Murgitroyd and Sonoda & Kobayashi present

Patents: Patentability of Software Inventions and AI – Overview of Legal Systems and Recent Trends

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Agenda

1. Patentability Requirements and Legal Basis
2. Subject Matter Eligibility and Examination Guidelines
3. Case Examples of AI-related Inventions in Japan
4. Protection of AI-related Inventions in European Jurisdictions

Patents: Patentability of Software Inventions and AI – Overview of Legal Systems and Recent Trends

1. Patentability Requirements and Legal Basis

Patentability Requirements in Japan

- Novelty and Inventive Step (JP Patent Law, Art. 29, Para.1 & 2)
- Industrial Applicability (Art. 29, Main Paragraph)
- "Patent eligibility" or Statutory Invention (same)
- Clarity in Claim Recitations (Art. 36, Para. 6, Item 2)
  Enablement Requirement (Art. 36, Para. 4)
  Support Requirement (Article 36, Para. 6, Item 1)

The JPO's attitude towards soft ware inventions has been generous on eligibility but strict on inventive step.

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Legal Basis
Relevant Articles in the Japanese Patent Law

JP Patent Law, Article 2

(1) "Invention" means the highly advanced creation of technical ideas utilizing the laws of nature.

(3) "Working" of the invention means the following acts:

i. in the case of an invention of a product (including a computer program, etc., the same shall apply hereinafter)*,…
ii. in the case of an invention of a process…
iii. in the case of a process for producing a product,…

(4)** A "computer program, etc." means a computer program (…) and any other information that is to be processed by an electronic computer equivalent to a computer program.

*Revised (or **added) in 2002

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SOFTWARE PATENTS IN EUROPE - EPC

European Patent Convention (EPC)

Article 52 - Patentable inventions

http://www.epo.org/law-practice/legal-texts/html/epc/2016/e/ar52.html

(1) 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.

(2) The following in particular shall not be regarded as inventions within the meaning of paragraph 1:
   a. discoveries, scientific theories and mathematical methods;
   b. aesthetic creations;
   c. schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers;
   d. presentations of information.

(3) Paragraph 2 shall exclude the patentability of the subject-matter or activities referred to therein only to the extent to which a European patent application or European patent relates to such subject-matter or activities **as such**.

SOFTWARE PATENTS IN EUROPE – GUIDELINES FOR EXAMINATION

EPO Guidelines For Examination

The invention must be of "technical character" to the extent that it must relate to a technical field (Rule 42(1)(a)), must be concerned with a technical problem (Rule 42(1)(c)), and must have technical features in terms of which the matter for which protection is sought can be defined in the claim (Rule 43(1)).

Subject-matter or activities listed in Art. 52(2), when taken **as such** (Art. 52(3)), are considered non-technical. In case of a claim containing a mix of technical and non-technical features, the examiner identifies which features contribute to the technical character of the claimed subject-matter.

Features that appear to be non-technical when taken in isolation may nonetheless contribute to the technical character of a claimed invention if, in the context of that invention, they contribute to produce a technical effect serving a technical purpose. The mere implementation of effects that are inherent in the excluded matter or result from circumvention of the technical problem rather than contributing to a technical solution would not qualify as technical effects.

Patents: Patentability of Software Inventions and AI – Overview of Legal Systems and Recent Trends

2. Subject Matter Eligibility and Examination Guidelines

2.1 Patent Eligibility in Japan

Highly advanced creation of technical ideas utilizing the laws of nature.

- Unlike a hardware-related invention, a software-related invention is NOT directly linked to the laws of nature.

- In Japan, protection of software-related inventions by the patent law has been discussed, mainly in view of whether software-related inventions fall under "Invention" as defined by the patent law. The discussion promoted revision of patent examination guidelines and the law *per se*.

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2.2 Patent Eligibility (“utilizing laws of nature”)

(1) Claimed invention as a whole must utilize laws of nature

If **the invention is fully regarded as utilizing the laws of nature**, regardless of whether the invention includes computer software, the invention is a statutory invention. Special considerations from the viewpoint of computer software are unnecessary.

(a) Inventions that concretely control an apparatus or process according to control for an apparatus
(e.g. engine control)

(b) Inventions that concretely process information based on technological aspects of an object
(e.g. image processing)

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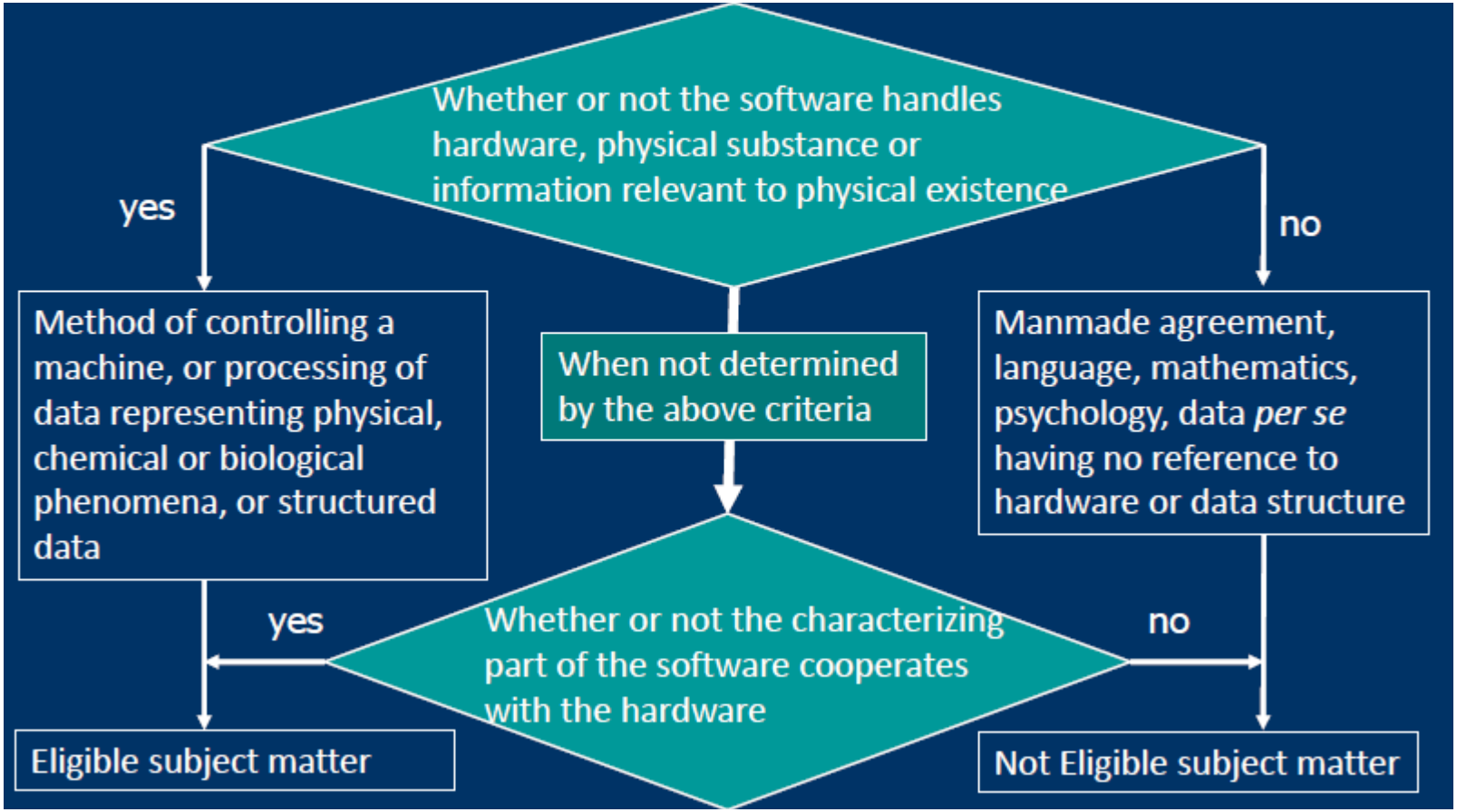
Subject Matter Eligibility Flowchart



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Examples of Unpatentable Subject Matter

- Program list
  - A program printed on paper or displayed on a screen (ineligible, not a technical idea)
- Programming language
  - (Ineligible, not utilizing the laws of nature)
- Program signal (array) or data signal (array)
  - Cannot be determined whether a “product invention” or a “method invention” (lacks clarity)

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Example of (1)(a): Invention concretely controlling an apparatus

Example claim:

- An apparatus for controlling rate of fuel injection for an automobile engine by a programmed computer, comprising:

  first detector means for detecting the rate of engine revolutions;

  second detector means for detecting transition of the rate of engine revolution; and

  fuel injection rate decision means for determining the rate of fuel injection by said control program in accordance with the values detected in said first and second detector means.

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Example of (1)(b): Invention concretely processing information based on technological aspects of an object

Example claim:

- An image processing method by computer for compensating blurring of optically read image data comprising the steps of:

  inputting a pixel matrix A of 3 rows and 3 columns obtained from image data picked up by an optical reading means;

  computing a pixel matrix C= A*B, wherein B is a matrix formed by stored filter parameters of 3 rows and 3 columns; and

  outputting the pixel matrix C.

$$B = \begin{pmatrix} 0 & -0.5 & 0 \\ -0.5 & 3 & -0.5 \\ 0 & -0.5 & 0 \end{pmatrix}$$

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2.2 Patent Eligibility (“utilizing laws of nature”) (cont.)

