security of communication of embedded content in websites**".

2.8 Non-obviousness

ad (i)

2.8.1 D3 discloses only one single IFrame channel. D1 teaches two IFrames and a cross domain data exchange between the two IFrames (see paragraph [0035]). However, D1 does not teach communication between two IFrames such that content from an external domain is communicated to a first frame and from the first frame via the host page to a second frame.

2.8.2 Since D1 and D3 do not disclose or suggest inter-channel communication in the sense of the claim wording, the combination of the teachings of D1 and D3 does not lead to the combination of features (A) to (D), in particular that content from the first frame is communicated to the host page and then to the second frame such that the second frame comprises content from the first frame (features (C) and (D)).

ad (ii)

2.8.3 D3 discloses pop-up windows, which could be considered as animations. However, these pop-up windows are not disclosed in the context of the embodiment of Figure 5 of D3, i.e. within an IFrame, and are not an animation which could be considered the result of a communication between two IFrames. D1 fails to disclose or suggest exchange of ad content between IFrames.

2.8.4 Therefore, D1 and D3 do not reveal or suggest an animation within a single IFrame, let alone within two IFrames. Consequently, nothing in D1 or D3 would lead the skilled person to features (E) and (F).

2.8.5 Consequently, the **subject-matter of claim 1 is inventive (**Article 52(1) EPC) within the meaning of Article 56 EPC. The same reasoning applies to the corresponding system claim 10. Claims 2 to 9 and 11 to 14 depend upon claims 1 or 10, respectively.

T 2932/19 () of 25.4.2023

European Case Law Identifier: ECLI:EP:BA:2023:T293219.20230425

TOOL MEMORY-BASED SOFTWARE UPGRADES FOR ROBOTIC SURGERY

Inventive step - (yes)

Application number: 05740306.5
IPC class: A61B 19/00, G06F 19/00
Applicant name: Intuitive Surgical Operations, Inc.

Board: 3.2.02

https://www.epo.org/law-practice/case-law-appeals/pdf/t192932eu1.pdf

The independent claims, claims 1 and 13 read as follows:

"1. A robotic system (500) comprising:

a robotic arm (504) having a tool holder (508) and a signal interface;

a plurality of robotic tools (506), each tool receivable by the tool holder for manipulation by the robotic arm;

a processor (502) having a memory (516) and coupled to the robotic arm, the memory comprising robotic tool data associated with the plurality of tools and the processor directing movement of a robotic tool (512) received by the tool holder using associated tool data from the processor memory;

a first additional tool (514), the first additional tool having a memory with additional tool data or code (230), the first tool transmitting the additional tool data to the processor via the tool signal interface, characterised in that the processor is conditioned to store the additional tool data or code in the processor memory and is operable to direct movement of the robotic arm using the additional tool data or code after the first additional tool is removed from the tool holder."

"13. A robotic method comprising:

mounting a first robotic tool (514) to a robotic arm having a tool holder and a signal interface, the robotic arm coupled to and directed by a processor having a processor memory storing robotic tool data associated with a plurality of tools coupleable to the robotic arm;

transmitting update tool data or code from a memory of the first robotic tool via the signal interface to the processor memory;

and directing movement of the robotic arm by the processor using the update tool data or code after the first robotic tool is removed from the robotic arm."

VII. This decision also refers to the document US 5,400,267 (D2), which is also cited in the decision under appeal.

1. The invention

The patent application in suit relates to a robotic system as defined in independent claim 1, comprising a robotic arm having a tool holder and a plurality of robotic tools, each of which is receivable by the tool holder for manipulation by the robotic arm. For this purpose, the robotic system comprises a processor which has a memory containing robotic tool data associated with the plurality of tools and which directs movement of a robotic tool received by the tool holder using associated tool data from the processor memory.

The robotic system further comprises a first additional tool having a memory with additional tool data or code. This additional tool data or code can be transmitted to the processor. The processor is conditioned to store the additional tool data or code in the processor memory and is operable to direct the movement of the robotic arm using the additional tool data or code after the first additional tool has been removed from the tool holder.

In other words, the additional tool data or code transferred from the first additional tool persists in the processor memory and is used subsequently to drive the robotic arm, including to control other robotic tools. This allows the programming of the processor to be easily updated by shipping to the user of the robotic system new robotic tools containing updated tool data or code (see first paragraph of page 3 and penultimate paragraph of page 10 of the description).

The patent application also relates to a corresponding method for updating a robotic system as defined in independent claim 13.

2. Inventive step starting from D1

2.1 As set forth in the decision under appeal and acknowledged by the appellant (points 31-35 of the statement of grounds of appeal), D1 discloses a robotic system comprising the features of claim 1 which are identified in point 2.1 on page 4 of the decision. Therefore, the subject-matter of claim 1 differs from the system of D1 only in that the processor is operable to direct the movement of the robotic arm using the additional tool data or code after the first additional tool has been removed from the tool holder. The Board also shares this view.

2.2 Considering D1 as the closest prior art, the Examining Division formulated the **objective problem** to be solved starting from this document as **how to reduce the configuration time and delay when a tool is replaced with a tool of the same tool type**.

In the Examining Division's view, the person skilled in the art proceeding from D1 would have immediately realised that the tool-type data which is transmitted from a first tool coupled to the robotic arm is not specific to that particular tool but in fact is common to all other tools of the same tool type. Accordingly, an obvious measure to solve the above-mentioned technical problem would have been to store the tool-type data obtained from the first tool in the processor memory and to re-use this data to control the robotic arm after the first tool has been removed, for example to drive a second tool of the same type subsequently coupled to the robotic arm. The person skilled in the art would thus have arrived at the claimed solution without an inventive step.

The Board concurs with the appellant that this reasoning is not convincing.

2.3 It is true that D1 is directed to reducing the delay associated with a tool change (column 2, lines 30-31). However, as put forward by the appellant, there is no disclosure or teaching in D1 that data transmitted from a tool coupled to the robotic arm can be retained as persistent data in the processor memory and be used after that tool has been removed. Instead, D1 merely focuses on increasing the efficiency of "each" tool change (ibid.), i.e. separately and independently of the subsequent coupling of any other tool.

2.4 Instead of each tool transmitting its entire tool-type data to the processor each time it is coupled to the robotic arm (column 15, lines 44-60), D1 discloses that alternatively, tool-type data for various predefined tool types can be contained in a look-up table stored in the processor memory and that a tool coupled to the robotic arm can transmit only a tool-type identifier referencing the relevant portion of data in the look-up table (column 16, lines 5-11). This indeed minimises the amount of data transmitted from the tool to the system, thereby reducing the configuration time associated with that tool change.

D1 discloses that the look-up table is loaded in the processor memory and later updated by the system manufacturer (column 16, lines 8-14). There is no hint that the look-up table could be dynamically updated or expanded with additional tool data or code from a tool coupled to the robotic arm. **On the contrary, D1 explains that coupling a tool of a type which is not referenced in the table may "result in inadequate robotic control"** (column 16, lines 14-19). This **implies that the system is not configured to update the look-up table with additional tool data or code that might be transmitted from that tool**.

Even accepting the technical problem formulated by the Examining Division, the person skilled in the art starting from D1 and seeking to solve this problem would have had no reason, without the benefit of hindsight, to deviate from the solution based on a look-up table taught in D1. The Examining Division's reasoning fails to convince for this reason alone.

T 1587/18 (Earthquake damage prediction/SWISS RE) of 28.3.2023

European Case Law Identifier: ECLI:EP:BA:2023:T158718.20230328

EARTHQUAKE DAMAGE PREDICTION AND PREVENTION SYSTEM AND METHOD THEREOF

Sufficiency of disclosure - (no)

Application number: 09781198.8
IPC class: G06Q 40/00
Applicant name: Swiss Reinsurance Company Ltd.

Board: 3.5.01

https://www.epo.org/law-practice/case-law-appeals/pdf/t181587eu1.pdf

1. The invention

1.1 The invention concerns generating an "impact index" indicative of the damage caused by an earthquake to a pre-defined portfolio of objects, such as buildings and bridges, which are spread across different geographical locations (page 1, first paragraph and Figure 3 of the published application). Such indices find application in e.g. insurance loss and risk assessment (page 7, lines 4 to 5).

1.2 The application describes the calculation of the impact index using non-intuitive terms, but it is relatively clear that it is the sum of the product of the objects' values ("weighting factors" - page 9, lines 9 and 10, and Table 1) and the estimated percentage damage they would sustain for a given severity of the earthquake ("impact ratio" - Table 2). The severity of the earthquake at an object's location is calculated from a function of the earthquake's magnitude at its hypocenter 2, the distance of the object from the hypocenter (Figure 4) and a set of parameters ("variable weight parameters" - c1 to c4 in Equation (1)). In the concrete embodiment, this function is the one-dimensional Equation (1) on page 17, but it is referred to as a parameterised "3-dimensional earth model" on page 12, but only in very general terms.

