The 10th IP Seminar
Intellectual Capital and Intangibles
in an Innovation Century

Patent infringement and Artificial Intelligence: Refection on Patent Law to Recognize AI as the Party Concerned Liable for Patent Infringement

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August 3d, 2018

The basic concept of Artificial Intelligence

I. The basic concept of Artificial Intelligence

A. Definition of AI

FUTURE of Artificial Intelligence Act of 2017, H.R. 4625, 115th Cong. (2017)

SEC. 3. DEFINITIONS.

(a) In General.—Except as provided in subsection (b), in this Act:

(1) ARTIFICIAL INTELLIGENCE.—The term “artificial intelligence” includes the following:

(A) Any artificial systems that perform tasks under varying and unpredictable circumstances, without significant human oversight, or that can learn from their experience and improve their performance. Such systems may be developed in computer software, physical hardware, or other contexts not yet contemplated. They may solve tasks requiring human-like perception, cognition, planning, learning, communication, or physical action. In general, the more human-like the system within the context of its tasks, the more it can be said to use artificial intelligence.

The basic concept of Artificial Intelligence

(B) Systems that think like humans, such as cognitive architectures and neural networks.

(C) Systems that act like humans, such as systems that can pass the Turing test or other comparable test via natural language processing, knowledge representation, automated reasoning, and learning.

(D) A set of techniques, including machine learning, that seek to approximate some cognitive task.

(E) Systems that act rationally, such as intelligent software agents and embodied robots that achieve goals via perception, planning, reasoning, learning, communicating, decision making, and acting.

(2) ARTIFICIAL GENERAL INTELLIGENCE.—The term “artificial general intelligence” means a notional future artificial intelligence system that exhibits apparently intelligent behavior at least as advanced as a person across the range of cognitive, emotional, and social behaviors.

(3) NARROW ARTIFICIAL INTELLIGENCE.—The term “narrow artificial intelligence” means an artificial intelligence system that addresses specific application areas such as playing strategic games, language translation, self-driving vehicles, and image recognition.

The basic concept of Artificial Intelligence

B. Technological Evolution

1. The first stage:

AI serves as a human being's instrument to invent or execute the specific technical or commercial mission

2. The second stage:

AI serves as the human's agent, with part of the human attribution and abilities, and can work with human beings to jointly achieve the planned scheme

3. The third stage:

AI functions independently from the interference of human beings and steps out the knowledge and cognition zone trained by the human to accumulate the experience of itself and make the autonomous decision for new circumstances

The issues of Patent Law about AI

II. The issues of Patent Law about AI

A. The eligible subject matter

PUREPREDICTIVE, Inc. v. H20.AI, Inc., 2017 WL 3721480 , at *5 (N.D. Cal. 29 August 2017)

Turning to this case, I agree with H20 that PPI's claims are directed to a mental process and the abstract concept of using mathematical algorithms to perform predictive analytics. The method of the predictive analytics factory is directed towards collecting and analyzing information. The first step, generating learned functions or regressions from data—the basic mathematical process of, for example, regression modeling, or running data through an algorithm—is not a patentable concept.

US009547821B1

(12) **United States Patent**
Loreggia et al.

(10) **Patent No.: US 9,547,821 B1**
(45) **Date of Patent: Jan. 17, 2017**

(54) **DEEP LEARNING FOR ALGORITHM PORTFOLIOS**

(71) Applicant: **International Business Machines Corporation**, Armonk, NY (US)

(72) Inventors: **Andrea Loreggia**, Padua (IT); **Yuri Malitsky**, New York, NY (US); **Horst C. Samulowitz**, White Plains, NY (US); **Vijay A. Saraswat**, Mahopac, NY (US)

(73) Assignee: **International Business Machines Corporation**, Armonk, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/015,272**

(22) Filed: **Feb. 4, 2016**

OTHER PUBLICATIONS

Deep Learning for Algorithm Portfolios, by Loreggia, published 2015.*
Convolutional Neural Network Committees for Handwritten Character Classification, by Ciresan, published 2011.*
Hoshen, et al., "Visual Learning of Arithmetic Operations", arXiv:1506.02264, Last revised Nov. 27, 2015, to appear in: AAAI Conference on Artificial Intelligence (AAAI 16'), Phoenix Arizona, Feb. 2016, 8 pages.
Vinyals, et al., "Show and Tell: A Neural Image Caption Generator" 2015 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Jun. 7-12, 2015, Boston, MA, pp. 3156-3164.
Xu, et al., "SATzilla: Portfolio-based Algorithm Selection for SAT" Journal of Artificial Intelligence Research, vol. 32, Jun. 2008, pp. 565-606.