(2) For software-related inventions, Cooperation of Software (SW) and Hardware (HW) is required

Regarding inventions, such as computer software for business, computer software for games, or computer software for numerical processes, which are created totally utilizing computer software:

- If the information processing by software is concretely realized by a hardware resource, this invention is deemed to utilize the laws of nature.
- In particular, if an information processing apparatus or methodology is concretely constructed by cooperation of SW and HW resources, according to the purpose of use.

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Example of (2) (SW-related inventions)
Cooperation of SW and HW resources

Classic example:

n, m: natural numbers , $1 \leqq n \leqq m < 256$)

$$s = \frac{(m+n)^2 - (m-n)^2}{4}$$

Calculation of m*n in an 8-bit CPU w/o a multiplier or a multiplication table.

i. calculate (m+n) and (m-n);
ii. obtain square of each by referring to a square function table;
iii. calculate difference between the squares;
iv. obtain m*n by two-bit shift.

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$$s = \frac{(m+n)^2 - (m-n)^2}{4}$$

n, m: natural numbers , $1 \leqq n \leqq m < 256$

Claim:

A calculation apparatus to calculate a product of m by n, comprising

means for inputting ‘n’ and ‘m’;

a square function table, wherein ‘k’ square value k**2 (where, $0 \leqq k < 511$) is stored;

arithmetical means comprising an adder-subtracter and a bit shift arithmetical unit; and

means for outputting the sum of ‘s’ by said arithmetical means,

wherein said arithmetical means refers to said square function table in order to obtain square values, without using a multiplier-divider unit.

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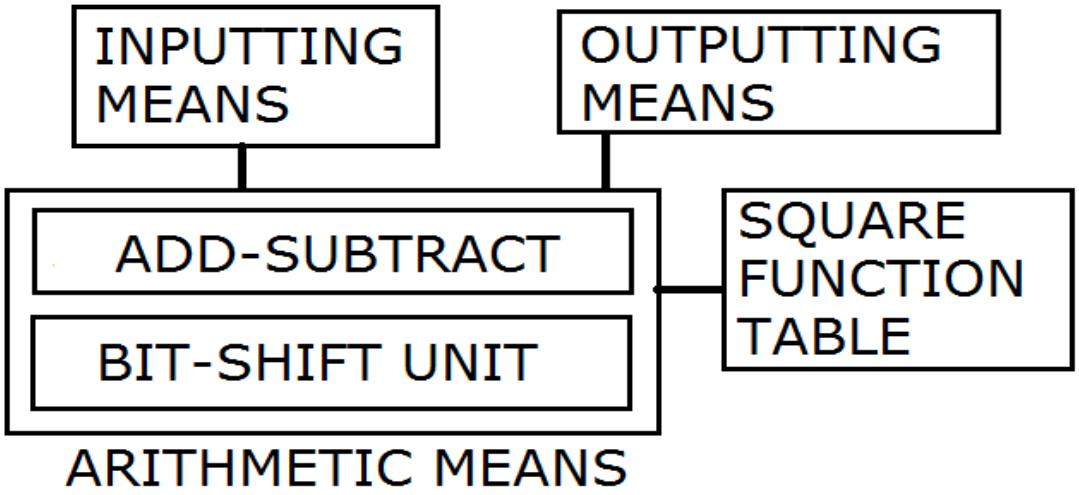
Example of (2) (SW-related inventions) Cooperation of SW and HW resources (cont.)

- The claimed invention is a “statutory invention”.
- It can be said that information processing by software is concretely realized by using hardware resources.



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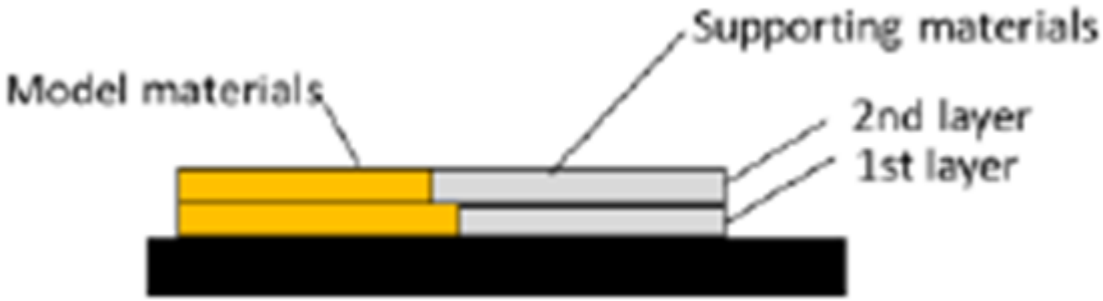
Example: 3D printing data

An example utilizing the laws of nature:

[Claim] 3D printing data used in a 3D printer which laminates model materials that finally constitute a 3D-modeled object and supporting materials that support said model materials during modeling,

- wherein the 3D printing data has a structure comprising in each layer of the 3D-modeled object:



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Example: 3D printing data claim (cont.)

model material data…;

a model material pointer…;

support material data…;

a support material pointer…;

….

wherein the control unit of the 3D printer is used for obtaining the model material data or the support material data from the storage portion in accordance with the model material pointer or the support material pointer after printing based on the model material data or the support material data.

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Example: AI Data

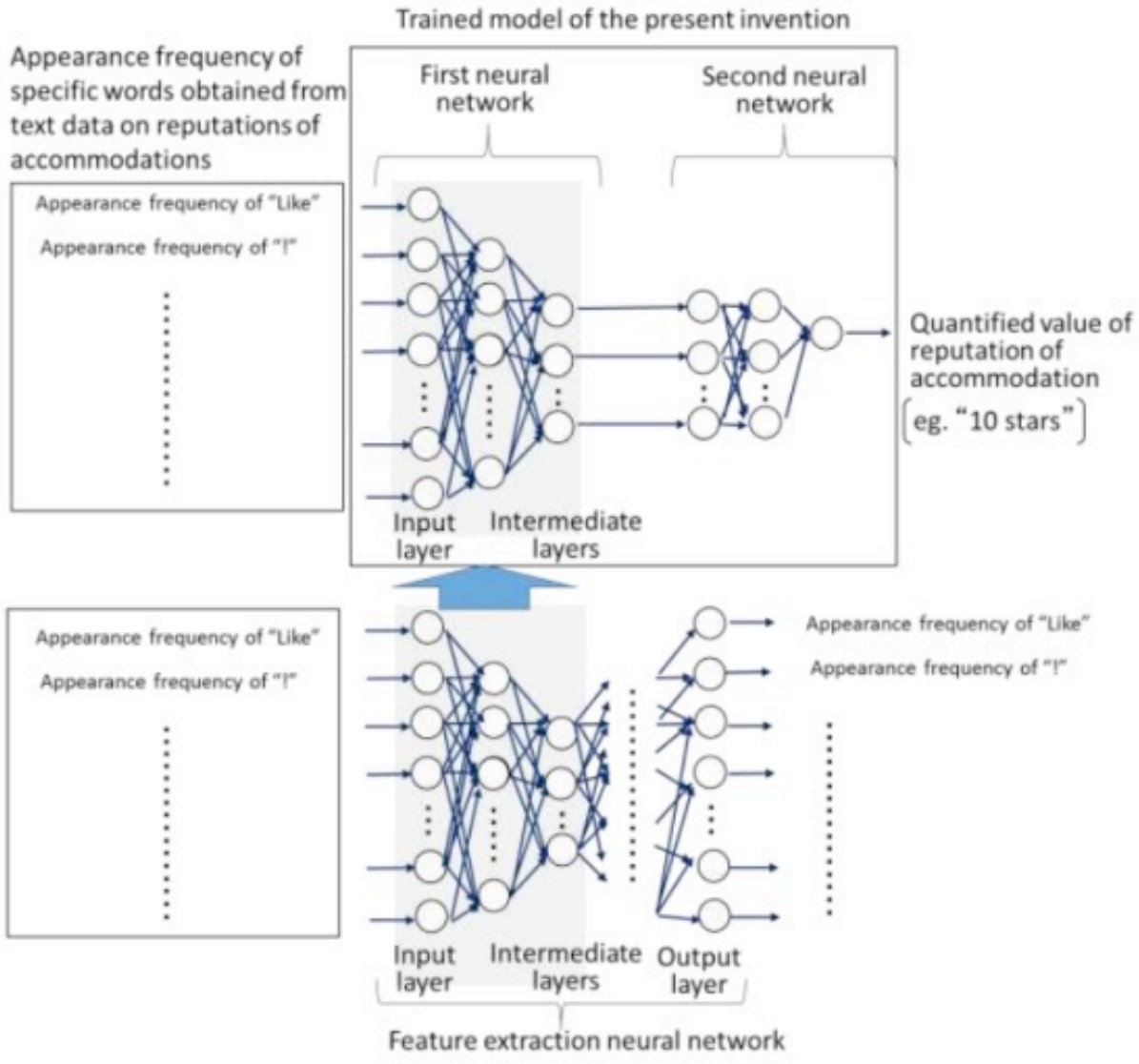
Trained Model for Analyzing Reputations of Hotels

Akira

I am at Hotel California.
I **like** it**!!!**

Natalie

Hotel California was horrible**!**



Hotel California

★★★☆

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Example: AI Data

Trained Model for Analyzing Reputations of Hotels

[Claim 1]

A trained model for causing a computer to function to output quantified values of reputations of accommodations based on text data on reputations of accommodations, wherein;

the model is comprised of a first neural network and a second neural network connected in a way that the said second neural network receives output from the said first neural network;

the said first neural network is comprised of an input layer to intermediate layers of a feature extraction neural network in which the number of neurons of at least one intermediate layer is smaller than the number of neurons of the input layer, the number of neurons of the input layer and the number of the output layer are the same, and weights were trained in a way each value input to the input layer and each corresponding value output from output layer become equal;

weights of the said second neural network were trained without changing the weights of the said first neural network; and

the model causes the computer function to perform a calculation based on the said trained weights in the said first and second neural networks in response to appearance frequency of specific words obtained from the text data on reputations of accommodations input to the input layer of the said first neural network and to output the quantified values of reputations of accommodations from the output layer of the said second neural network.