2. Sufficiency of disclosure (Article 83 EPC)

2.1 In the written procedure, the appellant explained that the invention concerned parameterisation of the 3-dimensional model and the use of foreshocks. However, it was not clear to the Board, either from the claims, the description or the appellant's explanations, how the parameters of the model were affected by the user input or how the foreshock measurements played a role in the calculation of the local intensity values.

2.2 During the oral proceedings the appellant explained that the **key point of the invention was that the parameters in the model were based on a regression of user observed values of damage caused by previous earthquakes (the foreshocks).** Thus, the foreshocks were not playing the traditional role of predicting an impending major earthquake as described in the opening part of the description at the end of page 3; rather they were used in adapting the

parameters of the model to the characteristics of the region. Also, different "users" were performing a variety of activities, including entering initial values, observation values, and possibly carrying out the regression, although the system could have been doing that automatically.

2.3 In detail, the appellant explained that in the invention:

Firstly, a user configures the system by selecting a seismic wave propagation function, such as a 3-dimensional model of the earth's structure. Contrary to the Board's initial understanding the generalisation of Equation (1) to the 3-dimensional model was not part of the invention, as it was conceded to be known.

Secondly, the same or similar user enters default values for the model's parameters, as well as the above-mentioned "impact ratios" for different types of objects, e.g. depending on their building material.

Thirdly, a plurality of users at various locations observe and record:

- the damage (impact ratio) caused by a foreshock, i.e. some arbitrary earthquake, to existing objects (e.g. buildings) and

- information about these objects (such as the material they are made of).

From this information and the previously entered data, the system infers the local intensity of the foreshock that caused the damage at each place of observation. The sets of local intensities, foreshock's magnitude and the distances from the objects' locations to the foreshock's hypocenter, are regressed to adjust the model parameters.

Lastly, the propagation function with the adapted parameters can be used to predict the intensities of future earthquakes at the locations of all the objects in the portfolio, and thus the overall damage.

2.4 This explanation finally clears up many of the Board's doubts, expressed in its communications, about what the invention actually does. **However, although it is eminently plausible, the Board judges that it is not disclosed in the application**.

Firstly, although not a definitive legal proof, the fundamental idea of using observed data sets to determine the model's parameters did not occur to any of the members of the Board, despite reading the application at the beginning of the appeal and after both of the appellant's replies.

Moreover, the **Board is unable to derive it using the accepted legal standards from the application.** The **only pertinent passage** in the description is on page 13, second paragraph, according to which:

" ... the index calculation module 105 comprises means for adapting the variable weight parameters and/or generated impact ratios and/or object parameter based on those received by the plurality of users."

The **passage does not indicate any criteria for adapting any of the parameters, let alone that object parameters and impact ratios observed during foreshocks are used to infer the foreshock's local intensities at the objects' locations, or that the inferred local intensities, along with the foreshock's magnitude and the distances from the objects' locations to the foreshock's hypocenter, are used to adapt the model parameters** (i.e. the variable weight parameters).

2.5 The appellant argued that the skilled person reading the application as a whole would have understood how to adjust the variable weight parameters.

The Board disagrees because the application does not comprise any embodiments describing the parameters' adaptation. The language used in the above-mentioned passage on page 13 is too broad and the repeated use of "and/or" conjunctions creates ambiguity, making it impossible for the skilled person to determine what is being adapted and how this adaptation is carried out, or by whom.

2.6 The appellant also referred to the paragraph on page 17, lines 12 to 17, according to which the user inputs impact ratios which are stored in an impact ratio table in association with earthquake intensity levels.

The Board, however, notes that this passage corresponds to the second step of the method outlined above. The subsequent paragraphs clarify that the stored impact ratios are used for calculating the damage caused by an earthquake by employing a model with predefined parameters, which corresponds to the last step of the method. The stored impact ratios are not used to infer a foreshock's local intensities from observations and to adjust the model parameters, as outlined in the third step above.

2.7 In view of the above, the **Board concludes that the application fails to disclose the adaptation of the model parameters with sufficient clarity and completeness to enable the skilled person to carry it out. Given that this adaptation is an essential aspect of the invention, the Board judges that the application does not meet the requirements of Article 83 EPC.**

T 0255/20 () of 5.5.2023

European Case Law Identifier: ECLI:EP:BA:2023:T025520.20230505

COMPUTER AIDED ANALYSIS AND MONITORING OF MOBILITY ABNORMALITIES IN HUMAN PATIENTS

Claims - clarity
Claims - main request (yes)

Application number: 11837661.5

IPC class: A61B 5/103, A61B 5/11, G06F 19/00
Applicant name: Shani, Mordechai
Cited decisions:
T 0726/10

Board: 3.2.02

https://www.epo.org/law-practice/case-law-appeals/pdf/t200255eu1.pdf

1. The application

The application relates to a system for monitoring the position and the movement of limbs of a human patient. This system can find application for analysing mobility abnormalities of a patient and providing physical therapy.

The system comprises one or more sensors configured to capture, in a calibration session, 3D positioning and orientation of limbs of a human patient, who is instructed to follow a sequence of movements.

The system also comprises a processor configured to monitor a set of key points positioned in predefined locations on the limbs of the human patient and generate an abnormality profile by analysing the set of key points in view of deviations from a predefined normal mobility profile. The normal mobility profile represents a standard of a healthy human following the sequence of movements.

The processor is further configured to semi-automatically generate a set of physical training or physiotherapeutic exercises tailored for the human patient's motor capabilities, based on the abnormality mobility profile and additional input from a human expert.

The system is configured to monitor compliance of the human patient with the tailored physiotherapeutic exercises, monitor the set of key points while the human patient performs the tailored physiotherapeutic exercises and analyse the monitored set of key points to yield an assessment of the physiotherapeutic condition of the human patient.

The system can be beneficial in providing effective physiotherapy to a patient.

2. Main request - clarity

In the impugned decision, the Examining Division held that the following feature in claim 1 defined a result to be achieved and led to a lack of clarity, contrary to Article 84 EPC:

"**and wherein the processor is further configured to semi automatically generate a set of physical training or physiotherapeutic exercises tailored for the human patient's motor capabilities, based on the abnormality mobility profile and additional input from a human expert**".

The Board does not share this view.

The **feature in question does not define a result to be achieved. It defines a functional feature of the processor in terms of an output derived from some inputs, as is typically the case for claims defining how a processor is configured or programmed**.

According to the claim, the processor outputs a set of exercises on the basis of monitored motor capabilities of a human patient and an additional input from a human expert. The expression "semi automatically" refers to the fact that the additional input is required.

Even if the claim does not define the algorithm according to which the inputs are considered for the provision of the output, this is a matter of broadness of the claim, not clarity.

The Examining Division's explanation in points 15.2.1.1 and 15.3 of the impugned decision appear to refer to sufficiency of disclosure, not clarity, as they consider implementations over the whole scope of the claim and the disclosure of the claimed result. However, the decision was not based on an objection of insufficient disclosure under Article 83 EPC. In any case, the person skilled in the art, noting an anomaly in the motor capabilities of a patient, would have known how to implement an algorithm proposing exercises to help improve the patient's conditions taking into account additional user inputs. This is a matter of programming capabilities and knowledge of useful exercises for certain conditions.

In conclusion, **the subject-matter of claim 1 is clear and complies with Article 84 EPC.** Hence, the impugned decision is to be set aside.

T 0761/20 (Automated script grading/UNIVERSITY OF CAMBRIDGE) of 22.5.2023

European Case Law Identifier: ECLI:EP:BA:2023:T076120.20230522

Automated assessment of examination scripts

Patentable invention - mathematical method
Inventive step - (no)

Application number: 11183934.6
IPC class: G06N 99/00
Applicant name: The Chancellor, Masters and Scholars of the University of Cambridge
Cited decisions: G 0001/19, T 0641/00, T 1784/06, T 0489/14, T 0755/18, T 0702/20

Board: 3.5.06

https://www.epo.org/law-practice/case-law-appeals/pdf/t200761eu1.pdf

Catchwords:
According to G 1/19, a direct link with physical reality is not required for a technical effect to exist. However an at least indirect link to physical reality, internal or external to the computer, is required.

The link can be mediated by the intended use or purpose of the invention ("when executed" or when put to its "implied technical use"). (see point 20)

The application

1. The application relates to automated assessment of scripts written in examination, in particular English for Speakers of Other Languages (ESOL) examinations (paragraphs 1 to 3).

1.1 The system comprises a feature analysis module, denoted as RASP (robust accurate statistical parsing) which extracts and numerically quantifies linguistic features of text (paragraphs 52 to 56) to form a feature vector.

1.2 This feature vector is used to grade scripts on the basis of discriminative models, such as SVM or large margin perceptrons, including a variant, said to be new, called the Timed Aggregate Perceptron (TAP, see paragraph 28). In the TAP training procedure, unlike in standard perceptron training, a timing parameter redu-ces the update rate as a function of how far the pro-cess has progressed, of the magnitude of the increase in empirical loss, and of the balance of the training distributions (paragraph 36). This has the role of providing an approximate solution that prevents overfitting (by early stopping).