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Primary Examiner — Stanley K Hill

382/101
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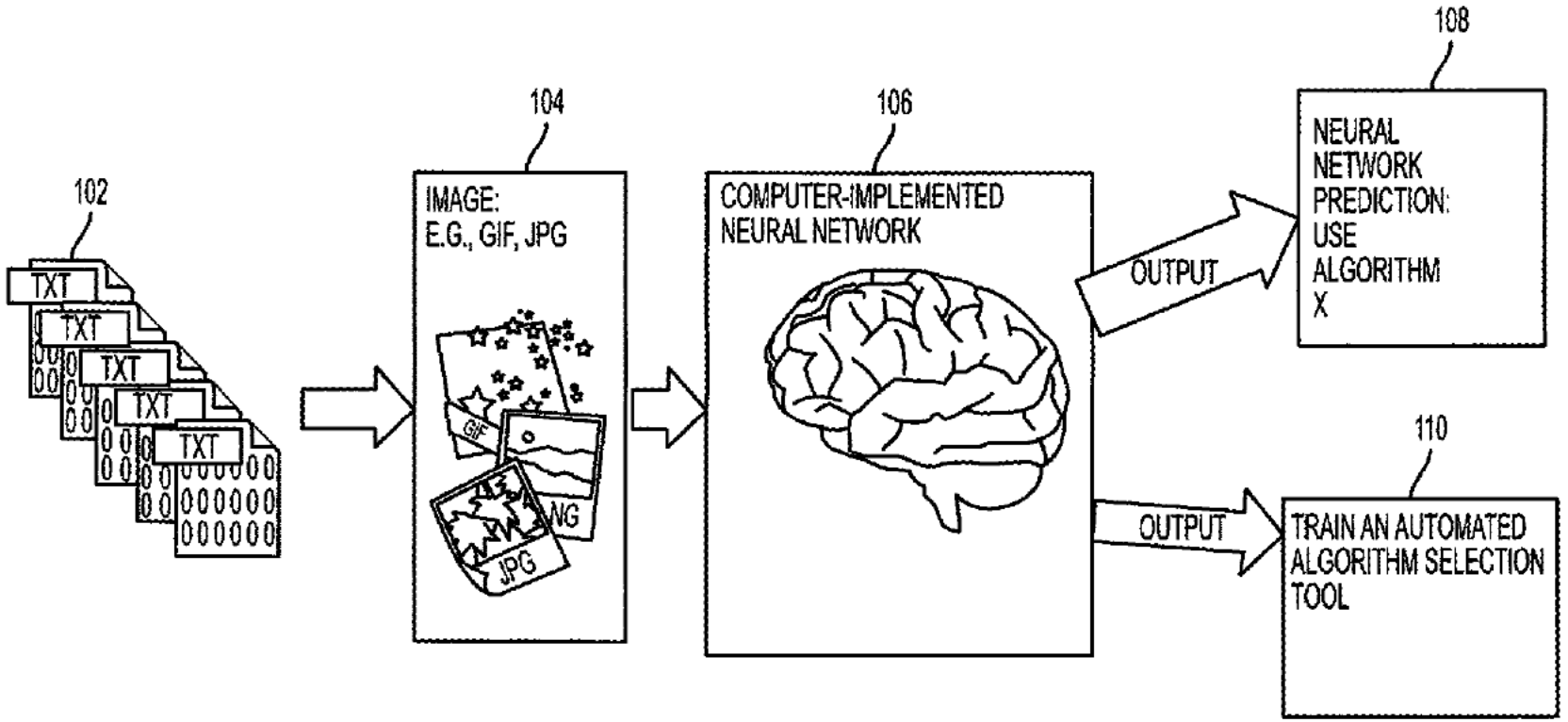
706/13
2015/0063688 A1* 3/2015 Bhardwaj G06K 9/18
382/159

trained to learn to automatically determine one or more problem solvers from a portfolio of problem solvers suited for solving the problem instance.