- This "trained model" is a program.

- SW and HW cooperates.

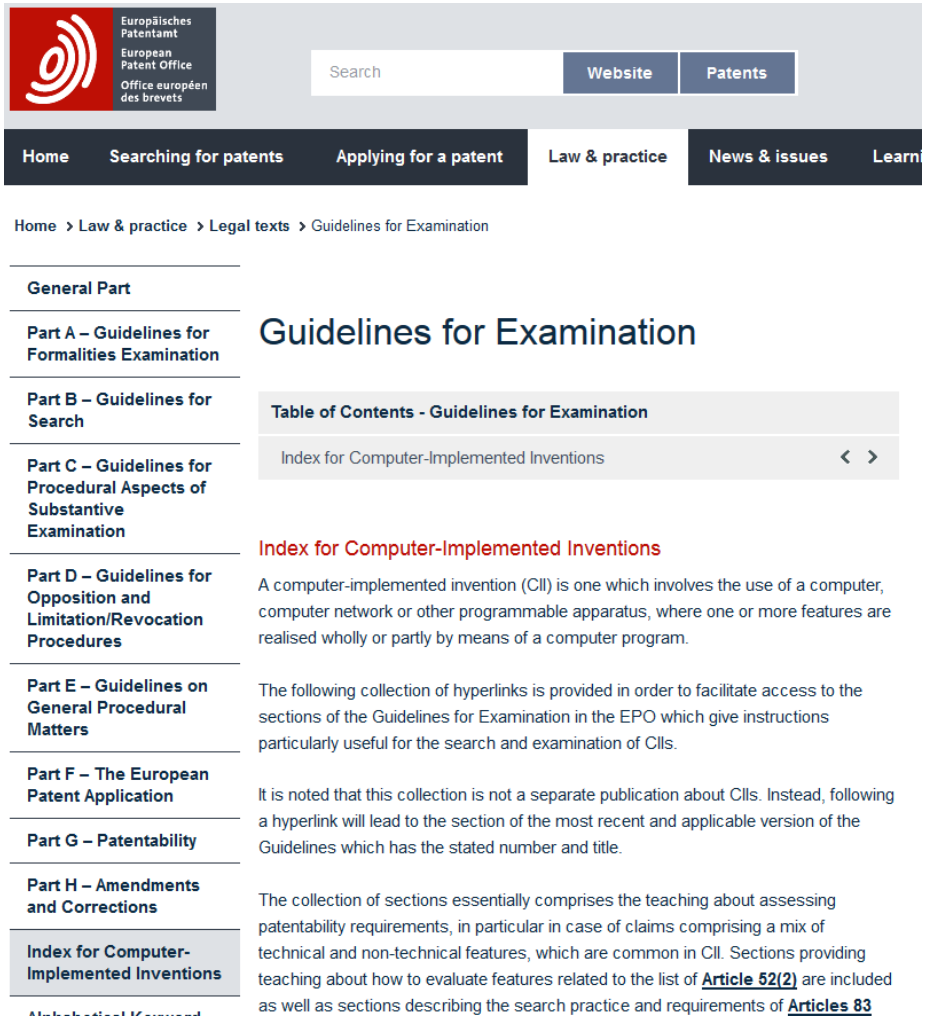
- SW processes are performed by HW.

Eligibility Satisfied.

GUIDELINES INDEX RE COMPUTER IMPLEMENTED INVENTIONS

EPO Guidelines: Index for CII

http://www.epo.org/law-practice/legal-texts/html/guidelines/e/j.htm



GUIDELINES UPDATE 11/2018

EPO Guidelines were updated as of 01/11/2018

– computer-related changes:

- G-II, 3.3 Mathematical methods (updated in GL 2018)
  - **G-II, 3.3.1 Artificial intelligence and machine learning (updated in GL 2018)**
  - **G-II 3.3.2 Simulation, design or modelling (updated 2017)**

- G-II, 3.5 Schemes, rules and methods for performing mental acts, playing games or doing business (updated in GL 2018)
  - G-II, 3.5.1 Schemes, rules and methods for performing mental acts (introduced in GL 2018)
  - G-II, 3.5.2 Schemes, rules and methods for playing games (introduced in GL 2018)
  - G-II, 3.5.3 Schemes, rules and methods for doing business (introduced in GL 2018)

GUIDELINES UPDATE 11/2018

EPO Guidelines were updated as of 01/11/2018
– computer-related changes:

- G-II, 3.6 Programs for computers (updated in GL 2018)
  - **G-II, 3.6.1 Examples of further technical effects (updated in GL 2018)**
  - **G-II, 3.6.2 Information modelling, activity of programming and programming languages (introduced in GL 2018)**
  - G-II, 3.6.3 Data retrieval, formats and structures (introduced in GL 2018)
- G-II, 3.7 Presentations of information (updated in GL 2018)

UPDATE: PROGRAMS FOR COMPUTERS (1)

- The basic patentability considerations in respect of claims for computer programs are in principle the same as for other subject-matter. While "programs for computers" are included among the items listed in Art. 52(2), if the claimed subject-matter has a **technical character** it is not excluded from patentability by the provisions of Art. 52(2) and (3).

- In order to have a technical character, and thus not be excluded from patentability, a computer program must produce a "**further technical effect**" when run on a computer. A "further technical effect" is a technical effect going beyond the "normal" physical interactions between the program (software) and the computer (hardware) on which it is run. The normal physical effects of the execution of a program, e.g. the circulation of electrical currents in the computer, are not in themselves sufficient to confer technical character to a computer program.

UPDATE: ROGRAMS FOR COMPUTERS (2)

- A computer program cannot derive a technical character from the mere fact that it has been designed such that it can be automatically performed by a computer. "Further technical considerations" going beyond merely finding a computer algorithm to perform a task are needed. They have to be reflected in claimed features that cause a further technical effect.

- **Examples:**
  - controlling an anti-lock braking system in a car,
  - determining emissions by an X-ray device,
  - compressing video,
  - restoring a distorted digital image,
  - encrypting electronic communications
  - implementing security measures for protecting boot integrity
  - implementing countermeasures against power analysis attacks
  - processor load balancing
  - memory allocation
  - processing code at low level, such as builders or compilers

UPDATE: AI (1)

- Artificial intelligence and machine learning are based on computational models and algorithms for classification, clustering, regression and dimensionality reduction, such as neural networks, genetic algorithms, support vector machines, k-means, kernel regression and discriminant analysis. Such computational models and algorithms are per se of an abstract mathematical nature, irrespective of whether they can be "trained" based on training data. Hence, the guidance provided in G-II, 3.3 generally applies also to such computational models and algorithms.

- When examining whether the claimed subject-matter has a technical character as a whole (Art. 52(1), (2) and (3)), expressions such as "*support vector machine*", "*reasoning engine*" or "*neural network*" are looked at carefully, because they usually refer to abstract models devoid of technical character.

UPDATE: AI (2)

- Technicality **YES**
  - the use of a neural network in a heart-monitoring apparatus for the purpose of identifying irregular heartbeats
  - classification of digital images, videos, audio or speech signals based on low-level features (e.g. edges or pixel attributes for images)

- Technicality **NO**
  - classifying text documents solely in respect of their textual content
  - classifying abstract data records or even "telecommunication network data records" without any indication of a technical use being made of the resulting classification (even if the classification algorithm may be considered to have valuable mathematical properties such as robustness)

- Where a classification method serves a technical purpose, the steps of generating the training set and training the classifier may also contribute to the technical character of the invention if they support achieving that technical purpose.

