PATENTING INVENTIONS ON SOFTWARE (AND AI):

MATHEMATICAL METHODS, COMPUTER PROGRAMS AND MEASUREMENTS

Ponente:

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Abstract

At the EPO, an invention can only be patented if it has technical character and solves a technical problem. According to established case law, measurements have the required technical character. In its decision G1/19, the Enlarged Board of Appeal has confirmed this principle and stated it to extend to what are called indirect measurements. This paper investigates a (somewhat diverse) selection of questions relating to the patentability of computer-implemented inventions and "*artificial intelligence*", in particular the exclusions of mathematical methods, the exclusion of computer programs and a recent development in the UK case law ("*Emotional Perception AI Ltd*"), and what may or not be considered an (indirect) measurement for the purpose of patentability.

I. INTRODUCTION

In the context of patenting inventions relating to artificial intelligence (AI), several different questions arise. (i) Which inventions directly concerning fundamental AI techniques can be patented or under which circumstances? (ii) Under which conditions can inventions incorporating AI techniques be patented? (iii) Whether and to what extent is it relevant whether AI was used in the innovation process leading to an invention, and (iv) does it matter in this context if an innovation was made "*autonomously*", in the sense that it was made without any human intervention?

In a nutshell, these questions can presently be answered from an EPO perspective as follows:[2] (i) Fundamental AI techniques, especially techniques referred to as machine learning (ML), are typically mathematical or otherwise abstract methods and, in practice, computer implemented. Therefore, according to established case law of the EPO, Art. 52(2) and (3) EPC is presently a bar to patenting in isolation most fundamental AI techniques. (ii) Inventions incorporating AI techniques are examined according to the standard established for computer-implemented inventions (see the following section 2). (iii) As regards the substantive patentability requirements, the EPO is generally indifferent as to how an invention is made. That "AI" (or any other software) was used in the process of making an invention, is therefore immaterial for the question of whether a patent should be granted for it. And (iv) for the time being, the designated inventor in any machine must be a person and cannot be a piece of software or an "AI".[3]

[2] See also Müller M (2024) "Issues in patenting 'artificial intelligence' from an EPO perspective", *Journal of Intellectual Property Law & Practice*, Vol. 19, No. 3, March 2024, Pages 234-249, and further references therein.
[3] See *EPO: J8/20 and J9/20 Designation of Inventor/DABUS*.

In this paper, a few issues regarding questions (i) and (ii) are considered. The following section 2 briefly reviews the examination of computer-implemented and "AI" inventions. Section 3 contains a few considerations relating to the exclusion of mathematical methods. Section 4 addresses the exclusion of computer programs and reports on a case relating to an artificial neural network (ANN) which is currently pending before the UK Court of Appeal (EWCA). Section 5 provides an overview about decisions of the Boards of Appeal of the EPO relating to direct and indirect measurements. Section 6 concludes.

II. EXAMINATION OF COMPUTER-IMPLEMENTED INVENTIONS (AND AI)

For an invention to be patentable under the EPC, it must have technical character (belong to a "*field of technology*", Art. 52(1) EPC) and involve an inventive step (Art. 56 EPC) based on a technical contribution to the art. Whether an invention has technical character is decided in view of Art. 52(2) and (3) EPC which, according to established case law, defines what is considered to be a non-invention by way of example.[4] The list of non-inventions (when claimed "*as such*") mentions, in particular, mathematical methods and programs for computers (Art. 52(2)(a) and (c) EPC). The technical contribution and the inventive step are determined according to the problem-solution approach and, when it comes to computer-implemented inventions, in its variant referred to as the COMVIK approach.[5] An aspect of it is that contributions which fall in fields corresponding to non-inventions according to Art. 52(2) are considered not make a technical contribution as required.

In its decision G1/19, the Enlarged Board of Appeal of the EPO answered the question whether a computer-implemented simulation with only numerical input and output and without any interaction with external physical reality, also referred to as purely numerical simulations, could solve a technical problem by producing a technical effect which could contribute to inventive step in the context of the COMVIK approach.[6] Although G1/19 was specifically concerned only with computer-implemented simulations, most of its statements relate to the examination of

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[4] See, e.g., Müller M (2020) "The patentable invention", in Macrez, F. and Debled, T., *Quel degré d'harmonisation du droit des brevets en Europe? – Jurisprudence France – OEB : convergences et divergences*, LexisNexis, coll. CEIPI, and further references therein.

[5] See *EPO: T641/00 Two identities/COMVIK*, headnote 1: "An invention consisting of a mixture of technical and non-technical features and having technical character as a whole is to be assessed with respect to the requirement of inventive step by taking account of all those features which contribute to said technical character whereas features making no such contribution cannot support the presence of inventive step.", as well as G1/19, r. 31, as well as Chandler W (2015), "Patentability of computer-implemented inventions (CIIs): state of play and developments, *OJ EPO*, Supplementary publication 5/2015, pp. 73-79, and Müller M (2022) "The problem-solution approach revisited", *Journal of Intellectual Property Law & Practice*, Volume 17, Issue 2, February 2022, Pages 199–209, and further references therein.

[6] See *EPO: G1/19 Pedestrian simulation*, question 1: "In the assessment of inventive step, can the computer-implemented simulation of a technical system or process solve a technical problem by producing a technical effect which goes beyond the simulation's implementation on a computer, if the computer-implemented simulation is claimed as such?"; on the Enlarged Board's interpretation of the question see also r. 53 and 61.

computer-implemented inventions in general and hence also apply to many "*artificial intelligence*" inventions in particular.

In G1/19, with reference to figure 1, the Enlarged Board of Appeal stated that "*technical effects could occur within a computer-implemented process (e.g., by specific adaptations of the computer or of data transfer or storage mechanisms) and at the input and output of this process*". The input and output could occur, respectively, at the beginning and the end of the process, reference being made to measurements or control signals for controlling a machine, or during its execution, e.g., by receiving periodic measurements or by continuously sending control signals to a technical system.[7]

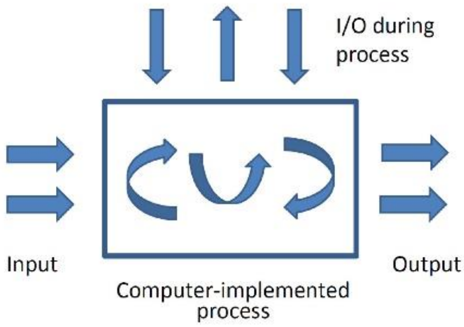

Figure 1 *Technical effects occurring in the context of computer-implemented processes (from EPO: G1/19 Pedestrian simulation)*