20 Claims, 11 Drawing Sheets



We claim:

1. A computer-implemented method of automated feature construction for algorithm portfolios in machine learning, comprising:

receiving, by one or more processors, a problem instance represented as text describing a problem to be solved by computer-implemented problem solver;

generating, by one or more of the processors, a gray scale image from the text by converting the text into the gray scale image that corresponds to the text;

rescaling, by one or more of the processors, the gray scale image to a predefined size that is smaller than an initial size of the gray scale image, into a rescaled gray scale image, the rescaled gray scale image representing features of the problem instance;

inputting, by one or more of the processors, the rescaled gray scale image as features to a machine learning-based convolutional neural network; and

training based on the rescaled gray scale image, by one or more of the processors, the machine learning-based convolutional neural network to learn to automatically determine one or more problem solvers from a portfolio of problem solvers suited for solving the problem instance,

wherein the receiving, generating, rescaling and inputting are performed for a plurality of problem instances for the training.

(19) **United States**

(12) **Patent Application Publication**

Natarajan et al.

(10) **Pub. No.: US 2017/0147975 A1**

(43) **Pub. Date: May 25, 2017**

(54) **UNMANNED AERIAL DELIVERY TO SECURE LOCATION**

(71) Applicant: **Wal-Mart Stores, Inc.**, Bentonville, AR (US)

(72) Inventors: **Chandrashekar Natarajan**, San Ramon, CA (US); **Donald R. High**, Noel, MO (US); **John J. O'Brien, V**, Farmington, AR (US)

(21) Appl. No.: **15/360,091**

(22) Filed: **Nov. 23, 2016**

Related U.S. Application Data

(60) Provisional application No. 62/260,086, filed on Nov. 25, 2015.

Publication Classification

(51) **Int. Cl.**

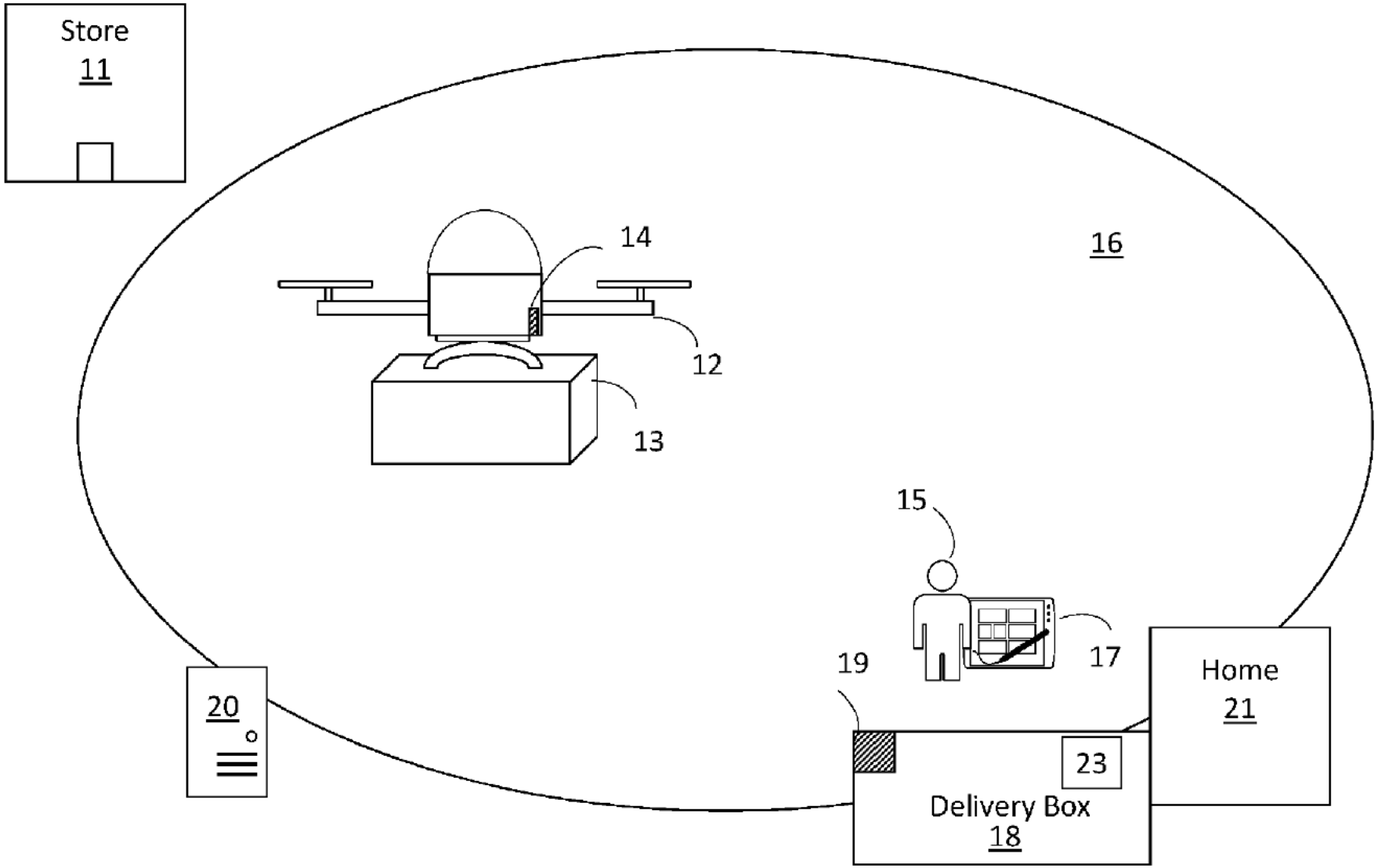
G06Q 10/08	(2006.01)
B64F 1/00	(2006.01)
B64C 39/02	(2006.01)