UPDATE: SIMULATION, DESIGN OR MODELLING (1)

- generally: claims directed to methods of simulation, design or modelling typically comprise features which fall under the category of mathematical methods or of methods for performing mental acts => excluded

- If at least partially computer-implemented => subject-matter as a whole not excluded (“technical character” needed)

- computer-implemented simulation methods cannot be denied a technical effect merely on the ground that they precede actual production and/or do not comprise a step of manufacturing the physical end product

- simulation of non-technical processes, such as a marketing campaign, an administrative scheme for transportation of goods or determining a schedule for agents in a call centre, does not represent a technical purpose

- generic limitation, such as "simulation of a technical system", does not define a relevant technical purpose

UPDATE: SIMULATION, DESIGN OR MODELLING (2)

Technicality **YES**

- determination of a technical parameter which is intrinsically linked to the functioning of the technical object in CAD (determination based on technical considerations)
- in a computer-implemented method of designing an optical system, the use of a particular formula for determining technical parameters for given input conditions
- determining by iterative computer simulations the maximum value that an operating parameter of a nuclear reactor may take without risking rupture of a sleeve due to stress

Technicality **NO**

- computer-aided determination of the technical parameters depending on decisions to be taken by a human user
- computer-implemented method resulting merely in an abstract model of a product, system or process, e.g. a set of equations, **even if the modelled product, system or process is technical**
- a logical data model for a family of product configurations having no inherent technical character and a method merely specifying how to proceed to arrive at such a logical data model
- a method merely specifying how to describe a multi-processor system in a graphical modelling environment

UPDATE: INFORMATION MODELLING, ACTIVITY OF PROGRAMMING AND PROGRAMMING LANGUAGES (1)

Technicality **NO**

- information modelling is an intellectual activity devoid of technical character
- specifications of a modelling language,
- the structure of an information modelling process (e.g. use of a template)
- the maintenance of models
- properties inherent to information models, like re-usability, platform-independence or convenience for documentation => not technical effects
- conceptual methods describing the process of software development (meta-methods)
- activity of programming, in the sense of writing code, is an intellectual, non-technical activity, to the extent that it is not used in the context of a concrete application or environment to contribute in a causal manner to the production of a technical effect
- reading a data type parameter from a file as input to a computer program, rather than defining the data type in the program itself
- naming conventions for object names for facilitating the intelligibility and the management of program code

UPDATE: INFORMATION MODELLING, ACTIVITY OF PROGRAMMING AND PROGRAMMING LANGUAGES (2)

Technicality **NO**

- defining and providing a programming language or a programming paradigm such as object-oriented programming, even if its particular syntax and semantics enable the programmer to develop a program with greater ease (easing the intellectual effort of the programmer is per se not a technical effect!)

Technicality **YES** (**MAYBE**)

- information model purposively used in the context of an invention to solve a specific technical problem
- features specifying how the model is actually stored (e.g. using relational database technology)

UPDATE: DATA RETRIEVAL, FORMATS AND STRUCTURES (1)

When assessing data structures and data formats, a distinction is made between functional data and cognitive data.

- **Functional data** serve to control the operation of a device processing the data. They inherently comprise, or reflect, corresponding technical features of the device.

- **Cognitive data**, on the other hand, are those data whose content and meaning are only relevant to human users.

Functional data => contributes to producing a technical effect

Cognitive data => does not contribute to producing a technical effect

UPDATE: DATA RETRIEVAL, FORMATS AND STRUCTURES (2)

Examples:

- a record carrier for use in a picture retrieval system stores coded pictures together with a data structure defined in terms of line numbers and addresses which instruct the system how to decode and access the picture from the record carrier => this data structure is functional data
- the cognitive content of the stored pictures (e.g. photograph of a person or landscape) has no technical effect

- an index structure used for searching a record in a database is functional data

- an electronic message with a header and a content section
  - information in the header comprises instructions which are automatically recognised and processed by the receiving message system => provision of such instructions in the header contributes to the technical character of the electronic message
  - the information in the content section, representing cognitive data, has no technical character

SUMMARY EPO

- known “technicality” principle applied to CII and AI
- EPO deems CII (including IoT) and AI to be treated according to the same considerations and prerequisites
- EPO remains very strict with respect to CII and AI, however, their importance is recognized
- “functional data” definition sufficiently clear ?

=> How to protect AI in Europe ?

Patents: Patentability of Software Inventions and AI – Overview of Legal Systems and Recent Trends

3. Case Examples of AI-related Inventions in Japan
   - Written Description Requirements
   - Inventive Step Requirement

Clarity requirements posed on software inventions

Computer software can be claimed in the form of a method, a program, a structured data, computer readable data storage media, etc.

Other expressions such as module, library, neural network, support vector machine, model are acceptable as long as they are clearly understood to mean computer software or hardware.

Expressions such as program product may be deemed as lacking clarity.

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Sugar Content Estimation System

Claim 1: Violation of the enablement requirement

A certain correlation among each data in a training data is not supported by the description and is not a common general technical knowledge at the time of filing. Therefore, the description requirement is not satisfied.

[Claim 1]

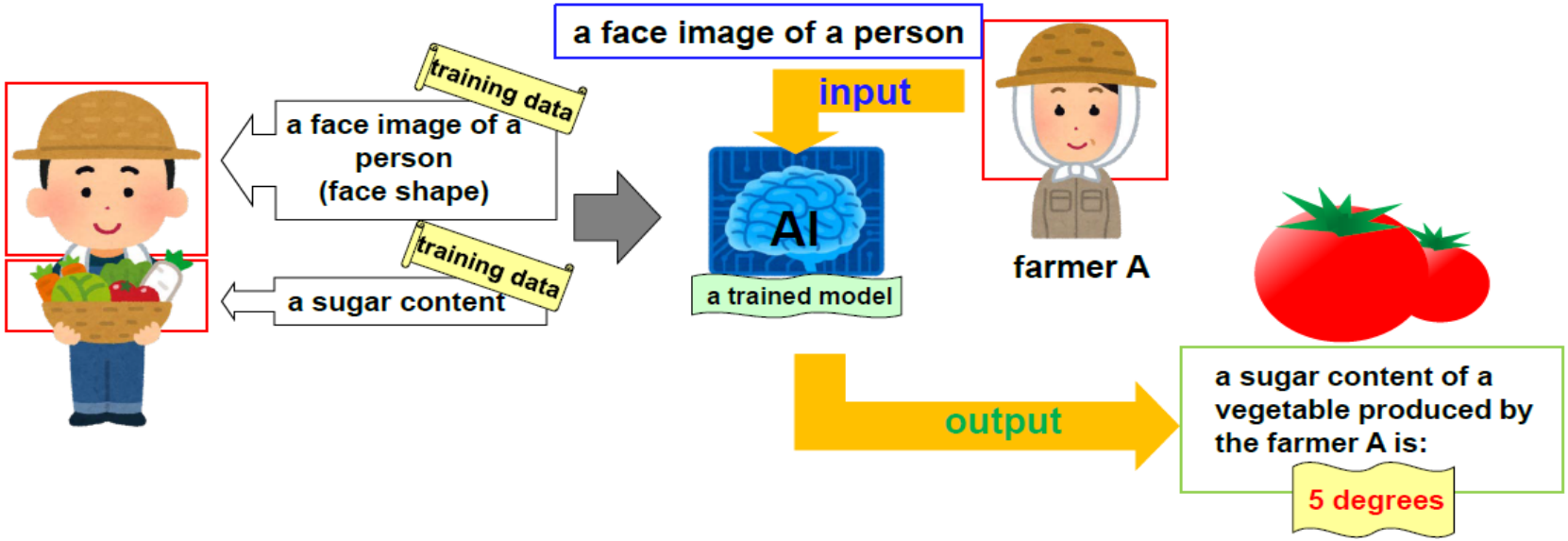
A sugar content estimation system comprising:

a storage means for storing face images of people and sugar contents of vegetables produced by the people;

a model generation means for generating a determination model through machine learning, to which a face image of a person is input and from which a sugar content of a vegetable produced by the person is output, using training data containing the face images of the people stored in the storage means and the sugar contents of the vegetables,

a reception means for receiving an input of an face image; and

a processing means for outputting, using the generated determination model that has been generated by the model generation means, a sugar content of a vegetable produced by a person that is estimated based on the face image of the person inputted to the reception means.



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Business Plan Design Apparatus

Claim 1: There is no reason for refusal found.

The description does not disclose a specific correlation among each data in a training data. However, such a specific correlation is a common general technical knowledge at the time of filing, and the description requirement is satisfied.