Not specifically discussed in G1/19 is the interaction with the user during the execution of the process. However, it is commonly accepted in the jurisprudence of the Boards of Appeal, that technical effects can also occur by way of user interaction.[8] Measurements and control signals are said to be "*typically achieved through direct links with physical reality*".[9] Adaptations of the computer and user interactions as mentioned above also relate to physical reality, namely to the "*computer as a technical device*". The Enlarged Board thus accepted that "*a direct link with physical reality* [...] *is in most cases sufficient to establish technicality*", but it refused the suggestion of the referring board that "*a direct link with physical reality*" is a necessary condition.[10] However, the Enlarged Board gave only few examples for situations in which a technical effect occurred without such a "*direct link*". One was the situation of a computer program which did not, of and by itself, have a technical effect, but might exhibit one, when and as soon as it is executed on a computer. This is referred to as the "*potential technical effect*" of a computer program.[11] And another one was the situation in which the "*outcomes of the simulation*" (typically data) had what was

[7] See *EPO: G1/19 Pedestrian simulation*, r. 85.
[8] For example, in the context of graphical user interfaces (GUIs); see, e.g., *EPO: T336/14 Presentation of operating instructions/GAMBRO*, catchword.
[9] See *EPO: G1/19 Pedestrian simulation*, r. 85.
[10] See *EPO: G1/19 Pedestrian simulation*, r. 88.
[11] See *EPO: T1173/97 Computer program product/IBM* and *EPO: G1/19 Pedestrian simulation*, r. 90 and 96.

called a "*further technical use*", i.e. an implied "*use having an impact on physical reality*", on the condition that this further use was "*at least implicitly specified in the claim*". If the claim allows that the generated data is used for non-technical purposes (e.g. "*to gain scientific knowledge about a technical or natural system*"), the generation of that data did not constitute a technical effect.[12] In a recent decision, the formula was proposed that "*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*."[13]

III. MATHEMATICAL METHODS

In the abstract, it may be difficult to define what is or is not a mathematical method, but in many instances, there will be agreement. For example, each of the following mathematical formulae determines (one or more) mathematical methods of determining one of its variables from the other ones.[14]

1) $V = l \cdot w \cdot h / 3$
2) $x(t) = x_0+v_0t+(1/2)at^2$
3) $0.37\ L^{1.5} / A \cdot N \cdot T < 1$
4) $c = m^e \pmod n$, $c^d = (m^e)^d \pmod n$
5) $f(x) = \theta(\mathbf{w} \cdot \mathbf{x} + b)$

None of these can, as such, be the subject of a successful patent application, however ingenious and "*inventive*" it may be in itself, as they all will fail to satisfy the requirements of Art. 52(2)a) and (3) EPC as an excluded mathematical method.[15] Generally, the exclusion of mathematical methods is not a matter of complexity; an artificial neural network (ANN) consisting of many perceptions has been found to be

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[12] See *EPO: G1/19 Pedestrian simulation*, r. 98 and r. 137.
[13] See *EPO: T 761/20 Automated script grading/UNIVERSITY OF CAMBRIDGE*, headnote.
[14] The first defines the volume of a pyramid with base length l, base width w and height h; the second defines, according to Newtonian mechanics, the location x at a point in time t of a moving object depending on its original location and speed, and its acceleration; the third is meant to describe the geometry of a certain class of optical fingerprint sensors by a desired relation between the boundary wavelength L, the effective numerical aperture A, the number N of light sensitive elements in the image sensor and the distance between centres of light sensitive elements (see *EPO: T1520/19 Ridge pattern recording/ABILMA*); the fourth are meant to describe the encryption and decryption of a message m according to the RSA algorithm, based on a key pair e/d and some large integer n (Rivest RL et al. (1978) "A Method for Obtaining digital Signatures and Public-Key Cryptosystems", Communications of the ACM, 21 (2) 120-126. See also U.S. Patent 4,405,829); and the last is meant to define the function implemented by a perceptron which maps its "input" vector **x**, multiplied by vector of "weights" **w** and offset by a "bias" via an "activation function" θ to its "output" f(x).
[15] Or by analogy, via the fact that the list according to Art. 52(2) is non-exhaustive ("in particular"), a mathematical "entity". See Müller M (2020) "The patentable invention", in Macrez, F. and Debled, T., *Quel degré d'harmonisation du droit des brevets en Europe? – Jurisprudence France – OEB : convergences et divergences*, LexisNexis, coll. CEIPI, section. For further examples regarding the exclusion of mathematical methods see, e.g., T1820/16 Solving a multidimensional optimization problem,

implementing a mathematical method as such just as an ANN with a single perceptron would.[16]

However, if the mathematical method is applied to solve a technical problem, its ingenuity will be taken into account in favour of inventive step. What is or is not a technical problem may be a matter of judgment and may evolve over time with the progress of technology, provided Art. 52(2) and (3) EPC are complied with.[17] In science and engineering, mathematical methods are omnipresent[18] and there is typically no doubt about the fact that they contribute to solving a technical problem in this context.[19] Mathematics is also at the heart of computing technology.[20] Image processing and image-based pattern and object recognition are largely based on mathematics and have, for a large part, been accepted to constitute technical application domains.[21] The encryption of messages or data communication has been accepted to solve a technical problem,[22] and so has hardware support for encryption[23] and the detection of side channel attacks,[24] as well as data coding and compression algorithms where they are used for the purpose of reducing the amount of data to be stored or transmitted.[25] Specific mathematical representations, when aiding the parallelisation of a calculation by exploiting parallel computing hardware, have been found to contribute to solving a technical problem.[26] The alleged technical effect may

[16] See, e.g., *EPO: T702/20 Sparsely connected neural networks/MITSUBISHI*, r. 16, and Müller M (2024) "Issues in patenting 'artificial intelligence' from an EPO perspective", *Journal of Intellectual Property Law & Practice*, Vol. 19, No. 3, March 2024, Pages 234-249.

[17] See, e.g., *EPO: G1/19 Pedestrian simulation*, r. 65 and 76.

[18] Galileo Galilei is attributed with the quote "Mathematics is the language in which God has written the Universe", presumably paraphrased from the introduction of his 1623 book "Il Saggiatore": "Philosophy [i.e. natural philosophy] is written in this grand book — I mean the Universe — which stands continually open to our gaze, but it cannot be understood unless one first learns to comprehend the language and interpret the characters in which it is written. It is written in the language of mathematics, and its characters are triangles, circles, and other geometrical figures, without which it is humanly impossible to understand a single word of it; without these, one is wandering around in a dark labyrinth." (cited from https://en.wikipedia.org/wiki/The_Assayer, last accessed on 1 Mach 2024).