1.3 The application describes embodiments with binary outputs based on SVM or TAP, useful for pass/fail gra-ding systems (paragraphs 24 to 39), and an embodiment denoted as a modification of the TAP using preference ranking (paragraphs 41 to 49).

1.4 In the latter embodiment, the perceptron's success is measured by its ability to correctly rank pairs of training samples on the basis of its scalar output; this scheme is conceptually aimed at reducing errors in relative grading (i.e. the decision which test to assign a higher score) as opposed to errors in absolute grading. The output of a perceptron is in essence the result of a dot product between the learned weight vector and the incoming sample. In the standard perceptron, to reduce the ranking errors, the weight vector is updated in the direction of the misclassified samples; in the proposed variant, the update direction is provided by the sum of the difference vectors between the samples of the misclassified pairs. This variant can be used both for binary fail/pass grading and for non-binary grading.

…

Inventive step

The decision under appeal

3. The Examining Division has started its inventive step analysis from document D2 and acknowledged (decision, reasons 2.2) that a number of features were not disclosed by D2.

These features are those defining the preference ranking variant of the TAP, the Examining Division considering that D2 disclosed an automated grading system using TAP.

3.1 The Examining Division then argued that

"2.3 The distinguishing features above are merely representing mathematical or linguistic operations and entities, implemented on a general-purpose computer. Said features are not directed to a specific technical implementation going beyond the common use of a general-purpose computer, and their implementation would be, therefore, straightforward for the person skilled in computer science.

2.4 Furthermore, the above differences are not limited to a technical purpose, since it is not specified how the input and the output of the sequence of mathematical or linguistic steps of this difference relate to a technical purpose, so that said difference would be causally linked to a technical effect. In particular, it is noted that **grading text scripts is not considered as serving a technical purpose**, in the first place."

3.2 Thus, it considered that **neither the features themselves nor their claimed purpose were technical, so that they did not contribute to a technical effect, and that their implementation on a computer was straightforward.**

The Appellant's arguments

4. The Appellant disagreed both with the assessment of the differences in view of D2, …

The Board's opinion

Differences and technical problem

6. As the Board understands the argument of the Examining Division, it does not depend on whether the differences to D2 also comprise the ones advanced by the Appellant, as the claim as a whole can be said to only define "mathematical or linguistic steps" used for "grading text scripts". This means that, if the argument of the Examining Division is correct, the claim as a whole is not "causally linked to a technical effect".

7. Also the Appellant, challenging the finding of the Examining Division, refers to the claim as a whole when it states an alleged contribution to the art and the corresponding technical problem solved. This is appropriate, as the specific effects of any distinguishing features over D2 are only relevant for inventive step if it can be acknowledged at all that a technical problem is solved. If that is the case, the differences themselves might give rise, for instance, to an argument that the results according to the invention correlate better with those of human markers than the prior art methods (instead of merely "well").

8. The Board shares this view and will therefore also address the claim in its entirety to assess whether a combination of features solving a technical problem can be identified.

9. The claim defines a method of automated script grading using machine learning, which is effectively a computer implemented process. Such processes may have technical effects - and thus be deemed to solve a technical problem - at their input or output, but also by way of their execution (see G 1/19, reasons 85). A technical effect may also be acknowledged in view of their purpose, i.e. an (implied) technical use of their output (see G 1/19, reasons 137).

Technical effects "within the computer"

10. The claimed method contains steps for extracting nume-rical "linguistic" vectors from scripts (for all considered samples, training scripts and scripts to be graded), a step of training a perceptron, and a step of using the perceptron to grade the scripts.

10.1 The extraction of linguistic vectors, which is the step providing the input to the grading perceptron, is not detailed in the claim. According to the description (see paragraph 52), they are defined and selected to capture sufficient information for evaluating the de-gree of linguistic competence; they can be said to provide a "mathematical" summary of a script. Since the claim provides no detail as to the contents of the vector, this step cannot be considered to provide any contribution on its own, be it related to the script acquisition (e.g. scanning or OCR) or modelling, or to any optimization within the computer.

10.2 The claimed perceptron model is a linear mathematical function mapping the input numerical vectors to output grades. Specific details are only claimed with regard to its training procedure, which is optimized to pre-serve the ranking of grades, as opposed to minimizing the absolute error in output grades (see point 1.4 above). The model is not based on technical considerations relating to the internal functioning of a computer (e.g. targeting specific hardware or satisfying certain computational requirements), and the preference ranking is chosen merely according to its educational purpose, which does not relate to any effects within the computer either.

10.3 Also the final step of using the perceptron to grade the scripts provides no effects within the computer.

11. In principle, the claimed training procedure might constitute a technical contribution to the state of the art (see e.g. G1/19, reasons 33). Taken alone, however, this is a mathematical method, so this contribution is in the - excluded - field of mathematical methods (see T 0702/20 and T 0755/18, catchwords) and is therefore not a patentable contribution.

12. Thus the **Board cannot identify any technical problem solved be it at the input, or in generating the output grade output, or by execution of the claimed process**.

Technical effect via "implied technical use"

13. What remains as a potentially patentable contribution is the purpose of the claimed system to provide an automated tool for script grading. This corresponds to the problem formulated by the Appellant, namely "providing a computer system that can automatically grade text scripts [and provide grades] that correlate well with the grades provided by human markers".

The questions to be answered are (i) whether this problem is, or implies, a technical one, and (ii) whether it is actually solved (T 641/00, reasons 5 and 6).

14. Turning first to question (ii), the Board remarks that the **human grading process is a cognitive task in which the marker evaluates the content of the script (e.g. language richness and grammatical correctness) to assign a grade.**

14.1 The assigned grade depends on the content of the script itself, but is also at least partly subjective: the marker will have preferences as to style and language, and will be influenced by experience and grades assigned to scripts in the past.

14.2 The **Board thus doubts that the problem of automating script grading is defined well enough that one can properly assess whether it has been solved, i.e. in the sense that it provides a system that can actually replace different human markers and provide "correct" grades.**

14.3 The Appellant has captured this in the problem formulation by the qualifier "correlate well". Given the results in the application, showing that the claimed system provides results that agree with the ground truth on the same level as the markers agree with each other, the Board is satisfied that the system can produce outputs that "correlate well" with the training data from human markers. The Board has no occasion to challenge that the invention may for instance be useful, as the Appellant submitted, for the (self-)evaluation of linguistic competences by students.

15. In its communication, the Board questioned under Article 84 EPC whether the claims of the main request comprised all the features necessary to produce this result. However, given that the Appellant was willing to amend the claims to overcome this objection, the Board leaves this question open and proceeds on the assumption that the problem, as qualified by the Appellant, is solved.

16. Under this assumption, there is a first argument that any automation of human tasks, irrespective of the task, is sufficient to conclude that a technical problem is solved, as it reduces human labor.

16.1 This argument, however, contradicts the requirement of G 1/19 that there must be a technical purpose. Though G 1/19 was related to computer-implemented simulations, its reasons apply to computer-implemented methods other than simulations as well.

16.2 The Enlarged Board stated that "information which may reflect properties possibly occurring in the real world [...] may be used in many different ways", that "a claim concerning the calculation of technical information with no limitation to specific technical uses would therefore routinely raise concerns with respect to the principle that the claimed subject-matter has to be a technical invention" (reasons 98), and that "[i]f the claimed process results in a set of numerical values, it depends on the further use of such data (which use can happen as a result of human inter-ven-tion or automatically within a wider technical pro-cess) whether a resulting technical effect can be con-sidered in that assessment" (reasons 124), and concluded

that "such further [technical] use has to be at least implicitly specified in the claim" (reasons 137).

16.3 Therefore, **the argument that a technical problem is already solved by the mere provision of any automated tool cannot succeed**.

17. As stated above, the Board assumes that the claimed invention serves the purpose of supporting its users in evaluating linguistic competences, as the Appellant argued. The Board also cannot see any other implied purposes. **The question remains whether the assessment of linguistic competences, or maybe merely providing a grade, is a technical purpose.**

What is technical?

18. The Appellant considers that automated grading makes a technical contribution in the field of "educational technology" and, if the Board disagrees, asks the question "what is a technical field?" or "a field of technology?".

19. The Board understands these two questions to be equivalent. The express reference to "fields of technology" in Article 52(1) EPC, introduced with the EPC 2000 in order to bring Article 52 EPC in line with Article 27(1) TRIPS, was not intended to change the established understanding that patent protection is "reserved for creations in a technical field", i.e. involving a "tech-nical teaching [...] as to how to solve a particular technical problem" (see OJ EPO Special edition 4/2007, 48, but also G 1/19, reasons 24, and T 1784/06, reasons 2.4).