[Claim 1]

A business plan design apparatus comprising:

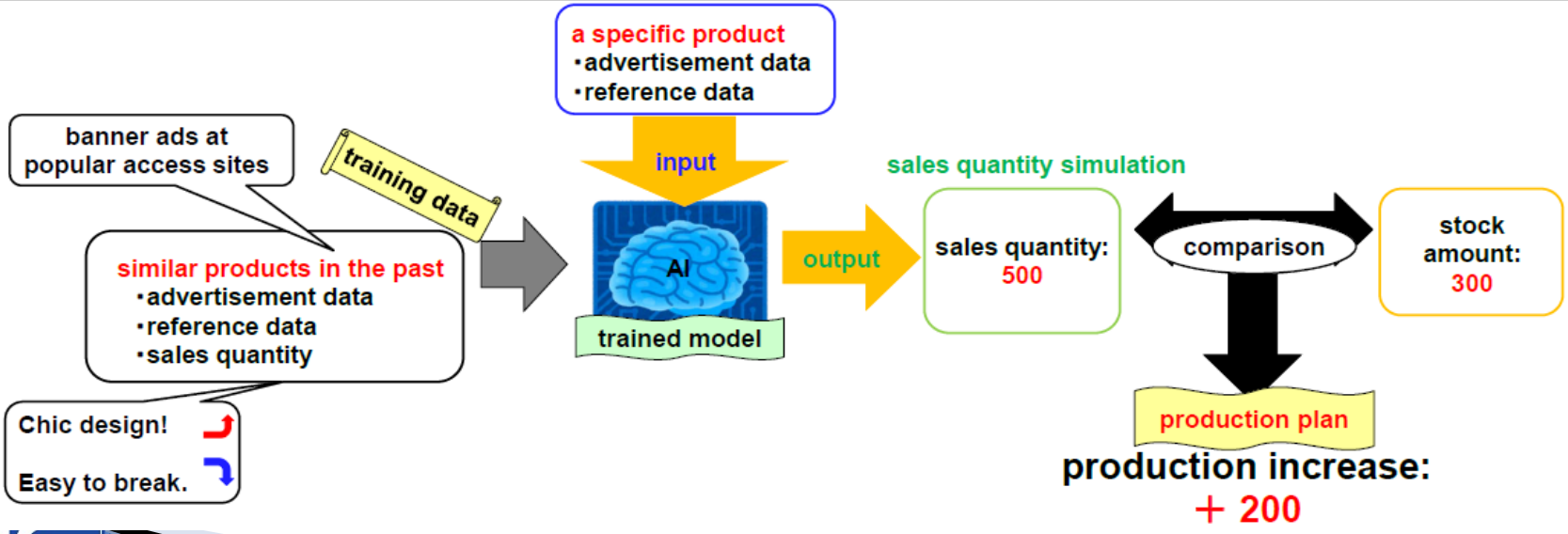
a storage means for storing a stock amount of a specific product;

a reception means for receiving a web advertisement data and mention data of the specific product;

a simulation and output means for, using an estimation model that has been trained through machine learning with a training data containing a web advertisement data and mention data of a similar product that has been sold in the past and a sales quantity of the similar product, simulating and outputting a future sales quantity of the specific product estimated based on the web advertisement data and mention data of the specific product;

a production plan making means for planning a future production quantity of the specific product, based on the stored stock amount and the output sales quantity; and

an output means for outputting the output sales quantity and the production plan.



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Autonomous Vehicle

Claim 1: There is no reason for refusal found.

The description does not disclose a specific correlation among each data in a training data. However, such a specific correlation is a common general technical knowledge at the time of filing, and the description requirement is satisfied.

Claim 1

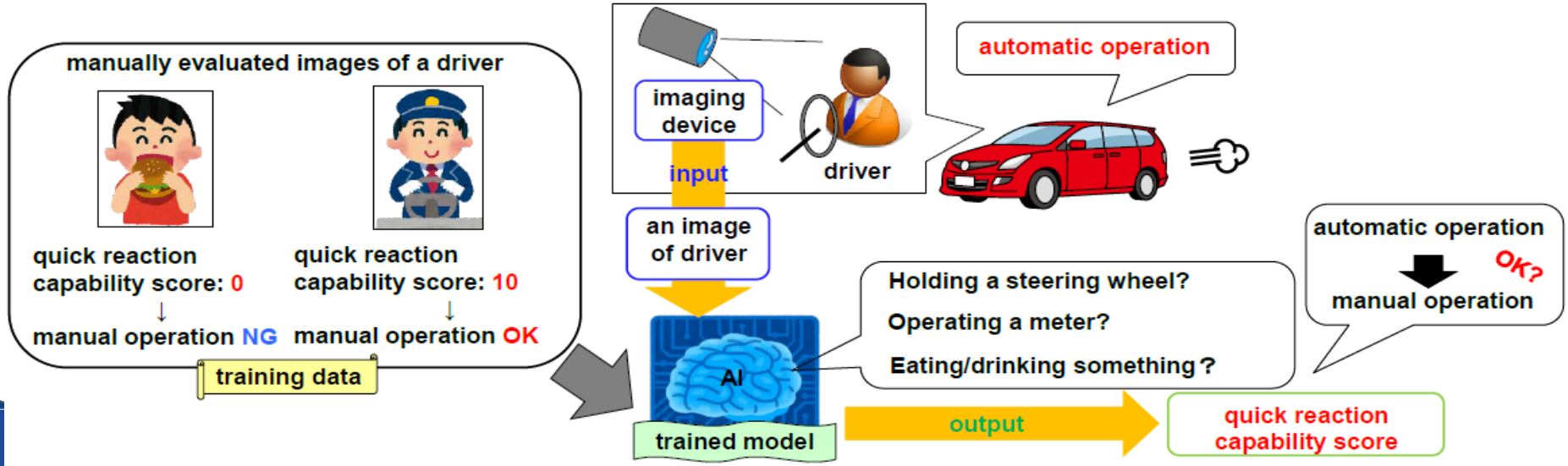
An autonomous vehicle having a driver monitoring device,

the driver monitoring device including:

an image obtainment unit that obtains an image taken by an imaging device that has been positioned so as to take an image of a driver seated in a vehicle seat; and

a quick reaction capability estimation unit that inputs the taken image to a trained learning model and obtains a quick reaction capability score representing a quick reaction capability of the driver during vehicle operation from the trained learning model, the trained learning model having been trained through machine leaning to estimate a quick reaction capability of the driver during vehicle operation,

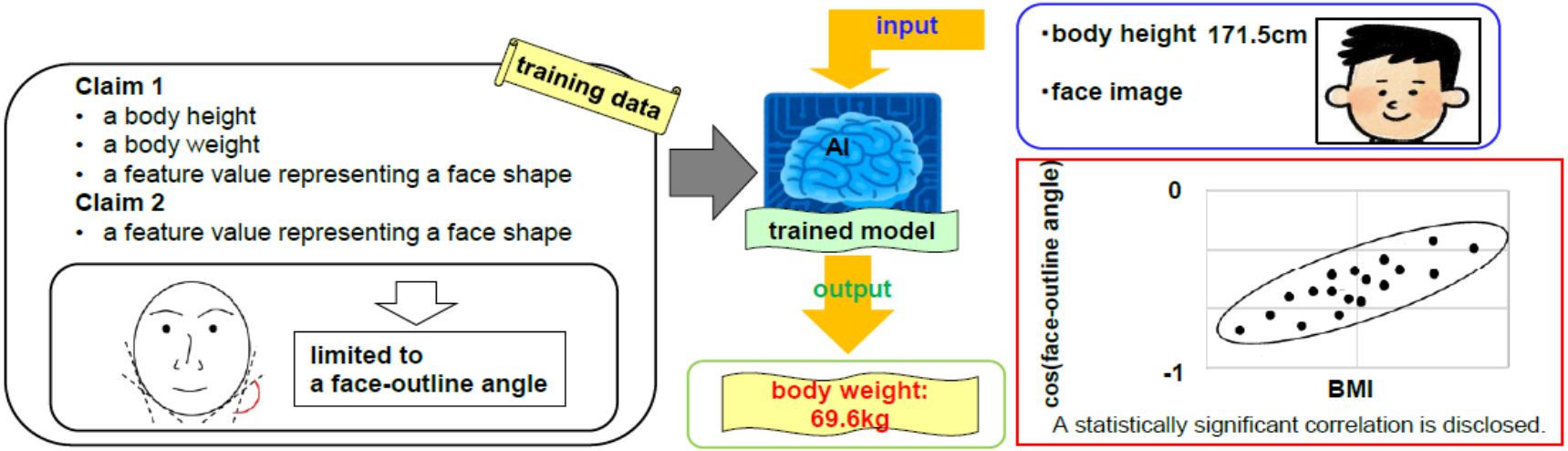
wherein switching from an autonomous operation mode in which a vehicle is operated automatically to a manual operation mode in which a vehicle is operated manually by a driver is prohibited, in a case where the obtained quick reaction capability score does not satisfy a predetermined condition.



Body Weight Estimation

Claim 1: violation of the support/enablement requirements
A certain correlation among each data in a training data disclosed in a generic concept is not supported by the description and is not a common general technical knowledge at the time of filing. Therefore, the description requirement is not satisfied.
Claim 2: There is no reason for refusal found.
A certain correlation among each data in a training data is supported by the statistics in the description. Therefore, the description requirement is satisfied.

[Claim 1]
A body weight estimation system comprising:
a model generation means for generating an estimation model that estimates a body weight of a person based on a feature value representing a face shape and a body height of the person, through machine learning using training data containing feature values representing face images as well as actual measured values of body heights and body weights of people;
a reception means for receiving an input of a face image and body height of a person;
a feature value obtainment means for obtaining a feature value representing a face shape of the person through analysis of the face image of the person that has been received by the reception means; and
a processing means for outputting an estimated value of a body weight of the person based on the feature value representing the face shape of the person that has been received by the feature value obtainment means and the body height of the person that has been received by the reception means, using the generated estimation model by the model generation means.
[Claim 2]
The body weight estimation system as in Claim 1, wherein the feature value representing a face shape is a face-outline angle.