[19] For a few arbitrary examples from the vast number of decisions, see e.g., *EPO: T297/86 Press presetting method, EPO: T448/92 Exercise responsive cardiac pacemaker, EPO: T1077/00 PMT detecting pacemaker, EPO: T965/06 Controlling an electric assist steering system, EPO: T362/09 Delay compensated doppler radar altimeter, EPO: T1001/16 Dental etraoral X-ray imaging, EPO: T3278/19 Laundry dryer.*

[20] Again, for a few examples see *EPO: T313/01 Addressing means and method/MOTORLA*; *EPO: T461/03 Calculation unit/TOSHIBA*, *EPO:* Synchronisation and cell identification signal in OFDM/HUAWEI, *EPO: T1900/19 Adaptive transforms for compressing streams*.

[21] Ever since *EPO: T208/84 VICOM;* as just one of many pertinent cases, see, e.g., *EPO: T814/20 Adapted Visual Vocabularies/CONDUENT*.

[22] See, e.g., *EPO: T1326/06 RSA Schlüsselpaarberechnung/GIESECKE&DEVRIENT*, r.6 and 7, and references therein, or *EPO: T1244/13 Arithmetic processor accommodating different finite field size*, *EPO: T832/14 Public key checking/CERTICOM*.

[23] See, e.g., *EPO: T1244/18 Arithmetic processor accommodating different finite field sizes* and E*PO: T2318/08 Koprozessor zur modularen Inversion/GIESECKE & DEVRIENT*.

[24] See, e.g., *EPO: T556/14 Masking a private key/CERTICOM* or *EPO: T1925/11 Modular reduction hardware/INSIDE SECURE*.

[25] See, e.g., *EPO: T650/13 Adaptive data compression/GOOGLE*, r. 6.3 and 6.4, and *EPO: T107/87 Kompression redundanter Folgen serieller Datenelemente/Heinz*, r. 3.

[26] See, e.g., *EPO: T2330/13 Checking selection conditions*, r. 5.7.8 and 5.7.9.

not be self-evident and may have to be established.[27] On the other hand, the application of mathematics in business methods typically does not solve a technical problem.[28] An application of Newtonian mechanics in a computer game[29] may not be considered to solve a technical problem.[30] And, a "*mathematical model of meaning*" of words, even if used in data retrieval, has been found not to solve a technical problem.[31]

The field of "*artificial intelligence*" is replete with mathematical algorithms, which has led to the situation that most (isolated) fundamental algorithms in the field are considered to be excluded and to qualify for patent protection only under the conditions elaborated in G1/19, typically (though not exclusively) if applied to solve a technical problem.[32]

The author notes that the exclusion of mathematical methods has often been and still is under discussion,[33] with renewed interest due to the recent dramatic advances in machine learning. Issues are what mathematical methods are or how they can be distinguished from computer programs or algorithms[34], whether the exclusion has been applied too leniently or too strictly and whether it should be dropped entirely[35]. The typical reasons for the exclusion of mathematical methods as such from patentability (to the best of the author's knowledge, in all patent systems of the world) are that they are intellectual activities (or "*mental acts*", see Art. 52(2)c)

[27] *EPO: T1294/16 Image data arrangement/OMRON* or *EPO: Ridge pattern recording/ABILMA, EPO: T2803/18 Analysing events from sensor data by optimisation*; see also Müller M (2024) "Issues in patenting 'artificial intelligence' from an EPO perspective", *Journal of Intellectual Property Law & Practice*, Vol. 19, No. 3, March 2024, Pages 234-249, section 4.5.

[28] See, e.g., *EPO: T1392/06 Generating a visiting plan/PANASONIC* or *EPO: T983/11 Coordinated marketing/PITNEY BOWES*.

[29] For instance, in the simple lunar lander game "Lunar LEM Rocket", in its BASIC version described in Ahl DH (1978), "Basic computer Games", published by Creative Computing.

[30] See, e.g., *EPO: T489/14 Pedestrian simulation/BENTLEY SYSTEMS*, r. 2.8.

[31] See *EPO: T1569/05 Method for retrieving data/CANON*, r. 3.5, and *EPO: T598/14 Enhanced retrieval/BRITISH TELECOMMUNICATIONS*, r. 2.3.

[32] See, e.g., the discussion in *EPO: T761/20 Automated script grading/UNIVERSITY OF CAMBRDIGE*, but also the EPO Guidelines for Examination, G-II, 3.3 and 3.3.1.

[33] The situation being different in the US than in Europe, as the US Patent Act does not have an explicit exclusion of mathematical methods, not even "as such", and the exclusion of "abstract ideas" and whether or to what extent it covers mathematical methods is matter of case law. For a recent contribution in Europe, see, e.g., Korndijk J (2021) "Adapting to Innovations in Artificial Intelligence: AI as Mental Steps Under the EPO", *European Intellectual Property Review, E.I.P.R.,* 43(12), 771-776.

[34] See, e.g., Schickedanz W (2000) „Das Patentierungsverbot von „mathematische Methoden", „Regeln und Verfahren für gedankliche Tätigkeiten" und die Verwendung mathematischer Methoden im Patentanspruch, *Mitteilungen der deutschen Patentanwälte*, Heft 4/5, 173-180.

[35] See, e.g., Newell A (1986) "Response: The Models are Broken, the Models are Broken", *University of Pittsburgh Law Review* 47, in response to Chisum DS (1986) "The patentability of algorithms", *University of Pittsburgh Law Review* 47: 959-1022, Klemens B (2005) "Math you can't use", Brookings Institution Press; de Laat PB (2000) "Patenting mathematical algorithms: What's the harm? A though experiment in algebra", International Review of Law and Economics 20, 187-204; and many others.

EPC)[36] or generally too abstract,[37] that mathematics is not invented but discovered,[38] that the protection of a universal mathematical method would provide an inappropriately broad protection,[39] and generally that mathematical methods are not the type of things for which the patent system was conceived.[40] The more detailed scrutiny which this topic deserves is well beyond the scope of this paper.[41]

IV. PROGRAMS FOR COMPUTERS (THE "*EMOTIONAL PERCEPTION*" CASE)

A case relating to the question of whether the exclusion of computer programs extends to artificial intelligence inventions – more specifically to ANNs or some of its uses – has recently attracted much attention.[42]

The case relates to UK patent application (GB1904713, published as GB2583455A), entitled "*Method of training a neural network to reflect emotional perception and related system and method for categorizing and finding associated content*") which was refused by the UKIPO (BL O/542/22 dated 22 June 2022).[43]

Its claim 1 as refused relates to "*A system for providing semantically relevant file recommendations, the system containing:*
a) an artificial neural network "ANN" having an output capable of generating a property vector in property space, the ANN trained by subjecting the ANN to a multiplicity of pairs of training data files [... based on] two independently derived separation