19.1 **The Board further notes that the field of "educational technology" as defined by the Appellant (see point 5 above) is a rather inhomogeneous one, covering insights from - and presumably contributions to - a wide range of "fields", technical ones and non-technical ones. It appears questionable, therefore, that this field can be considered a technical one as a whole. However, this question is not decisive.**

19.2 What is **decisive, according to established case law of the Boards of appeal**, is **whether the invention makes a contribution which may be qualified as technical in that it provides a solution to a technical problem**. If this is the case, a contribution to a field of technology may be said to also be present. It is noted that the "field" of this contribution may be different from the one to which the patent more generally relates: for instance, inventions within the broad field of "educational technology" may make contributions in the field of computer science.

20. In G 1/19, the Enlarged Board followed its earlier case law and "refrain[ed] from putting forward a definition for 'technical'", because this term must remain open (section E.I.a, especially reasons 75 and 76; see also OJ EPO Special Edition 4/2007, 48). Nonetheless, the Enlarged Board provided considerations as to what may be considered technical.

20.1 The referring Board had suggested that a technical effect might require a "direct link with physical reality, such as a change in or a measurement of a physical entity" (see T 489/14, reasons 11).

20.2 The Enlarged Board accepted that such a "direct link with physical reality [...] is in most cases sufficient to establish technicality" (reasons 88) and, in this context, that "[i]t is generally acknowledged that measurements have technical character since they are based on an interaction with physical reality at the outset of the measurement method" (reasons 99). It also stressed that an effect could also be "within the computer system or network" (i.e. internal rather than "(external) physical reality", see G 1/19, reasons 51 and 88).

20.3 It recalled that potential technical effects might also be sufficient (see also reasons E.I.e), i.e. "effects which, for example when a computer program [...] is put to its intended use, necessarily become real technical effects" (reasons 97).

20.4 And it also considered that calculated data, while "routinely raising concerns with respect to the principle that the claimed subject-matter has to be a technical invention over substantially the whole scope of the claims" might contribute to a technical effect by way of an implied technical use (reasons 98 and 137), "e.g. a use having an impact on physical reality" (rea-sons 137).

20.5 While the Enlarged Board of Appeal has thus found that a direct link with physical reality may not be required for a technical effect to exist, it has, **in this Board's view, confirmed that an at least indirect link to physical reality, internal or external to the computer, is indeed required.** The link can be mediated by the intended use or purpose of the invention ("when executed" or when put to its "implied technical use").

21. Returning to the case at hand, the Board finds that automated **script grading, by itself or via its intended use for evaluating linguistic competences, does not have an implied use or purpose which would be technical via any direct or indirect link with physical reality**.

Conclusion

22. The claimed computer-implemented method of automated script grading does not provide a contribution to any technical and non-excluded field, be it by way of how the automation is carried out, or by way of its use; an inventive step according to Article 56 EPC can therefore not be acknowledged.

T 1634/20 (Bildqualität/BUNDESDRUCKEREI) of 22.5.2023

European Case Law Identifier: ECLI:EP:BA:2023:T163420.20230522

VERFAHREN ZUM BEWERTEN EINER BILDQUALITÄT EINES BILDES

Erfinderische Tätigkeit - Keine technische Aufgabe

Anmeldenummer:	14727447.6
IPC-Klasse:	G06K 9/00, G06K 9/03
Name des Anmelders:	Bundesdruckerei GmbH

Angeführte Entscheidungen: G 0001/19

Kammer: 3.5.06

https://www.epo.org/law-practice/case-law-appeals/pdf/t201634du1.pdf

Anspruch 1 des Hauptantrags lautet wie folgt:

Verfahren (100) zum automatisierten Bewerten einer Bildqualität eines Bildes, mit:

Extrahieren (101) eines ersten Bildbereichs des Bildes;

Extrahieren (103) eines zweiten Bildbereichs des Bildes;

Bestimmen (105) eines ersten Tonwertumfangs des ersten Bildbereichs;

Bestimmen (107) eines zweiten Tonwertumfangs des zweiten Bildbereichs; und

Bestimmen (109) eines Unterschiedes zwischen dem ersten Tonwertumfang mit dem zweiten Tonwertumfang, um die Bildqualität zu bewerten

wobei das Bild ein Bild einer Person ist,

wobei der erste Bildbereich eine Abbildung des Gesichts der Person oder eines Gesichtsbereichs der Person umfasst,

wobei der zweite Bildbereich eine der folgenden Abbildungen umfasst: weiterer Gesichtsbereich der Person, Bildhintergrund, Haare der Person, Hals der Person, Torso der Person,

wobei das Bestimmen (109) des Unterschieds zwischen den Tonwertumfängen ein Anwenden einer mathematischen Abbildung von den Tonwertumfängen der Bildbereiche auf ein Maß zum Bewerten der Bildqualität umfasst,

so dass den Bildbereichen eine unterschiedliche Gewichtung bei der Bewertung der Bildqualität zukommt.

Die Anmeldung

1. Die Anmeldung bezieht sich auf die Bewertung der Qualität eines Bildes, insbesondere auf seine Eignung für ein Identifikationsdokument wie einen Reisepass oder einen Führerschein (Seite 1, Zeile 7-11, und Seite 7, Zeilen 17-24).

1.1 Es wird vorgeschlagen, die Qualität auf Basis von Unterschieden im Tonwertumfang zwischen Bildbereichen, z.B. zwischen dem Gesichtsbereich und dem Bildhintergrund, zu bewerten (Seite 1, letzter Absatz), und zwar durch "Anwenden einer mathematischen

Abbildung von den Tonwertumfängen der [...] Bildbereiche auf ein Maß zum Bewerten der Bildqualität" (Seite 15, Zeile 14-17; Seite 20, Zeile 24-27).

1.2 Gemäß der Anmeldung auf Seite 15, und "gemäß einer Ausführungsform", "wird die Bildqualität des Bildes als hoch bewertet, wenn alle Bildbereiche jeweils einen hohen Tonwertumfang aufweisen".

…

Hauptantrag

2. Die Prüfungsabteilung war der Ansicht (Bescheid vom 28. Oktober 2019, Punkt 1), dass "Ohne weitere Einschränkung [...] die Aufgabe der Bestimmung einer Bildqualität eines Bildes keine technische Aufgabe [sei], da sie anhand von nicht technischen, insbesondere ästhetischen Gesichtspunkten bestimmt werden [könne]". Sie widersprach der Anmelderin darin, dass die Erfindung mit der Prüfung eines Reifenprofils vergleichbar sei (s.u., Punkt 3.3), da es sich "anders als [...] bei der Profiltiefe eines Reifens [...] bei der Bildqualität nicht um eine wohldefinierte technische Messgröße" handele.

2.1 Hingegen sei "die Bestimmung der Bildqualität im Sinne einer Eignung des Bildes für eine spätere Identifikation eine technische Aufgabe". Für diesen Zweck seien die beanspruchten Verfahrenschritte "Allerdings [...] viel zu breit gefasst, als dass sie tatsächlich zu der Lösung dieses technischen Problems beitragen würden."

…

4. In ihrer Mitteilung vom 1. Dezember 2022 äußerte die Kammer die Auffassung, dass der **Begriff der "Bildqualität" ohne Angabe eines Zwecks unklar** sei, da er in der Bildverarbeitungstechnik **nicht eindeutig definiert sei und beispielsweise ein rein subjektives Maß sein könne** (Artikel 84 EPÜ).

4.1 Insoweit stelle die Bewertung der Bildqualität im allgemeinen auch keine klare technische Aufgabe dar, und daher könne kein technischer Beitrag zum Stand der Technik anerkannt werden. Wenn auch das beanspruchte Verfahren als Ganzes nach ständiger Rechtsprechung der Beschwerdekammern nicht von der Patentierbarkeit ausgeschlossen sei, liege eine erfinderische Tätigkeit im Sinne des Artikels 56 EPÜ nicht vor, da die Kammer die "eindeutig technischen Merkmale" als für den Fachmann naheliegende Schritte zur Implementierung eines (gegebenen) nicht-technischen Verfahrens ansehe.

5. In ihrem Schreiben vom 23. Januar 2023 verwies die Beschwerdeführerin auf den Abschnitt G-II, 3.3 in den Prüfungsrichtlinien des EPA, der "digitale Audio-, Bild- oder Videoverbesserung oder -analyse, z.B. Entrauschen, Personenerkennung in einem digitalen Bild, Beurteilung der Qualität eines übertragenen digitalen Audiosignals" als solche Beispiele für mathematische Methoden anführt, die im Kontext der Erfindung eine technische Wirkung erzeugten (Hervorhebungen durch die Beschwerdeführerin). Die Bewertung der Bildqualität wie beansprucht müsse analog ebenfalls als ein technischer Beitrag angesehen werden.

6. Während der mündlichen Verhandlung führte die Beschwerdeführerin weiter aus, dass die Ansprüche bewusst nicht auf den Zweck beschränkt seien festzustellen, ob die Qualität eines Bildes für seine Verwendung als Passfoto ausreiche.

6.1 Mit Zweckbeschränkung sei der mögliche Schutzbereich zu eng. Zur Anmerkung der Kammer, dass so das Verfahrensergebnis nur eine Zahl sei, betonte die Beschwerdeführerin, dass diese Zahl dennoch Informationen über die Bildqualität enthalte und für verschiedene Zwecke nutzbar sei.