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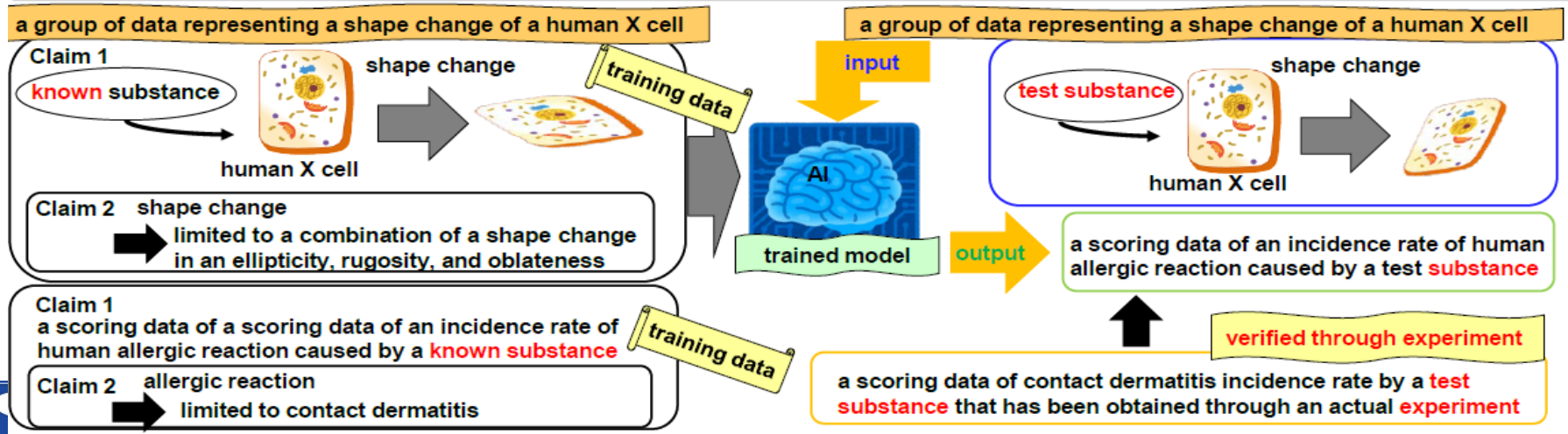
Allergy Incidence Rate

Claim 1: violation of the support/enablement requirements
A certain correlation among each data in a training data disclosed in a generic concept is not supported by the description and is not a common general technical knowledge at the time of filing. Therefore, the description requirement is not satisfied.
Claim 2: There is no reason for refusal found.
A certain correlation among each data in a training data is supported by a performance evaluation result using an actual AI model. Therefore, the description requirement is satisfied.

[Claim 1] A method for estimating an allergy incidence rate of a test substance in a human being comprising:
inputting a training data to an artificial intelligence model to train the model, the training data including a group of data representing a shape change of a human X cell in culture solution and a scoring data on incidence rates of human allergic reaction caused by each substance, in which each of the substances is separately added to the culture solution and the incidence rates of human allergic reaction caused by each of the substances are already known;
obtaining a group of data representing a shape change of a human X cell that has been measured in culture solution to which a test substance is added;
inputting, to the trained artificial intelligence model, the group of data representing a shape change of a human X cell that has been measured in the culture solution to which the test substance is added; and
causing the trained artificial intelligence model to calculate a scoring data of an incidence rate of human allergic reaction.
[Claim 2] The method for estimating an allergy incidence rate as in Claim 1, wherein the group of data representing a shape change of a human X cell is a combination of a shape change in an ellipticity, rugosity, and oblateness of the human X cell; and the allergic reaction is contact dermatitis.



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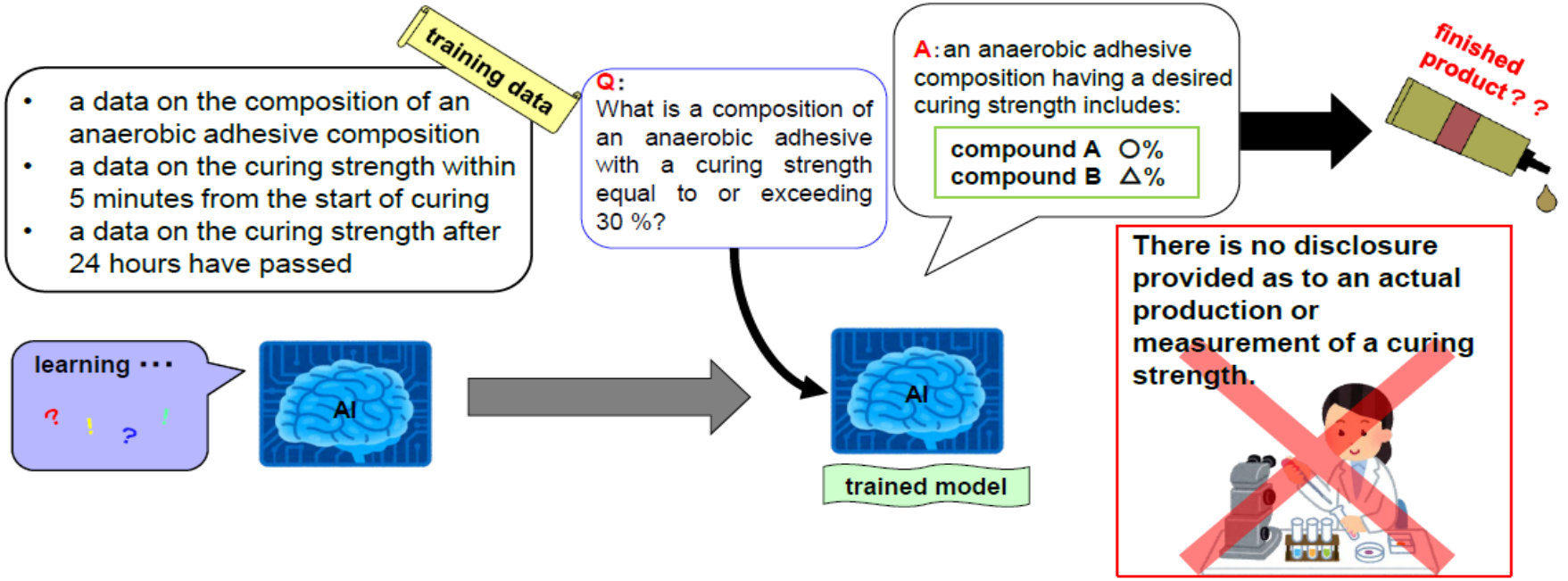
Anaerobic Adhesive Composition

Claim 1: violation of the support/enablement requirements

An invention of product is claimed. However, the invention is not evaluated using an actually-produced product and an estimation accuracy of a trained model is not verified. Further, it is not assumed that it is a common general technical knowledge at the time of filing that an estimation result by a trained model can be a substitution for an actual experimental result. Therefore, the description requirement is not satisfied.

[Claim 1]

An anaerobic adhesive composition comprising: a 0.08 - 3.2 mass % compound A, a 0.001 – 1 mass % compound B, and a residue containing an anaerobically curable (meth)acrylate monomer, wherein the anaerobic adhesive composition shows the curing strength equal to or exceeding 30 % of the curing strength after 24 hours have passed, within 5 minutes from the start of curing.



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Written Description Requirements Summary

- Correlations should be supported in the Description, or at least known in the art
- Claims should not be generalized beyond features specified in the Description
- Actual results of an AI predicted model should be verified

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Inventive Step

Reasons to deny inventive step:

1. Motivation to combine prior art.
   - Common technology field
   - Common problem
   - Common action and functionality
2. Suggestion in prior art.
3. Design Matter.
4. Mere mixture.

Reasons to support for inventive step:

1. Remarkable effect.
2. Fact to prevent prior art from being combined.

One skilled in the art in software invention relating to a specific field is one having technical common senses in both the specific field and the computer technology field.

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Cancer Level Calculation

Claim 1: Mere a systemization of manually-operated tasks using AI and considered to be lack of inventive step.