[36] See e.g., Sterckx S and Cockbain J (2012) "Exclusions from patentability: How far has the European Patent Office Eroded Boundaries?" Cambridge University Press, citing the Swiss delegation at an Intergovernmental Conferences working towards the EPC as having said mathematical methods are merely "intellectual activities and therefore excluded from patentability".
[37] See esp. US: *Gottschalk v. Benson*, 409 U.S. 63 (1972).
[38] As mentioned, e.g., in Samuelson P (1990) "Benson Revisited: The case against patent protection for algorithm and other computer program-related inventions", *Emory Law Journal*, Vol. 39, 1025.
[39] Addressing this and other arguments in disagreement, see Katzenellenbogen B (2011) "Should Pythagoras have been entitled to a patent", originally published on the Law360, available at https://www.knobbe.com/news/2011/07/should-pythagoras-have-been-entitled-patent, last accessed on 1 Mach 2024.
[40] See, e.g., van Empel M (1974) "The Granting of European Patents", A.W. Sijthoff, 69: "Scientific theories and mathematical methods are clearcut examples of 'mental process'. Their exclusion will therefore probably not give rise to much dispute", or *US CAFC: Electric Power Group, LLC v. Alstom S.A.*, A: "we have treated analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category"
[41] But see *EPO: 1927/17 Data consistency management/ACCENTURE GLOBAL SERVICES* for a thorough review of the jurisprudence of the boards of appeal on the mathematical method exclusion and the pertinent travaux préparatoires of the EPC.
[42] For instance, JUVE has listed it amongst its "top 10 patent cases in Europe 2023", see https://www.juve-patent.com/cases/juve-patent-top-10-patent-cases-year-2023/, last accessed on 28 February 2024. It is acknowledged that, in general, the tests under Art. 52 and 56 may not be entirely aligned between the EPO and the UK, but they seem to be sufficiently so for the purposes of the case at hand that no express comparison appears to be required. See also Zech H (2024) "The Editor's Choice – UK High Court of Justice [2023] EWHC 2948 (Ch)", GRUR Patent, Vol. 3, p. 122.
[43] No decisions on related European patent applications have issued yet (see in this regard published International Patent Applications WO2022/069904 A1, WO2022/043643 A1, and WO2020/201746).

distances, namely: a first independently derived separation distance [...] in semantic embedding space [...] obtained from natural language processing "NLP" of a semantic description of the nature of the data associated with [...] the [...] training data files; and a second independently derived separation distance [...] in property embedding space [...] derived from measurable properties extracted from [...] the [...] training data files, and wherein training of the ANN [...] converge[s] distances of generated output vectors, in property embedding space, towards corresponding pairwise semantic distances in semantic space [...]
e) processing intelligence arranged: in response to the trained ANN receiving target data as an input [...] to produce an ordered list which identifies relevant reference data files that have property vectors measurably similar to the property vector and thus to identify relevant reference files that are semantically similar to the target data [...]."

The central idea of the invention is to recommend, based on a sample data file (the "*target data*", preferably an audio file, e.g., music), other data files which users might perceive as similar. To represent the users' perception, each of a given training set of data/music files is manually assigned a vector of perceptual or emotive qualities in what is called a "*semantic space*". Moreover, a measure of similarity between such associative descriptors is defined, so that it is possible, given the semantic descriptors of two data/music files, to decide whether they are perceived as similar. On the other hand, each data/music file is assigned a vector of measurable properties in so-called "*property space*", relating for instance to "*rhythm*", "*timbre*", "*tonality*" or "*musical texture*". Again, a measure of similarity between vectors in property space is defined. The central idea of the invention is to train an ANN on pairs of data files so that similarity in "property space" ends up corresponding to similarity in "*semantic space*". Given the sample data file, the system can then recommend semantically similar data files only based on the comparison between their descriptors in property space.

The UKIPO refused the application because the ANN could be implemented entirely in software, the generation of the semantic vectors and the extraction of audio features (no other examples for property vectors being disclosed in detail) was done using off-the-shelf software, and because the ANN – at the given level of generality – was "*an abstract model which takes a numerical input, applies a series of mathematical operations […], and outputs a numerical results at successive layers. A claim to an ANN or the algorithms by which it is trained, in a general and abstract sense, relates wholly to a mathematical method*". Even on the assumption that there was "*something more than a mathematical method present*", the hearing officer could not "*see how it* [was] *technical in nature*". Specifically, the application of an ANN to "*recommending semantically similar files* [was] *not a technical process*". Ultimately, the hearing officer considered that the "*specific application* [of the claimed ANN] *as part of a file recommendation engine is* […] *enough to dispense with the mathematical* *method as such objection*" and decided that the application "[fell] *solely within the computer program exclusion*".[44]

The appeal against this decision was allowed by the High Court of England and Wales decided ([2023] EWHC 2948 (Ch), dated 21 November 2023). It started its considerations from an ANN implemented in hardware and considered the software implementation of an ANN as an emulation of the hardware embodiment. In the case of a hardware ANN, it found that there was no "*program in the normal sense*", and the software used to emulate an ANN was not the computer program relevant for the exclusion of the claimed invention. More specifically, referring to the parties' submission that the hardware ANN "*is not implementing a series of instructions preordained by a human*", it found that also in an emulated ANN, "*the actual operation of* [its] *nodes and layers inter se is not given to those elements by a human. It is created by the ANN itself*." [45] After concluding that the computer program exclusion is not invoked by the claim, it investigated what would happen if that conclusion was wrong – i.e. if there was a computer program after all, esp. "*assuming* [...] *that the computer program is either the training program or the overall training activity*" – and found two technical effects outside the computer, i.e. external technical effects, which prevented the exclusion from applying: One was that the output, by the trained ANN, of "a file that would not otherwise be selected", and the other "*the result ANN, and particularly a trained hardware ANN*" itself.[46] The mathematical method exclusion was not decided upon as it had not been an alternative basis for the decision under appeal and the respondent had not resurrected it.[47]

After this decision, the UKIPO immediately suspended its Guidelines for the examination of patent applications relating to artificial intelligence (AI) inventions (23 November 2023) and instructed examiners (with guidance published on 29 November 2023) not to object to inventions involving an ANN under the "*program for a computer*" exclusion.[48] Shortly after that, the UKIPO nonetheless appealed the case to the Court of Appeal.[49] The hearing before the Court of Appeal is scheduled for 14 May 2024.