6.2 Ein konkreter solcher Zweck sei kein wesentliches Merk-mal der Erfindung. Ihr Kern sei es, ein Qualitätsmaß aus den Tonwertumfängen verschiedener Bereiche abzuleiten, und dies sei klar im Anspruch gemacht worden. Die Bedeutung des Begriffs "Bildqualität" als eine objektive Größe gehe daher aus dem Anspruch selbst hervor.

6.3 Weitere Einzelheiten zur Ausführung der Bewertung seien im Anspruch nicht nötig. Es sei dem Fachmann klar, welche mathematischen Abbildungen geeignet wären, und die Anmeldung gebe auf Seite 20 auch ein detailliertes Beispiel an. Dass die Anmeldung keine konkreten Ergebnisse enthalte, sei der Tatsache zu schulden, dass die Beschwerdeführerin ihre Idee so schnell wie möglich habe schützen lassen wollen. Der Fachmann sei jedoch in der Lage, die Parameter des beschriebenen Verfahren selbst zu wählen und zu testen.

Auffassung der Kammer: Klarheit

7. Wie schon erwähnt, und von der Beschwerdeführerin nicht bestritten, ist der Begriff der Bildqualität in der Bildverarbeitung nicht einheitlich definiert. In dieser Hinsicht teilt die Kammer die Ansicht der Prüfungsabteilung, dass **Bildqualität auch ein rein subjektives Maß sein kann**: Beispielsweise kann die Qualität eines Originalbildes im Vergleich mit einem verarbeiteten, geschärften Bild ebenso als schlechter angesehen werden (z.B. aus ästhetischen Gründen, weil es bspw. farblos oder unscharf erscheint) wie auch als besser (etwa allein deswegen, weil es realitätsgetreuer ist).

8. Die Kammer teilt auch nicht die Auffassung, dass der Begriff durch die beanspruchten Schritte, insbesondere die Verwendung einer mathematischen Abbildung von den Tonwertumfängen zu einem objektiven Qualitätsmaß, klar werde.

9. Das relevante Merkmal definiert das "Anwenden einer mathematischen Abbildung von den Tonwertumfängen der Bildbereiche auf ein Maß zum Bewerten der Bildqualität".

9.1 Die mathematische Abbildung ist im Anspruch nicht weiter definiert. Es ist dem Fachmann grundsätzlich klar, dass nicht jede mathematische Abbildung zu einem sinnvollen Qualitätsmaß führen kann. Aber der Anspruch gibt keinen Hinweis darauf, welche Abbildungen vom Anspruch umfasst sind, weil eben nicht festgelegt ist, in welchem Sinne oder zu welchem Zweck die Qualität bewertet werden soll. Es ist daher unklar, ob eine gegebene mathematische Abbildung unter den Schutzbereich fällt oder nicht.

9.2 Auch kann das von der Beschwerdeführerin gegebene Beispiel der Reifenprofilmessung, wie schon von der Prüfungsabteilung richtig festgestellt (Bescheid vom 28. Oktober 2019),

nicht überzeugen, da im Unterschied zur Bildqualität die Profiltiefe eine objektiv definierte Messgröße ist. Die behauptete Analogie liegt daher nicht vor.

10. Nach alledem ist Anspruch 1 nicht klar (Artikel 84 EPÜ).

Auffassung der Kammer: technischer Beitrag

11. Ungeachtet des Klarheitseinwands ist das Ergebnis des beanspruchten **Verfahrens im Kern ein numerisches oder anderweitig diskretes Qualitätsmaß** (gut/schlecht). Wie von der Großen Beschwerdekammer in G1/19 festgestellt, und im Widerspruch zu den Ausführungen der Beschwerdeführerin, kommt Daten eine technische Wirkung allenfalls dann zu, wenn ihr technischer Zweck im Anspruch wenigstens implizit ist (G 1/19, Entscheidungsgründe 98 und 137).

11.1 Das ist **hier nicht der Fall**. Der Anspruch impliziert ausdrücklich keinerlei Zweck, und er schließt auch nicht-technische Zwecke (bspw. ästhetische) nicht aus.

11.2 Der zitierte Abschnitt G-II, 3.3 aus den Prüfungsrichtlinien des EPA, die ohnehin für die Kammer nicht bindend sind, steht dem genannten Ergebnis nicht entgegen. Den Beispielen fehlt es im übrigen an Details, und die Kammer merkt auch an, dass die "Beurteilung der Qualität eines [...] digitalen Audiosignals" dort - im Unterschied zum vorliegenden Fall - nur im Kontext einer Datenübertragung betrachtet wird.

12. Da dem Anspruch **keine technische Wirkung** zugeschrieben werden kann, beruht sein Gegenstand nicht auf einer erfinderischen Tätigkeit im Sinne des Artikels 56 EPÜ.

T 1618/19 () of 28.2.2023

European Case Law Identifier: ECLI:EP:BA:2023:T161819.20230228

RUNDOWN BLENDING OPTIMIZATION APPARATUS AND METHOD

Inventive step - auxiliary request (yes)

Application number: 12789274.3
IPC class: G06Q 10/06, G05B 19/418
Applicant name: AspenTech Corporation
Cited decisions: G 0001/19

Board: 3.4.03

https://www.epo.org/law-practice/case-law-appeals/pdf/t191618eu1.pdf

1. The invention as claimed

1.1 The invention relates to product blending and component inventory management in a refinery. The objective of the product blending operations is to meet all the shipment commitments on schedule, while operating within the tank inventory constraints both for the blending components as well as the blended products. This operation should be executed in an optimal fashion in terms of overall cost and profitability. A multi-period blending optimisation system produces the optimum schedule for blending, along with optimum recipes and blended volume for each blend, while addressing the underlying inventory optimisation problem.

1.2 It is an alleged object of the invention to additionally minimise give-away losses (losses that occur when a premium quality product must be sold for the regular product price), to utilize better the most valuable components in higher quality products or as direct sales, thus increasing the net profitability of the refinery. A further objective is to realise a multi-period blending optimisation system that can optimise blending operations for components without storage tanks (see pages 1 and 2 of the application).

1.3 This is **achieved by a nonlinear mathematical model which simulates an ongoing refinery process taking into account initial values and cost parameters (main request) and by minimising the number of changes of the split ratio for a splitter and of the sequence of blends (first auxiliary request).**

…

Main Request

3.1 Technicality

3.1.1 The claimed subject-matter relates to a concrete apparatus, namely a blending control system in a refinery, and a corresponding method and is therefore overall undoubtedly technical.

3.1.2 Moreover, the claimed blending control apparatus/method comprises a computer modeling apparatus/method. The modeling is performed for an active refinery process in an actual refinery. The feeding of the model with the input parameters (flow and product parameters of the "rundown components supplied from the splitter" and refinery product commitments) as well as the direct conversion of the simulation results ("blend recipes", "blend events", "blend timing", "split ratio") into output signals for the control of the blender and splitter in the refinery process can be considered technical inputs / outputs according to G 1/19, OJ EPO 2021, A77, reasons 85, and are therefore technical or have a technical effect.

3.1.3 The **feeding of process parameters of a running process, i.e. the refinery process, into the simulation and the conversion of calculated process parameters into control signals are thus indications of a "direct link with physical reality" (G 1/19, reasons 88) and of a "further technical effect"** that goes beyond the mere technical implementation of the algorithm in a computer (G 1/19, reasons 91). …

3.1.4 Consequently, the entire subject-matter of claims 1 and 6 is considered technical.

…

3.5 Effect and problem

3.5.1 The appellant defined the technical problem as "providing a blend control system that is more cost effective and provides a higher quality blend than the system in D5".

3.5.2 In this regard, the board disagrees because the differing features do not improve the model, schedule, or blending process in D5. These features are not explicitly mentioned in D5 simply because the focus in D5 is not on the refinery process as such and the refinery infrastructure, but rather on the modeling, planning, and scheduling.

3.5.3 The board therefore defines the **problem to be solved as implementing the model described in D5 in a realistic refinery infrastructure**.

…
3.6.4 Consequently, the board is of the opinion that the subject-matter of claim 1 is not inventive over D5 in combination with document D7 and the common general knowledge of the skilled person (Articles 52(1) and 56 EPC).

4. First auxiliary request - inventive step
…

4.3.2 D5 fails to disclose:

(e) to encourage the sequence of blends to remain the

same from one optimization and the next

(f) to minimize the number of changes in the split

ratio for the or each splitter

4.4 Effect and problem

The effect of differing features (e) and (f) is independent from the effect of differing features (a) to (d). Features (e) and (f) have the effect of increasing the robustness of the blend schedule and blending system (page 17, lines 8 to 10). This applies to both the optimisation problem and the refinery infrastructure. Every change leads to additional risks and efforts, both in terms of timing, production downtime and additional personnel and material expenses. The **additional partial problem to be solved may therefore be formulated as "increasing the robustness of the system and running the optimisation of the scheduling in a conservative manner".**

4.5 Non-obviousness

ad (e)

4.5.1 D5 does not disclose a "conservative system", but a system with high flexibility ([0018]), e.g. to deal with particularly favorable or cheap crude oil being available on the spot market at short notice. In this case, production volumes can be increased at short notice in order to benefit from the currently favorable crude oil ([0036]). This already leads away from the problem to be solved.