[Claim 1] A cancer level calculation apparatus that calculates a possibility that a subject person has cancer, using a blood sample of the subject person comprising

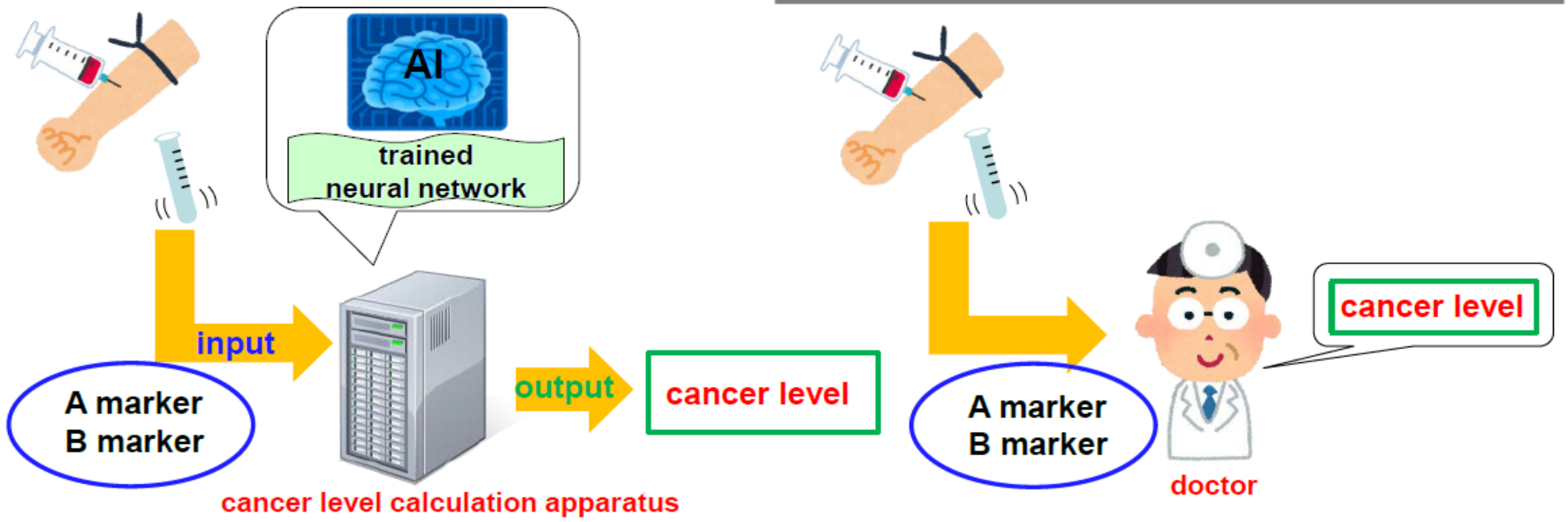
a cancer level calculation unit that calculates a possibility that a subject person has cancer, in response to an input of measured values of A marker and B marker that have been obtained through blood analysis of the subject person,

the cancer level calculation unit including a neural network that has been trained through machine learning using training data to calculate an estimated cancer level in response to the input of the measured values of A marker and B marker.

[Cited Invention 1]

A cancer level calculation method of calculating a possibility that a subject person has cancer carried out by a doctor, using a blood sample of the subject person comprising

a step of cancer level calculation, wherein a possibility that a subject person has cancer is calculated, using measured values of A marker and B marker that have been obtained through blood analysis of the subject person.



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Hydroelectric Generating Capacity

Claim 1: mere a modification of estimation method to estimate output data based on input data, and considered to be lack of inventive step
Claim 2: a significant effect is found because of addition of training data for machine learning, and considered to have inventive step

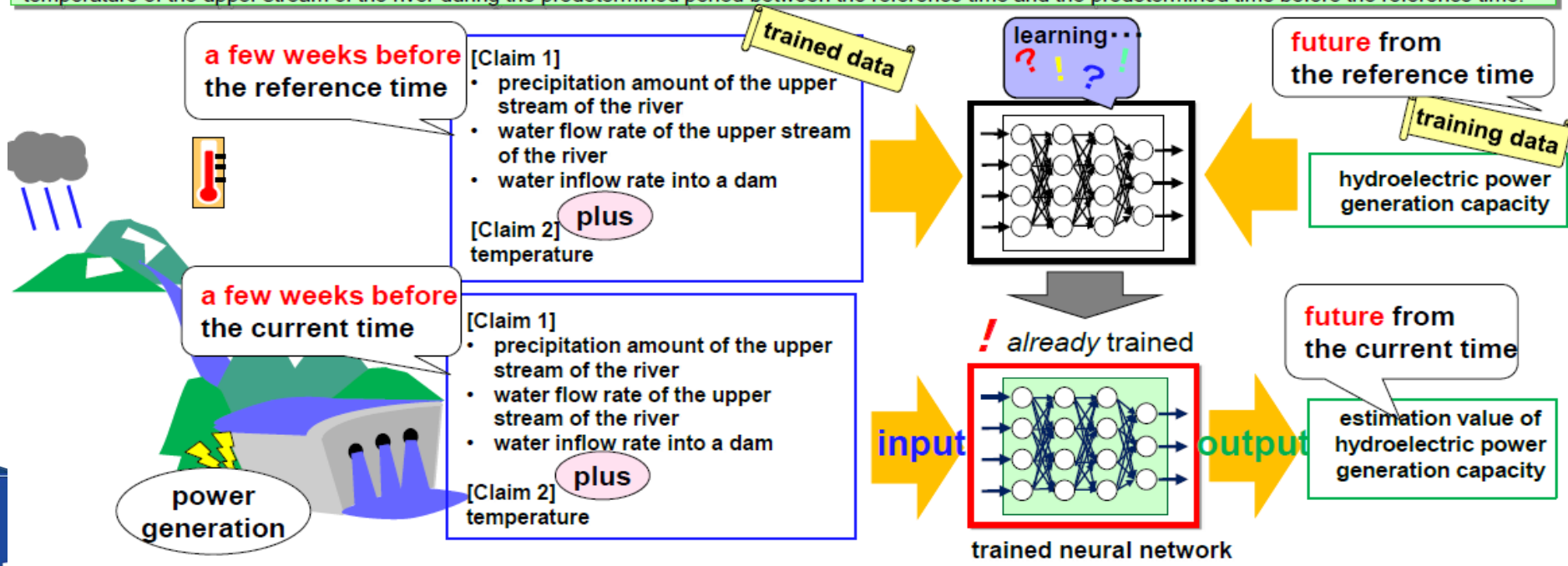
[Claim 1] An estimation system of a hydroelectric power generating capacity of a dam comprising:

a neural network that is built by means of an information processor, the neural network having an input layer and an output layer, in which an input data to the input layer containing a precipitation amount of the upper stream of a river, a water flow rate of the upper stream of the river, and a water inflow rate into a dam during a predetermined period between a reference time and a predetermined time before the reference time, and an output data from the output layer containing a hydroelectric power generating capacity in the future after the reference time;

a machine learning unit that trains the neural network using a training data corresponding to actual values of the input data and the output data; and

an estimation unit that inputs the input data to the neural network that has been trained by the machine learning unit with setting a current time as the reference time, and then calculates an estimated value of a future hydroelectric power generating capacity based on the output data of which reference time is the current time.

[Claim 2] The estimation system of a hydroelectric power generating capacity as in Claim 1, wherein the input data to the input layer further contains a temperature of the upper stream of the river during the predetermined period between the reference time and the predetermined time before the reference time.



Screw Clamping

Claim 1: Modification of a training data for machine learning is made only in a combination of known data, and considered to be lack of inventive step

[Claim 1] A screw clamping quality estimation apparatus that assesses a screw clamping quality at the time of automatic screw clamping operation by means of a screwdriver comprising:

a condition measurement unit that measures a set of condition variables containing a rotation speed, angular acceleration, position, and inclination of the screwdriver;

a machine learning unit that trains a neural network through machine learning by associating, with each other, the set of condition variables measured by the condition measurement unit and the screw clamping quality at the time of automatic screw clamping operation with the use of the set of condition variables; and

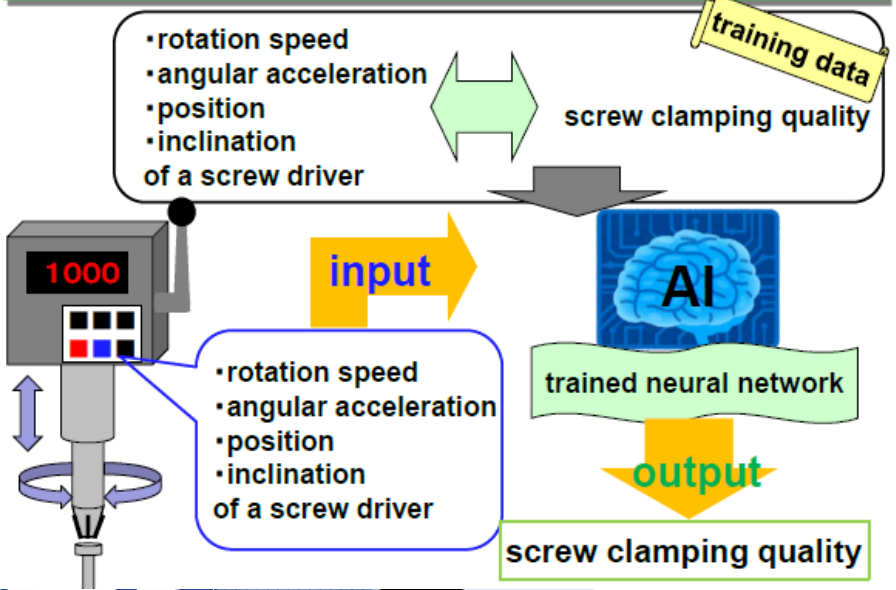
a screw clamping quality estimation unit that estimates a screw clamping quality in response to an input, to the neural network that has been trained by the machine learning unit, of the set of condition variables that have been measured at the time of automatic screw clamping operation by means of a screwdriver.