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[44] *UK: BL O/542/22*, r. 78 and 79.
[45] See *UK: Emotional Perception AI Ltd v Comptroller-General of Patents, Designs and Trade Marks [2023] EWHC 2948 (Ch)*, r. 41, 42, 50, 54, 56, 58.
[46] See *UK: [2023] EWHC 2948 (Ch)*, r. 62 and 77-78.
[47] See *UK: [2023] EWHC 2948 (Ch)*, r. 81-83.
[48] https://www.gov.uk/government/publications/examining-patent-applications-relating-to-artificial-intelligence-ai-inventions, last accessed on 28 February 2024, stating that "The Guidelines to the examination of AI related applications have been temporarily removed pending consideration of the judgement in Emotional Perception AI Ltd v Comptroller-General of Patents, Designs and Trade Marks [2023] EWHC 2948 (ch).", and https://www.gov.uk/government/publications/examination-of-patent-applications-involving-artificial-neural-networks/examination-of-patent-applications-involving-artificial-neural-networks-ann, last accessed on 28 February 2024.
[49] The appeal is based on four grounds, namely that: 1. the Judge erred in holding that the exclusion from patent protection for "a program for a computer … as such" was not engaged, 2. the Judge was wrong to rely on the Appellant's 'concession' (that the hardware implemented

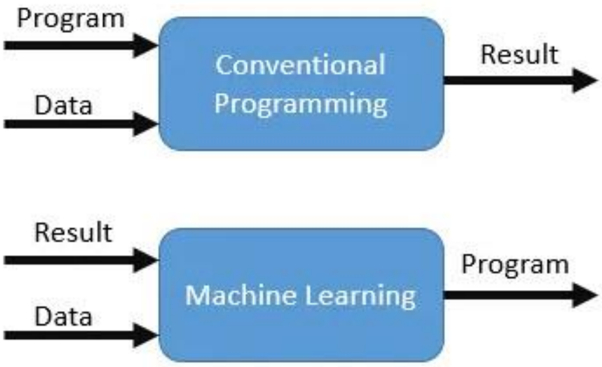

Figure 2 *"Conventional Programming" vs Machine Learning (picture from Stefanus 2019)*

It has been observed that the decision of the High Court appears to be in tension with the current examination practice at the EPO and the Boards of Appeal and established concepts in computer science.[50] Only few considerations are offered at this point: A common illustration of Machine Learning as opposed to "*conventional programming*" (see figure 3)[51] is that conventionally a program is provided (e.g., by a programmer) which determines its results based on input data, whereas an idea of machine learning is to "*train*" a system such as an ANN with input data and the associated results so as to *generate a program* which can reproduce this association. In this presentation of machine learning, the trained neural system still figures as a computer program. More specifically, one might consider the weights determined through training to be the computer program running on the ANN architecture, irrespective of whether the latter is implemented in hardware or software. It is also remarked that a compiled program (object code) is a computer program just as the original program text (source code) even though compilation is an automated process which does not rely on human intervention.

The decision of the Court of Appeal and its ramifications, including a potential further appeal to the UK Supreme Court, are awaited with interest.

ANN 'implies' that the software implemented ANN is not operating a program), 3. the Judge was wrong to exclude the consideration of the mathematical exclusion model, and 4. the Judge was wrong to hold that the claimed invention involves a substantive technical contribution

[50] See, e.g., Emanuilov I (2023) "Emotionally Yours: On Artificial Neural Networks as Programs for Computers under UK Patent Law", Kluwer Patent blog, 8 December 2023, https://patentblog.kluweriplaw.com/2023/12/08/emotionally-yours-on-artificial-neural-networks-as-programs-for-computers-under-uk-patent-law/, last accessed on 28 February 2024, also cited in Dinev P (2024) "Patenting artificial intelligence: the High Court's decision in *Emotional Perception*", *Journal of Intellectual Property Law & Practice*, Volume 19, Issue 4, April 2024, pages 287-290; see also Pearce D (2024) "If you like this …", Tufty the Cat patent blog, 26 January 2024, https://tuftythecat.blogspot.com/2024/01/if-you-like-this.html, last accessed on 22 March 2024.

[51] This drawing is taken from Stefanus R (2019) "Conventional Programming vs Machine Learning", *Medium*, available at https://rstefanus16.medium.com/conventional-programming-vs-machine-learning-a3b7b3425531, last accessed on 1 March 2024. Very similar presentations however appear to widely used, and the author has not been able to identify its original creator.

V. INVENTIONS INVOLVING MEASUREMENTS

In G1/19, the Enlarged Board stated that "[t]*he calculation of the physical state of an object (e.g. its temperature) is typically part of a measurement method*" and that "*it 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*", and that the same applied to "*indirect measurements*" which "*are still related to physical reality and thus of a technical nature*".[52] No definition for indirect measurements was given, but the statement was illustrated by reference to two earlier board of appeal decisions which dealt with "*the measurement of a specific physical entity at a specific location by means of measurements of another physical entity*"[53] "*and/or measurements at another location*".[54]

Identifying claimed features as measurements is important because, as the Enlarged Board states, even indirect measurements "*are still* [...] *of a technical nature, regardless of what use is made of the results*".[55] Accordingly, a measurement, direct or indirect, might contribute to, or possibly establish, an inventive step over the prior art based on an argument, say, that the method of measurement itself was simpler, faster, more precise, made possible at all or merely significantly different from available measurement methods. Also, particular measurement methods might be useful for testing, surveillance or diagnostics (e.g. of technical devices).[56]

The remainder of this section looks more closely into the question of what may or may not be considered an "*indirect measurement*" within the meaning of

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[52] See *EPO: G1/19 Pedestrian simulation*, r. 99.

[53] See *EPO: T1148/00 Seed material/OY PANIMOLABORATORIO*, r. 9: Figure 6 shows the results of an experiment wherein the effect of Lactobacillus plantarum DSM 7388 and Lactobacillus plantarum E-98, of suppressing retard in mash filtration is tested. As this retard is known to be caused by gram-negative bacteria (see Legend to Table 2), the experiment is an indirect measurement of the inhibitory effect of both lactobacilli on said bacteria.

[54] See *EPO: T91/10 Constant Vacuum/MAASLAND*, r. 5.2.1: In order to measure and keep constant the vacuum present in the teat space a vacuum sensor can be arranged either in the teat space or in the milk line connected to this space.

[55] Still *EPO: G1/19 Pedestrian simulation*, r. 99. See, in this respect, also the EPO Guidelines for Examination, G-VII, 5.4.2.4, Example 4. It is also noted, that the pertinent section in the Guidelines for Examination G-II, 3.3, stating that "If steps of a mathematical method are used to derive or predict the physical state of an existing real object from measurements of physical properties, as in the case of indirect measurements, those steps make a technical contribution regardless of what use is made of the results." was criticized to contain an incorrect (i.e. too broad) "blanket statement" on the matter in *EPO: T1910/20 Displaying cluster centres/ROCHE*, r.2.