4.5.2 If the skilled person is entrusted with the problem to be solved, the straightforward solution would be to use the weighting factors in D5 to make the system more "inert". However, the weighting factors in D5 ([0048], [0089]) are used differently than in the present application (see equations (19) and (24) in the description of the application). The weighting factors are used as part of the optimization procedure and are used to converge the optimization towards a termination criterion ([0055], Figure 5). These weighting factors cannot make the system as a whole more "inert" with respect to certain specific parameters.

4.5.3 In order to run the optimisation of the scheduling in a conservative manner, the skilled person would first have to select, out of a variety of parameters, the specific parameters to be discouraged by the system for change. One solution would be to make the blends themselves more "inert", i.e. to reduce the changes from one blend to the next blend, e.g. by introducing a "damping" mechanism which reduces the changes determined by the optimization scheme. This is however not what is claimed. Rather, independent claims 1 and 6 of the first auxiliary request require that the "sequence of blends" and thus the order and timing of the blends should remain unchanged from one optimization to the next. There is no suggestion for this feature in the available state of the art, neither in D5 nor in D7 nor in any other cited document.

ad (f)

4.5.4 Furthermore, since D5 itself does not reveal any splitter, the skilled person does not receive any suggestion to minimize the changes in the split ratio. D7 and D9 and the other cited documents are also completely silent about this feature.

4.5.5 Hence, the board is of the opinion that the subject-matter of claims 1 and 6 of the first auxiliary request is not obvious to the skilled person. Claims 2 to 5 and 11 and claims 7 to 10 are dependent on claims 1 and 6, respectively.

Accordingly, the subject-matter of claims 1 to 11 of the first auxiliary request involves an inventive step (Articles 52(1) and 56 EPC).

5. Summary

The subject-matter of claim 1 of the main request does not involve an inventive step.

T 1148/18 (Travel process prediction/THE AQUA ENTERPRISE COMPANY) of 15.12.2022

European Case Law Identifier: ECLI:EP:BA:2022:T114818.20221215

TRAVEL PROCESS PREDICTION SYSTEM AND COMPUTER PROGRAM

Inventive step - predicting travel time of transportation (no Inventive step - not technical)

Application number:	11854755.3
IPC class:	G06Q 50/30, G06Q 10/04, B61L 25/02, B61L 27/00, G06Q 30/02 G06Q 30/04, G06Q 50/26, G08G 1/005
Applicant name:	The Aqua Enterprise Company
Cited decisions:	T 1173/97, T 0641/00, T 0154/04, T 1670/07, T 1954/08, T 0983/11 T 0977/17

Board: 3.5.01

https://www.epo.org/law-practice/case-law-appeals/pdf/t181148eu1.pdf

The invention

1. The invention concerns a system for predicting travel time ("travel process") of a passenger or baggage ("travel object") using e.g. scheduled flights ("transportation repeatedly operated at specific time") (see preamble of claim 1 and paragraphs [0004] and [0005] of the published application).

More particularly, the claims concern a comparative prediction of the passage time ("a request for comparing passage time at which the travel object passes through a specific passage point when the travel object uses each of the plurality of pieces of transportation" - means for accepting feature in claim 1). As shown in Figure 15, a user provides information about flight A and flight B in order to compare them.

According to paragraph [0062] the comparison is based on the statistical analysis of previous travellers' data associated with the two different flights. This data includes the points in time on which travellers pass through various checkpoints at the airport ("passage time" - first means feature of the claim) and corresponding flight information ("transportation specifying information" - second means feature) - see Figure 8.

The system calculates a mean/variance of a passage time (calculating feature), e.g. the exit time at the arrival airport, and performs a statistical test (testing feature). Based on the test result the user receives an advice ("explanatory data" - storage means and extracting features), for example "Make travel plan with sufficient time to spare" (see Figure 19, "ADVICE T").

Main request, inventive step (Article 56 EPC)

2. The wording of claim 1 is very general and, thus, admits a broad interpretation.

For example, in the first feature, "**specifying a passage time**" could mean that an operator inputs this data manually (see paragraph [0030]), which is probably the ordinary meaning of "specifying", whereas the appellant considers it to be automatic "measuring" using a check machine. Similarly, the term "**acquiring**" in the second feature covers manually and automatically inputting flight data.

Furthermore, it is meaningless to compare the mean of the "passage times", which are absolute time points for different flights, for example an exit time at the arrival airport. However, for the sake of argument, the Board accepts the appellant's interpretation that it means comparing an elapsed (relative) time between passage points, for example the time between leaving the airplane and exiting the airport.

3. The Board judges that, regardless of the above, **claim 1, in technical terms, defines a general purpose computer system which runs a software for implementing a non-technical concept, namely predicting a travel process or, more specifically, a travel time such as a duration of stay in an airport.**

In light of the description the travel time depends on a number of (possibly interrelated) factors, for example airline schedules, passenger volume, weather conditions, entry formalities or customs/security handling. These **factors are either of an administrative nature or a matter of logistics planning**. They are, however, not based on technical considerations, for example regarding the operation of a technical system in the airport.

To identify the relevant factors and come up with a statistical prediction model might involve a great deal of ingenuity and be far from trivial. This, however, pertains to the field of statistics applied to **logistics planning** which is **not a field of technology** as required by Article 52(1) EPC.

In the Board's view predicting a travel time based on historical data is conceptually similar to predicting arrival dates for delivery of mail based on previous delivery times (see T 0983/11 - Coordinated marketing/PITNEY BOWES, reasons, point 2.4) or predicting future purchases based on previous ones (see T 0977/17 - Storing electronic receipts/OTTO GROUP SOLUTION PROVIDER, reasons, point 2.2).

These are all activities excluded per se from patentability under Article 52(2)(a) and/or (c) and (3) EPC (cf. also T 154/04 - Estimating sales activity/DUNS LICENSING ASSOCIATES, reasons, points 19 and 20).

4. Claim 1 differs from a general purpose computer system merely in the functions provided by the claimed means.

These functions essentially define the various aspects of statistics involved in predicting the travel time, i.e. data collection, organisation/storage, analysis, interpretation and presentation.

Specifically, they include:

- collecting ("specifying", "acquiring") and "storing" logistics (passage time, transportation specifying information) and statistical data (explanatory data comprising an explanatory text);

- receiving ("accepting") user input (i.e. flight information and a specific passage point) to perform a comparative analysis;

- retrieving ("extracting") historical data for the given user input and performing statistical calculations ("calculating", "statistically testing");

- providing ("extracting", "outputting") the results of the calculations and an explanation of the statistics.

First, **these steps relate to mental or mathematical activities and are normally part of any statistical data analysis**. It is a person skilled in the application of statistical mathematics to logistics planning, **not a technically skilled person, that performs this kind of statistical analysis. Mathematical/statistical methods as such do not have technical character** (Article 52(2)(a) and 52(3) EPC), and cannot contribute to inventive step.

Second, the **output of the analysis is not used for a technical purpose**. It merely supports the user in creating a (possibly more accurate) travel schedule - see paragraph [0130] of the application.

…

7. The Board, however, agrees with the appellant that Figure 1 indeed shows a hardware architecture going beyond a general purpose computer system, but this is not reflected in the claim.

As mentioned above, the claimed "means" neither refer to specific hardware means (e.g. readers, servers, etc.) nor to a specific hardware/software configuration that could provide a further technical effect (cf. T 1173/97 - Computer program product/IBM, Headnote), e.g. by allocating functions to different system components.

The claim merely provides a functional definition of "means" and, thus, is not limited to any particular technical features. In other words, the means may be realised by simply programming the corresponding functions on a computer.

8. The statistical calculations might, as argued by the appellant, provide accurate/reliable prediction results. This is, however, an inherent property of the calculations themselves and not a result of a particular implementation or the underlying technical system.

9. In the Board's view the **prediction of a travel time is not a technical activity** - see point 3 above. Hence, **a more accurate or faster prediction, in the sense of an enhanced speed of**

the prediction algorithm, can not be considered technical either (see T 1954/08 - Marketing simulation/SAP, reasons, point 6.2).

Also, **any results thereof, e.g. a more accurate travel schedule, are not technical as the prediction does not affect a technical system involved in, and thus impacting on, the (physical) travel process.**

For the same reason also the appellant's argument that using a large amount of (measurement) data and applying complex statistical calculations were not usual at the priority date of the application fails. These are, as outlined above, non-technical activities and can be included in the problem specification. Thus, for assessing inventive step it is irrelevant whether or not they were known in the prior art.

10. The appellant argued that storing explanatory data/text would provide a feedback or self-learning system enabling more accurate/reliable future predictions.