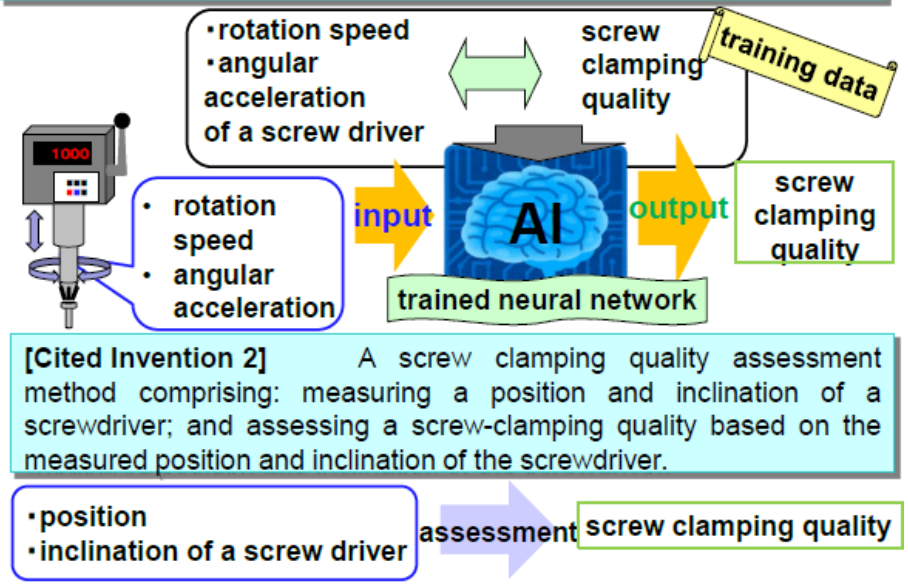
[Cited Invention 1] A screw clamping quality estimation apparatus that assesses a screw clamping quality at the time of automatic screw clamping operation by means of a screwdriver comprising:

a condition measurement unit that measures a set of condition variables containing a rotation speed and angular acceleration of the screwdriver;

a machine learning unit that trains a neural network through machine learning by associating, with each other, the set of condition variables measured by the condition measurement unit and the screw clamping quality at the time of automatic screw clamping operation with the use of the set of condition variables; and

a screw clamping quality estimation unit that estimates a screw clamping quality in response to an input, to the neural network that has been trained by the machine learning unit, of the set of condition variables that have been measured at the time of automatic screw clamping operation by means of a screwdriver.





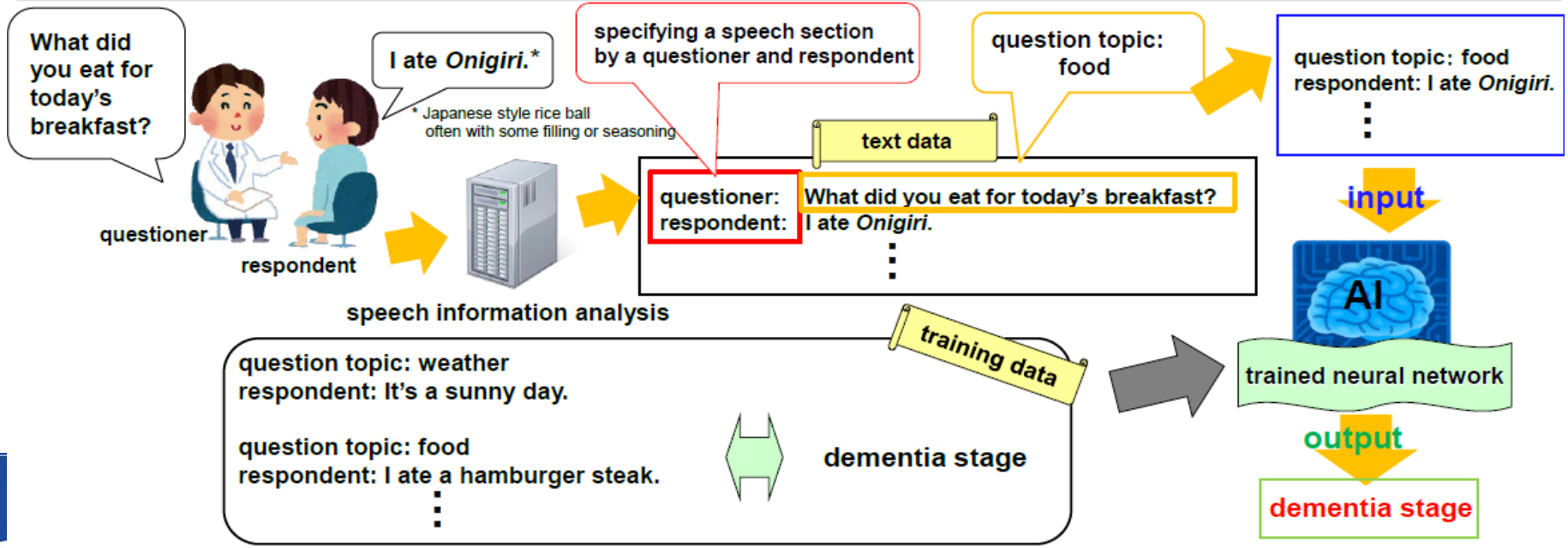
[Cited Invention 2] A screw clamping quality assessment method comprising: measuring a position and inclination of a screwdriver; and assessing a screw-clamping quality based on the measured position and inclination of the screwdriver.

·position
·inclination of a screw driver
assessment
screw clamping quality

Dementia Stage

Claim 1: Pre-processing of training data for machine learning is a factor supporting the existence of inventive step.

[Claim 1] A dementia stage estimation apparatus comprising:
a speech information obtainment means for obtaining a speech information on a conversation between a questioner and a respondent;
a speech information analysis means for analyzing the speech information, and then specifying a speech section by the questioner and a speech section by the respondent;
a speech recognition means for converting, through speech recognition, the speech information on the speech section by the questioner and the speech section by the respondent into text and then outputting a character string;
a question topic specification means for specifying a question topic by the questioner based on the result of the speech recognition; and
a dementia stage determination means for inputting, to a trained neural network, the question topic by the questioner and the character string of the speech section by the respondent to the question topic in an associated manner with each other, and then determining a dementia stage of the respondent,
wherein the neural network is trained through machine learning using training data so as to output an estimated dementia stage, in response to an input of the character string of the speech section by the respondent in an associated manner with the question topic by the questioner.



Inventive Step Summary

- Mere application of AI to a human operation or known method not enough
- Addition of training data leading to a significant effect may have Inventive Step
- Preprocessing of training data for machine learning may have Inventive Step

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Patents: Patentability of Software Inventions and AI – Overview of Legal Systems and Recent Trends

4. Protection of AI-related Inventions in European Jurisdictions

LEVELS OF AI

- core AI
  - algorithms
- machine learning
  - training of algorithms using respective data
- AI as a tool
  - application of AI, i.e. application of the trained algorithm (e.g. pattern recognition, autonomous driving,…)

PROBLEMS WITH AI PROTECTION BY PATENTS

- algorithms not patentable
- algorithms often published by the authors
- AI often based on known algorithms

- machine learning patentable if technical effect can be shown
- data used for training in many cases represents the actual (commercial) value
  - data not necessarily functional data

- outcome of machine learning often not definable and therefore not patentable
- who is the inventor?

AI - KEEP IT SECRET !

In many cases, a treatment of

- the algorithms
- the data
- the outcome

as a trade secret seems to be the best or even the only option for protection.

=> EU trade secret directive (EU 2016/943) !

AI AND CII IN NATIONAL JURISDICTIONS (1)

FR

- software per se is protected by copyright,
- computer programs as such are excluded from patentability
- the main validity criterion is the "technical character" of the CII; a "further technical effect“ is necessary
- FR Guidelines for examination => computer program product claims should be drafted as follows:
  - a) A computer program comprising means for carrying out the steps of the method of claim X when said program is executed on a computer

    or
  - b) A computer program product comprising means stored on a medium for a computer comprising:
    - programming means viewable by the computer for carrying out step A,
    - programming means viewable by the computer for carrying out step B,
    - programming means viewable by the computer for carrying out step C

    when said program operates on the computer.

AI AND CII IN NATIONAL JURISDICTIONS (2)

FR

- although guidelines define claim structure, the validity of such claims before FR jurisdictions is more than doubtful

=> paradoxal situation, but

i) concerns only claims directed at computer programs, and should not affect the validity of other types of claims involving a computer program, and

ii) even though this appears to be something admitted by the FR practitioners at the moment, this may change in the future, as this only relies upon an isolated decision of 1st instance (TGI Paris).

AI AND CII IN NATIONAL JURISDICTIONS (3)

UK

- no significant recent developments
- somewhat more restrictive than the EPO

IT

- no real Examination => EPO case law is followed
- Italian application is sent to EPO for Search Report and Opinion and the Applicant must reply to the objections
- no recent milestone decisions on this matter by Italian Courts.

AI AND CII IN NATIONAL JURISDICTIONS (4)

DE

- software per se is protected by copyright
- German Patent Act (Patentgesetz): programs for data processing units as such are expressly excluded from patent protection
- the invention must lie in a field of technology
- the teaching claimed by the invention must comprise instructions for the solution of a specific technical problem by technical means
- updated examination guidelines (January 2019)

  => mixed claims allowable but non-technical features not to be considered during examination
- generally somewhat slightly easier to get software patent in DE granted

Thanks to the audience!

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