[56] See, e.g., *EPO: T 438/14 IR-camera for determining the risk of condensation*. As my colleague Miguel Domingo Vecchioni has pointed out, also the decision of the German Federal Court of Justice, *DE: BGH X ZB 1/15 Flugzeugzustand*, can be seen as applying a similar ratio, when it accepts as a technical invention a „Method for determining the state of an aircraft, namely the position, speed and orientation of the aircraft, comprising the steps of: determining a number of measured values ... of an inertial system which determines the aircraft state, wherein ..." based on the finding that "A sufficient relationship with the controlled application of natural forces exists if a mathematical method is used for the purpose of gaining more reliable knowledge about the condition of an aircraft on the basis of available measured values and thus influences the functioning of the system used to determine this condition." (see headnote c); translations by the author).

what G1/19 and, more generally, which "*measurement situations*" might profit from the positive assessment of G1/19 as regards technical character.[57] It must be stressed that the term "*indirect measurement*" is not only not defined in G1/19 but also not used frequently (or consistently) in the jurisprudence of the boards of appeal.

a. MEASUREMENTS

A priori, it is noted that the distinction between a "*direct*" and an "*indirect*" measurement is not as sharp as it may seem. Arguably, most (if not all) measurements must be seen as indirect to some degree. While the measurement of a person's height with a yardstick held next to them might appear as a reasonably direct measurement, already measuring temperature with a mercury thermometer is indirect insofar as the expansion of the mercury with rising temperature is mapped to a proportional increase in temperature. Moreover, temperature itself is a statistical quantity representing the average kinetic energy of the particles of a substance. A watch measures time via spatial movements of its hands, and a power meter might determine the electrical current by measuring a voltage over a known resistance.[58]

This fundamental issue aside, there appears to be little doubt in most concrete cases as to what is considered a measurement. It may also not be decisive whether what an invention performs to obtain relevant data can or must be called a measurement. What rather appears to matter is whether what the invention determines is the "*physical state of an object*" according to G1/19[59] – which in the author's view extends to any objective physical, chemical, biological, physiological (etc.) or technical quantity – and that it is "*based on an interaction with physical reality at the outset*". For example, determining the gross national happiness index will fail (at least) the former criterion, and obtaining insights about the world by meditation will fail the latter one.

b. INDIRECT MEASUREMENTS

Coarsely speaking, one might talk about an indirect measurement if what is actually measured is not the physical or technical (henceforth, for simplicity, "*physical*" as used in G1/19) quantity of interest but some other quantity, and what is measured undergoes some calculation to produce an indication about the quantity

[57] To consider this question was put to the author by the organizers of the XXXIX Jornadas of the Spanish group of the AIPPI.
[58] See also *EPO: T175/90*, r. 4.1: "… direkte Messung der Stromstärke mittels eines Amperemeters durchführbar, zugleich vorteilhafter als eine indirekte Messung mittels eines Voltmeters wird."
[59] See *EPO: G1/10 Pedestrian simulation*, r. 98.

of interest. Insofar as this process is "*based on an interaction with physical reality at the outset*" and determines a physical quantity of interest, it may appear, as a whole, to have all traits of a measurement and may, in its context, play the role otherwise played by a measurement.

There are many reasons why an indirect measurement in this sense may be preferred over a direct one. A direct measurement may not be possible at all (such as determining the composition of matter in stars), certain kinds of measurements may not be available[60] (say, measuring the volume of a perforated container by filling it with a liquid), it may be impossible to place a sensor at certain locations within a device or an organism, or it may not be possible, for practical or economic reasons, to carry out a measurement at the relevant point in time.

For the indirect measurement to be "*useful*", the measured quantity must allow a "*good*" determination of the quantity of interest. Ideally, the measured quantity should be proportional to the measured value (or reasonably so, within the given technical limits). Depending on circumstances, a less precise relation between the measured quantity and the quantity of interest – such as a well-understood correlation[61] or a probabilistic model[62] – may have to be accepted. Whether a specific approximation of the quantity of interest is acceptable will often depend on what use is (meant to be) made of the determined quantity.[63]

c. MEASUREMENTS "*WITHOUT PURPOSE*"

At this point it is worth noting that, according to the present jurisprudence of the boards of appeal, a claimed invention has technical character as a whole as soon as it contains one technical feature. For this reason alone, any claim specifying a (direct) measurement will have technical character, irrespective of any subsequent

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[60] See, e.g., *EPO: T371/18*, r. 4.1.4: "Even though it is further explained in paragraph 3.3 of A1 that tauf(t) may be calculated using the drill string torque -GΓφ'(0,t), it is common ground that in practice it cannot be measured directly and fed back to the PI controller. However, the skilled person would use an indirect measurement of the drill string torque based on the angular acceleration and the actual drive torque based on equation (19)"

[61] See, e.g., *EPO: T2420/19*, r. 8.6.: "With increased branching by higher radical initiator amount, the number of tertiary carbon radicals will increase and also the probability of beta-scission and creation of a vinylidene. The vinylidene content will then be an indirect measurement on the amount of introduced branches in the low density polyethylene of the present invention", or *EPO: T171/18*, r. 3.6: "As an alternative argument, the appellant-opponent submits that the measurement in P9 (at the pressure regulating valve) represents an indirect measurement of the claimed airflow and as such anticipates the claimed feature. The board notes, however, that this airflow is not correlated with the airflow from the milking machines. ", and *EPO: T161/18 Äquivalenter Aortendruck/ARC SEIBERSDORF*, which concerns a method of determining the cardiac output via an artificial neural network from the "equivalent" peripheral aortic pressure. Notably, the question of technical character or contribution, however, let alone the issue of (indirect) measurements did not arise in this latter case.

[62] See *EPO: T182/20 Malfunction prediction/HITACHI ENERGY*, r. 3.8-3.12.

[63] The author acknowledges that it was his colleague Iulian Alecu who stressed this point in a conversation on the matter.

calculation and independent of the precision with which the calculation determines the quantity of interest. The question arises whether the "*indirect measurements*" as a whole, i.e. the measurement itself and the subsequent calculation, contribute to the technical character of the claimed invention.[64]

At the same time, it is necessary to recall that G1/19 states that indirect measurements have technical character "*regardless of what use is made of the results*".