The Board cannot see that the explanatory data (see Figure 18) is in any way related to a feedback/learning loop for controlling a technical system. The purpose of the explanatory text is to explain to the layperson the results of statistics - see Figure 19. Such explanation neither represents technical data nor supports the user in performing a technical task. Thus, it cannot produce a technical effect (see T 1670/07 - Shopping with mobile device/NOKIA, reasons, point 13).

11. For the reasons given, the Board judges that claim 1 of the main request lacks an inventive step over a general purpose computer system (Article 56 EPC).

T 0702/20 (Sparsely connected neural network/MITSUBISHI) of 7.11.2022

European Case Law Identifier: ECLI:EP:BA:2022:T070220.20221107

HIERARCHICAL NEURAL NETWORK DEVICE, LEARNING METHOD FOR DETERMINATION DEVICE, AND DETERMINATION METHOD

Inventive step - (no)

Application number: 14882049.1
IPC class: G06N 3/04
Cited decisions: G 0001/19, T 0641/00, T 0154/04, T 1326/06, T 1294/16, T 1924/17
Citing decisions: T 0761/20
Applicant name: Mitsubishi Electric Corporation

Board: 3.5.06

Catchwords:
A neural network defines a class of mathematical functions which, as such, is excluded matter. As for other "non-technical" matter, it can therefore only be considered for the assessment of inventive step when used to solve a technical problem, e.g. when trained with specific data for a specific technical task.

https://www.epo.org/law-practice/case-law-appeals/pdf/t200702eu1.pdf

Claim 1 of the main request defines:

A hierarchical neural network apparatus (1) implemented on a computer comprising

a weight learning unit (20) to learn weights between a plurality of nodes in a hierarchical neural network, the hierarchical neural network being formed by loose couplings between the nodes in accordance with a sparse parity-check matrix of an error correcting code, wherein the error correcting code is a LDPC code, spatially-coupled code or pseudo-cyclic code, and comprising an input layer, intermediate layer and output layer, each of the layers comprising nodes; and

a discriminating processor (21) to solve a classification problem or a regression problem using the hierarchical neural network whose weights between the nodes coupled are updated by weight values learned by the weight learning unit (20)

or comprising

a weight pre-learning unit (22) to learn weights between a plurality of nodes in a deep neural network, the deep neural network being formed by loose couplings between the nodes in accordance with a sparse parity-check matrix of an error correcting code, wherein the error correcting code is a LDPC code, spatially-coupled code or pseudo-cyclic code, and comprising an input layer, a plurality of intermediate layers and an output layer, each of the layers comprising nodes; and

a discriminating processor (21) to solve a classification problem or a regression problem using the deep neural network whose weights between the nodes coupled are updated by weight values learned by the weight pre-learning unit (22)

and

a weight adjuster (23) to perform supervised learning to adjust the weights learned by the weight pre-learning unit (22) by supervised learning; and wherein

the weights are learned by the weight pre-learning unit (22) by performing unsupervised learning; and

the weights between the nodes coupled are updated by weight values adjusted by the weight adjuster (23).

The application

1. The application relates to a neural network apparatus, a method of classifier learning and a discrimination method (paragraph 1). It starts from the observations (paragraphs 2 and 3) that a standard fully connected neural network requires a large amount of computations and may lead to overfitting, i.e. a classifier that learns the training data too well and is not able to generalise.

1.1 It is thus proposed to reduce the number of connections between the nodes; the application talks about "loose coupling" in this context. Unlike the prior art cited in paragraph 3 of the application, the connections are established prior to the training, independently of the learning data (paragraph 6), according to the check matrix of an error correcting code (figure 4, paragraphs 7, 19-23).

1.2 According to the application at paragraph 27: "making the loose couplings between the nodes based on the check matrix of an error correcting code enables the classifier learning and discriminating processing to be performed at high speed while maintaining the discrimination performance".

The decision under appeal

2. There is agreement between the Examining Division and the Appellant (grounds of appeal page 2), and indeed the Board, that the **difference between the claimed invention and D1 resides in that the different layers of the neural network are connected in accordance with an error code check matrix.**

3. The Examining Division argued (12.1.3) that these distinguishing features "do not serve a technical purpose, and they are not related to a specific technical implementation either. They merely pertain to the initial, fixed structural definition of an abstract mathematical neural network-like model with unknown, possibly abstract data in- and outputs by means of a binary-valued matrix prior to the model's further simulation and manipulation by means of a computer".

The Appellant's arguments

4. The Appellant argued in the grounds of appeal that the whole system claimed served a technical purpose (grounds of appeal, bottom of page 2 and first full paragraph on page 3).

4.1 The claims related to machine learning "which serves a technical purpose by solving a well defined technical problem by mathematical means". This argument was supported by analogy to T 1326/06 (issued by this Board in a different composition), in which it had been recognized, in the Appellant's words, "that methods relating to data encoding and/or decoding can serve a technical purpose even though they are almost entirely based on mathematical algorithms and used for encrypting and decoding abstract data".

4.2 The system was implemented by a computer, so a specific technical implementation was present. T 697/17 stated in section 3.5 of its reasons that "describing a technical feature at a

high level of abstraction does not necessarily take away the feature's technical character". The Appellant argued that "By analogy, the possibility that the neural network apparatus may process unknown, possibly abstract data in- and outputs should not necessarily take away the technical character of the distinguishing feature" (page 3, paragraph 3).

4.3 The distinguishing feature solved the problem of improving the learning capability and efficiency of a machine (page 4, paragraph 3) by reducing the required computational resources and preventing overfitting (page 3, paragraph 4). This "paved the way for the de-velopment of compact hardware artificial intelligence" as shown by DA1. These technical effects were demon-stra-ted in scientific papers and "the specific design of sparse neural networks has become a major research trend in the field of machine learning recently" as shown by DA2 (page 4, paragraphs 1 and 2).

5. In its **preliminary opinion, the Board tended to agree with the Examining Division** and, in particular, did not consider that machine learning in general solved a technical problem or constituted a field of technology within the meaning of Article 52(1) EPC. In response, the Appellant provided the following arguments during the oral proceedings before the Board.

6. The claim was directed to a neural network apparatus. An artificial neural network was a mathematical algo-rithm meant to mimic the human brain, by replicating biological optimization. It was implemented and trained in hardware, on a computer; the application itself also referred to a microcomputer. It allowed the automation of complex tasks, so that the computer could perform them instead of a human; automation was generally recog-nized by the case law as a technical problem. A neural network was thus not an abstract mathematical method, but it used mathematics to solve a technical problem, as was the case in cryptography. Artificial neural networks were therefore to be considered as defining a field of technology.

6.1 Though implemented by way of a computer program, a neural network was not a conventional computer program in that its functioning was not determined by the programmer but by the data used for the training. The programmer could not predict how the neural network would work. If its execution was stopped, the programmer would not understand the significance of the values of its mathematical parameters; also in that it was similar to cryptography. A neural network implemented on a computer set-up that computer to function like an artificial brain.

6.2 The current application contributed to the domain of neural networks. As already explained in the grounds of appeal, the new network structure with sparse connections allowed for a more efficient implementation by reducing the computing and storage requirements, so that networks could be placed on smaller devices.

6.3 The fact that data remained abstract did not mean that a technical problem could not be acknowledged (T 697/17, reasons 3.5, as already submitted in the grounds of appeal). What was a technical field remained an open question. The Enlarged Board considered in G 1/19 (reference being made to points 67 and 85 of the reasons) that it was "never possible to give an exhaus-tive list of (positive or negative, alternative or cu-mu-lative) criteria for assessing

whether a computer-implemented process solves a technical problem", and that technical effects, such as "better use of storage", could occur "within the computer".

The Board's opinion

Technical background: neural networks

7. A neural network is composed of nodes, called "neurons", linked to each other by edges transmitting the output of one neuron to the input of another. Each neu-ron implements a parameterized mathematical function, typically a weighted addition of its inputs followed by a nonlinear operator (e.g. a threshold, a sigmoid function etc.); the parameters are called weights.

7.1 The structure of the network, i.e. the neuron types (the functions they implement) and the way in which they are connected differs from one network to another, but there are always neurons receiving the input data, and others producing the output. For instance, in a classical feed-forward network, the neurons are organized in layers, each inner layer receiving inputs from the preceding layer and outputting data to the following layer, the first layer receiving the input data, and the last layer outputting the result.

7.2 In principle, it is possible, if cumbersome, to replace the inputs to each neuron by the mathematical functions implemented by the nodes of the previous layer and write down the mathematical function that the network implements as a whole, i.e. the output as a function of the input. The function definition so obtained is determined by the structure of the network, which gives it its general form, and by its weights.

7.3 Each set of weights defines a different such function. Thus neural networks with a particular structure constitute a class of mathematical functions, and each member of the class is defined by its weights.