From this one might conclude that a less than ideal determination of a physical quantity of from a measured quantity (say, the qualitative classification of response times by a psychologist when carrying out a test, e.g., as "*immediate response*", "*delayed response*" and "*no response*")[65] may not qualify as an "*indirect measurement*" within the meaning of what G1/19 stated. In positive terms, one might say that an invention claiming a measurement followed by some calculation on the measured quantity but *without specifying or implying any particular use* made of the determined quantity, has technical character if the determined quantity provides factual information about the physical conditions of the entity under investigation. Whether this is the case appears to depend, amongst other things, on whether the method determines the quantity of interest in an objective, reliable and reproducible manner (e.g. the merely subjective and qualitative method of timing cited above might not be accepted), which fact may have to be established by some form of evidence.[66] Arguably however, the accuracy itself should, in view of G1/19,[67] not be a criterion to determine whether an "*indirect measurement*" has the required technical character.[68] Instead, accuracy should be considered under different requirements, such as inventive step or sufficiency of disclosure (Art. 56 and 83 EPC).

d. EXAMPLES FOR MEASUREMENTS AND THE LIKE

Measurements determine quantities of physical reality, occur in all fields of science and engineering, and may be applied to all kinds of physical objects (such as machinery, plants or the human body). Also ubiquitous in science and engineering are "*indirect measurements*" as discussed above, i.e. the determination of quantities based on actual measurements of other quantities followed by some calculation.

In this section, several scenarios are considered in view of the question whether the "*indirect measurement*" as a whole can profit from the statement in G1/19 and be considered to have technical character as a whole.

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[64] Within the meaning of, in particular, *EPO: T641/00 Two identities/COMVIK*, headnote I.
[65] See, e.g., *EPO : T619/02 Odour selection/QUEST INTERNATIONAL, r. 2.3.1, p. 18.*
[66] Which might be challenging to provide, for instance, if one where to 'invent' a method for 'measuring' the "primordial energy" referred to in *EPO: T748/03 Pyramiden-Generator.*
[67] See EPO: G1/19 Pedestrian simulation, r. 111.
[68] In discussions with the author, his colleague Miguel Domingo Vecchioni has stressed this point.

One might ask whether determining a quantity associated with a population of people should be considered a measurement in the relevant sense, or under which conditions. A potential answer could be that this may well be the case if the quantity of interest relates to a specific and concrete population in question (say, the "*packing density*" of a crowd under surveillance in a public space), it might not be if the determined quantity relates to a merely estimated or assumed "*typical*" property of the inaccessible totality of a population[69] or of a class of entities (such as, say, the average height of pine trees in Norway). Determining the latter quantities might better be considered the result of a scientific rather than technological endeavour.[70]

Measurements make use of some kind of measurement device, typically some kind of sensor or yardstick.[71] Obtaining information about a quantity by interviewing people, e.g., by means of a questionnaire or a poll is, arguably, not a measurement in this sense, for instance because an interview may not produce sufficiently objective, reliable, and reproducible results.

Measurement produces data. A question at stake is whether a claim for the processing of the data alone, i.e., without the measurement itself being claimed, can still profit from the idea that a measurement is of "*technical nature, regardless of what use is made of the results*". Arguably, this is generally not the case unless the data itself implies a measurement.[72] However, business data (say stock values) are

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[69] For example, in *EPO: T489/14 Pedestrian simulation/BENTLEY SYSTEMS*, r. 7.5, it was found that "the calculated information about the movement of simulated pedestrians", during the simulation in question", "did not represent a direct or indirect measurement of any of the real pedestrians (or other physical entities) that were measured in the process of generating the pedestrian profiles. […] Hence, in the present case no physical entity (or process) can be identified by the method of claim 1 in the sense that its physical status or some physical property is described by information calculated on the basis of data obtained by a direct or indirect physical interaction with the entity."

[70] Cf. in this regard *EPO: G1/19 Pedestrian simulation*, r. 98.

[71] Also a known hand span or foot size when used to measure a distance would appear to be a measurement device in this sense.

[72] This argument might be made by analogy to the implied further technical use according to *EPO: G1/19 Pedestrian simulation* or in view of the idea that data may be "functional" as expressed in *EPO: T1194/97 Data structure product/PHILIPS*. A related argument also is, arguably, the fact that methods of processing an image are considered to be technical even though the act of taking the image (i.e. some kind of "measurement"), is generally not claimed, based on *EPO: T208/84 mathematical method – computer program/VICOM,* r. 3 and 5. In contrast, for an example where the absence of a measurement was an aspect for a negative decision on the matter, see *EPO: T3226/19 Opportunity estimation/LANDMARK GRAPHICS*, 3. 2.6 and 2.7: "Estimating the prospect of finding oil or such like based on physical soil properties … The claimed method does not include actual steps of measuring "based on an interaction with physical reality at the outset of the measurement method". Nor does it include … some form of indirect measurement of a physical entity based on another physical entity (G 1/19, point 99). Instead, the estimation of the opportunity in the claimed method is based on "intrinsic parameters" which are not further specified in the claim. The calculated result is not used for estimating the accuracy or improving the reliability of the measurements, but rather for performing sensitivity analysis, for example for business purposes. Therefore, the claimed method cannot be considered a measurement method either."

not "*measured*" data.[73] And retrieving data from internal computer memory or from peripheral storage is not obtaining them by way of "*measurement*".

Measurements may undergo some processing. Some such processing may be taken to contribute to the technical character of the invention (and will thus be taken into account for inventive step)[74] while other processing may not. For example, an electric current may be measured by determining the voltage over a known resistance and dividing the former by the latter. More complex calculations are imaginable. For example, the Kalman filter[75] provides a method of improving a noisy measurement of the state of a system based on a prediction of that state based on earlier measurements, and is, as such, a well-known means to improve measurements for example in object tracking or navigation systems. The relevant processing should be automated or, at least, reliably predictable. And the result of the calculation should still be a physical quantity itself and produce objective and reliable information about the measured physical quantity. For example, changing the price for a refreshment depending on the measured temperatures will not be sufficient: while the temperature measurement itself will still be considered technical,[76] its further use to set the price will probably be found not to make a technical contribution, because the price is not a physical quantity but follows business needs, and also because the temperature-price relationship may be set according to technically arbitrary criteria.