8. The **network is used to "learn" a relationship between pairs of input and output data using known such pairs (training data) so that, when presented with new input data, it can output the "correct" result. The learning process proceeds by changing the values of the weights until the relationship is learned to a level deemed satisfactory, by minimising a loss function depen-ding on the errors made on the training set and their cost.**

8.1 The learning process "fixes" the weights in a network (although they may also be changed by re-training at a later time). It may be said that the learning produces a member of the class of functions which is suitable to replicate the input-output relationship expressed in the training data.

8.2 The capability of a neural network to learn that relationship, and thus to fulfil its task of providing a correct result on unseen data, is based essentially on "brute force". A large amount of configurable parameters (the weights) are provided so that the functions represented by the neural networks can approximate a large set of input-output distributions, given sufficient data. Nonetheless, the structure of the neural

network determines and constrains the class of functions it can represent and thus the set of input-output distributions it can model. The accuracy of the trained neural network also depends on the adequacy of the loss function and of the training data quality (e.g. data coverage and accuracy).

Legal background: exclusion and technicality

9. Article 52(1) EPC provides that:

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.

Article 52(2) EPC provides a list of things that, in particular, shall not be considered as inventions within the meaning of Article 52(1) EPC, inter alia mathematical methods (paragraph (a) and programs for computers (paragraph (c).

Their patentability shall be excluded (Article 52(3) EPC) only to the extent to which a European patent application or European patent relates to such subject-matter or activities as such.

10. **A neural network relates to both programs for computers and to mathematical methods. The question to be answered is whether it relates only to such subject-matter "as such" or whether it relates to something more, and, in particular, to something that can fulfil the patentability conditions of the EPC**.

11. Article 52(1) EPC is understood as setting out four requirements to be fulfilled by a patentable invention: there must be an invention, and if there is an invention, it must satisfy the requirements of novelty, inventive step, and industrial applicability (see, e.g., G 1/19, reasons 30 (A)).

11.1 Established case law for computer-implemented inven-tions defines a corresponding two-step approach (also known as the "two hurdle approach") (see, e.g., G 1/19, reasons 37-39). In the first step, it is assessed whe-ther there is an invention in the meaning of Article 52(1), in view of the exclusions in Article 52(2) EPC, by the so-called "any hardware" approach. It is consi-dered that an invention is something that possesses technical character, and that this condition is ful-filled the moment any technical means, e.g. a computer, is claimed (cf. G 1/19, reasons 28 and 29).

11.2 In the second step, following the so-called Comvik approach (T 641/00), it is made sure that only features contributing to the technical character of the invention are considered for the assessment of, in particular, inventive step (cf. G 1/19, reasons 30 (F), cited from T 154/04). In particular, "non-technical" features, understood in this context as features which, on their own, would fall within a field excluded from patentability Article 52(2) EPC (see, e.g., T 1294/16, reasons 35), can only be considered for this assessment if they contribute to solving a technical problem (see also T 1924/17, reasons 15 to 19). Even technical features may be ignored with regard to inventive step if they do not contribute towards solving a technical problem (see G 1/19, reasons 33).

11.3 Accordingly, whether a claimed invention is patentable or not can often be decided by focusing on the technical problems it solves, and by means of which combination of features, be they technical or not, and by answering the question of whether this combination of features is obvious. As a consequence, the Boards of Appeal often limit their objections to ones under inventive step even if it might be possible to raise other objections, too.

The case at hand

Main request

12. The claimed neural network apparatus may have, as argued by the Appellant, a new and non-obvious structure. The proposed network structure, however, only defines a class of mathematical functions (see above points 7 and 8), which, as such, is excluded matter. As for other "non-technical" matter, it can therefore only be considered for the assessment of inventive step when used to solve a technical problem (see above point 11).

12.1 The Appellant has argued that the claimed neural network solved a technical problem by providing effects within the computer related to the implementation of neural networks (storage requirements), and that neural networks generally solve technical problems by automating human tasks. Though the Appellant has not argued this, the Board remarks that a technical problem may also be solved if the outputs of the system have an implied further technical use (G 1/19, reasons 137).

Effects "within the computer"

13. The Appellant has emphasised that the claim is to a neural network apparatus implemented on a computer.

13.1 This makes the application pass the first hurdle with the "any hardware" approach. However, in view of the question which technical problem might be solved, the Board notes that the implementation does not require any adaptation of the computer. This might be why the Examining Division referred to the lack of a "specific" technical implementation. The compact hardware referred to in DA1 is neither part of the present claims, nor of the application, for that matter.

14. The Appellant argued that the proposed modification in the neural network structure, in comparison with standard fully-connected networks, would reduce the amount of resources required, in particular storage, and that this should be recognized as a technical effect, following G 1/19, reasons 85.

14.1 The Board notes that, while the **storage and computational requirements are indeed reduced in comparison with the fully-connected network, this does not in and by itself translate to a technical effect, for the simple reason that the modified network is different and will not learn in the same way.** So **it requires less storage, but it does not do the same thing**. For instance, a one-neuron neural network requires the least storage, but it will not be able to learn any complex data relationship. The proposed comparison is therefore

incomplete, as it only focuses on the computational requirements, and insufficient to establish a technical effect.

The neural network apparatus as an automation tool

15. The appellant has also argued that neural networks apparatuses are artificial brains, and that artificial brains solve an automation problem, because they can carry out various complex tasks, instead of the human, without being programmed specifically for one task or another. In its argument, the appellant stressed that the neural networks mimic the human brain and that their behaviour cannot be predicted or understood by their programmer.

16. The Board **sees no evidence that a neural network functions like a human brain**. While its structure is inspired by that of the human brain, this does not imply that they can actually function like one.

16.1 Moreover, whilst the **functioning of a neural network may not be foreseeable prior to training and the programmer may not understand the significance of its individual parameters, as the Appellant argued, the neural network still operates according to the programming of its structure and learning scheme**. Its **parameters and provided results are fully determined, given the training data and the training procedure: at its core, as explained above, a neural network is a mathematical approximation function, which can be simple and understandable if the network is small (e.g. an approximating line going through a set of 2D points for a single neuron perceptron). It is only the sheer complexity of a larger neural network that makes it appear unpredictable. That a learning system is complex is not sufficient to conclude that it replicates the functioning of a brain. The Board also notes that the claims do not determine any specific degree of complexity.**

16.2 The **Appellant thus has not convinced the Board that neural networks in general function like a human brain or can replace the human in performing complex tasks. Even less so has the Appellant established that the claimed neural network solves the "brain" automation problem in general.**

17. The claims do not further specify any particular task, i.e. type of relationship to be learned, for the neural network. Hence, it cannot be said either that the claimed neural network solves any specific automation problem.

Implied "further technical use"

18. **The claimed learning and use of the network "to solve a classification problem or a regression problem" (where classification is merely regression with discrete outputs corresponding to the classes), can use any data. The outputs of the neural network do not have therefore any implied "further technical use"; they may, for instance, be related to forecasting stock market evolution**. In cryptography, the example provided by the Appellant, the situation is different: the encryption of digital messages was found to address the technical problem of increasing system security by preventing data access to parties not in possession of the decryption key (T 1326/06 reasons 6 and 7).

Conclusion

19. The claim as a whole specifies abstract computer-implemented mathematical operations on unspecified data, namely that of defining a class of approximating functions (the network with its structure), solving a (complex) system of (non-linear) equations to obtain the parameters of the functions (the learning of the weights), and using it to compute outputs for new inputs. **Its subject matter cannot be said to solve any technical problem, and thus it does not go beyond a mathematical method, in the sense of Article 52(2) EPC, implemented on a computer.**

19.1 Under the "any hardware" definition of the first hurdle it is to be concluded that the claimed matter is not excluded from patentability but does not involve an inventive step in the sense of Article 56 EPC.

Further remarks

20. **The Board stresses that there can be no reasonable doubt that neural networks can provide technical tools useful for automating human tasks or solving technical problems. In most cases, however, this requires them to be sufficiently specified, in particular as regards the training data and the technical task addressed. What specificity is required will regularly depend on the problem being considered, as it must be established that the trained neural network solves a technical problem in the claimed generality.**

21. For the sake of completeness, the Board also notes the following: even if, as the Appellant argued, general methods for machine learning, and neural networks in particular, were to be considered as matter not excluded under Article 52(2) EPC, it would remain questionable whether the proposed loose connectivity scheme actually provides a benefit beyond the mere reduction of storage requirements, for instance a "good" trade-off between computational requirements and learning capability.

21.1 In terms of learning, the Appellant asserted that the new structure avoided overfitting, but did not justify this assertion. As explained above, the performance of a given neural network structure, including whether overfitting occurs, generally depends on the data characteristics. Here, however, data characteristics are not considered when the network connectivity is determined (see 1.1 above). The Board notes that the prior art cited in the application, as well as DA2 (see the algorithm in Box 1, bottom of the second page), relate to data-driven sparsity, i.e. the connectivity scheme is learned from the task at hand, based on the training data distribution.

21.2 Hence the Board cannot see in this particular case, considering the content of the application, for which type of learning tasks the proposed structure may be of benefit, and to what extent.