The nature of the calculation should, normally, not play a role: for instance, it should not matter in principle whether the calculation is carried out by "*conventional software*" according to fixed, mathematical rules, or using an ANN exploiting an existing correlation between inputs and outputs.[77] It is conceivable, however, that a "*conventional*" calculation evaluates a fixed mathematical operation on measured values in such a way that it can be clearly assessed whether the calculated values have a factual, physical relevance of for the physical quantity of interest. In contrast, whether the estimate of some value produced by an ANN on the basis of certain input measurements represents a relevant fact about physical reality may be less straightforward to assess. For example, it might be considered plausible in principle that there is some correlation between the measured peripheral aortic pressure and

[73] See, e.g., *EPO: T619/05 Facilitating transactions in diamonds/DIAMONDS.NET*, r. 3.3.
[74] See again *EPO: T641/00 Two identities/COMVIK*, headnote I.
[75] See, e.g., Stepanov OA (2011) "Kalman filtering: Past and present: An outlook from Russia. (On the occasion of the 80th birthday of Rudolf Emil Kalman), *Gyroscopy and Navigation*, Vol. 2, No. 2, pp. 99-110, Pleiades Publishing Ltd.
[76] Or, for instance, "forecasting a value of a weather-based structured financial product" as discussed in *EPO: T1798/13 Forecasting the value of a structured financial product/SWISS REINSURANCE COMPANY LTD* or the mapping of "a time series of acceleration vectors" of an individual customer to its "gait category" *EPO: T1234/17 Customization based on physiological data/ADIDAS AG*.
[77] See also Müller M (2024) "Issues in patenting 'artificial intelligence' from an EPO perspective", *Journal of Intellectual Property Law & Practice*, V Vol. 19, No. 3, March 2024, Pages 234-249.

the cardiac output of a patient and that, therefore, a suitably trained ANN might actually succeed in producing a sufficiently accurate estimate of the latter on the basis of the former.[78] However, it is also possible to train an ANN based on a spurious correlation between, say, the present distance between Neptune and the Sun and the air pollution in Washington, D.C., over a certain period of time[79] but the capability of the so-trained ANN to predict the air pollution from the planetary distance would likely not be considered to make a technical contribution.

In general, if the measured data undergoes a human, subjective or otherwise unpredictable, assessment, the data so obtained might not be considered to (still) constitute a measurement.[80]

It may be questioned whether the *prediction* of a value may qualify as a "*measurement*" in the relevant sense or whether, at least, the prediction may be considered technical if it is based on some measurement and thus "*based on an interaction with physical reality at the outset*". It is imaginable that a finding in such instances may depend on how predictable the physical property of interest is. For instance, a method of predicting the location of an autonomous robot in the imminent future might be accepted as technical, whereas a method of predicting the size of the Swiss glaciers in 50 years from now might not, even if based on measurements. At this point it is recalled that the conclusion in an individual case might depend on the use that is (meant to be) made of the determined quantity, and that merely gaining scientific knowledge about a technical or natural system is, according to G1/19[81], not considered to be a technical use.

The results of a direct or indirect measurement may merely be displayed to a human user, they might have a "*further technical use*" or purpose, or they might be used to actually make an impact on physical reality. In the latter case, or if the further technical use is implied, a correspondingly claimed invention will be found to have technical character for this reason alone. If the results are only displayed, a central question will be whether the displayed data represent reliable information about a concrete physical system. This issue has been discussed, in the jurisprudence of the boards of appeal, with reference to the question whether the displayed information relates to conditions prevailing in an apparatus, which was formulated in an early

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[78] Irrespective of what further details might be needed for the skilled person to actually carry out the relevant training, see *EPO: T161/18 Äquivalenter Aortendruck/ARC Seibersdorf*.
[79] See https://www.tylervigen.com/spurious/correlation/3072_the-distance-between-neptune-and-the-sun_correlates-with_unhealthy-air-quality-in-washington-dc, last accessed on 29 February 2024. See also the corresponding fictitious, AI-generated "scientific publication" available on the Internet: Harris C et al. (2024) "Out of This World Pollution: Exploring the Neptune-Sun Distance and Air quality in Washington, D.C.", *The Interplanetary Journal of Environmental Science*, Vol. 258, No. 4, 818-828.
[80] See, e.g., *EPO T1741/08 GUI Layout/SAP* and *EPO: T1680/07 Shopping with mobile device/NOKIA*.
[81] See *EPO: G1/19 Pedestrian simulation*, r. 98.

decision of the boards of appeal.[82] In the more recent jurisprudence of the boards of appeal, this statement has been qualified so that not the display of every "*condition*" in a machine qualifies as technical, but only "*technical conditions*" and not, for example, a stock value that happens to be stored in the physical register of a computing machine.[83] It has also been stated that this line of case law is no longer relevant in view of G1/19,[84] but the author tends to consider that the ratio of these decisions can be captured reasonably well by analogy with what G1/19 said about indirect measurements.[85]

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[82] See *EPO: T115/85 Computer-related invention*, r. 7 and headnote 2: "Giving visual indications automatically about conditions prevailing in an apparatus or system is basically a technical problem", and *EPO: T362/90*, headnote: "The simultaneous optical display of prevailing and desirable conditions in a gearbox is based on a technical problem and is not excluded from patent protection under Article 52(2)(d) EPC even if its realisation comprises non-technical features relating to the reproduction of information in addition to technical adaptations."

[83] See, e.g., *EPO: T1161/04 Stock index/NASDAQ*, r. 4, and EPO: *T528/07 Portal system/ACCENTURE*, r. 3.5, *EPO: T336/14 Presentation of operating instructions/GAMBRO*, r. 1.2.4, and several others.

[84] See, e.g., *EPO: T2841/19 Business service context/BMC SOFTWARE*, r. 2.5: "According to the recent case law from the Enlarged Board of Appeal in its decision G 1/19, points 28, 29 and 78, the criterion for computer-implemented inventions to be eligible for patent protection is now the "any hardware" approach, which was not used in decision T 115/85. For this reason alone, decision T 115/85 is irrelevant for the question of whether there is an inventive step under Article 56 EPC."

[85] See, e.g., *EPO: T1027/20 Availability status/MICROSOFT TECHNOLOGY LICENSING*, r. 4.7: "… informing the user about the progress of a technical process is in principle a technical problem (see *EPO: T 528/07 Portal system/ACCENTURE*, r. 3.3 to 3.5; *T 1670/07 Shopping with mobile device/NOKIA*, Reasons 12 and 13). This principle has not changed with decision G 1/19 of the Enlarged Board. This decision rules that measurements, including indirect measurements, have technical character since they are based on an interaction with physical reality at the outset of the measurement method. Moreover, measurements are of a technical nature regardless of what use is made of the results (G 1/19, reasons 85, 86 and 99)." or *EPO: T1422/19 Content item visibility/GOOGLE*, r. 4.4: "The method does not merely calculate this information from numerical input data but measures 'raw' information about a running web browser and processes this information to produce an estimate of a technically meaningful parameter, namely the extent to which a content item displayed within a web page is visible to the user, and on the basis of technical considerations relating to what is possible with an unmodified browser that enforces standard security constraints. Such an indirect measurement is normally of a technical nature (see decision G 1/19, not yet published in the OJ EPO, point 99); but see also *EPO: T1910/20 Displaying cluster centres/ROCHE*, r. 3.