(52) **U.S. Cl.**

CPC ***G06Q 10/0832*** (2013.01); ***G06Q 10/0833*** (2013.01); ***H04L 63/0876*** (2013.01); ***G07C 9/00182*** (2013.01); ***B64C 39/024*** (2013.01); ***B64F 1/00*** (2013.01); *G07C 2009/00769* (2013.01); *G07C 2009/0092* (2013.01); *B64C 2201/128* (2013.01)

(57) **ABSTRACT**

A delivery management system comprises a communication device that receives a notification of a communication established between an unmanned aerial vehicle (UAV) that delivers a payload and a delivery box constructed and arranged to receive the payload from the UAV when the UAV is a predetermined distance from the delivery box and moving in a direction toward the delivery box, the communication including an identity of the UAV; a verification device that processes the notification and validates the identity of the UAV; and an instruction generator that generates an instruction to the delivery box to open the delivery box in response to the verification device validating the identity of the UAV and a determination by the communication device that the communication is established between the UAV and the delivery box. The communication


Store
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Home
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Delivery Box
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What is claimed is:

1. A delivery management system, comprising:

a communication device that receives a notification of a communication established between an unmanned aerial vehicle (UAV) that delivers a payload and a delivery box constructed and arranged to receive the payload from the UAV when the UAV is a predetermined distance from the delivery box and moving in a direction toward the delivery box, the communication including an identity of the UAV;

a verification device that processes the notification and validates the identity of the UAV; and

an instruction generator that generates an instruction to the delivery box to open the delivery box in response to the verification device validating the identity of the UAV and a determination by the communication device that the communication is established between the UAV and the delivery box, wherein the communication device includes an autolocker communication device that outputs the instruction to the delivery box.

The issues of Patent Law about AI

B. Prior art

1. How to distinguish the meaningful prior art from the manipulated prior art ?

2. Some claim-drafting firms take advantage of AI to produce a flood of resembled or revised claims to block others' patent applications.

3. How to evaluate the legal status of prior art when AI has been used in claim drafting ?

The issues of Patent Law about AI

C. Inventorship

1. Whether AI should be recognized as a legal person /entity to enjoy the sole/joint inventorship about AI-genetated invention?

2. Is it necessary to admit the legal personhood of AI to achieve the objectives of patent law?

3. How to assess and reconcile the impact upon the human-oriented legal system as soon as AI may be an inventor under patent law?

The issues of Patent Law about AI

D. Patentability: Non-obviousness

1. To what extent, it is allowable on the direct competition in the R&D market between the human-generated inventions and AI-generated ones?

2. In order to avoid marginalizing of the innovative activities of human beings, is it necessary to establish the two parallel prior art, respectively, for the human inventor and the AI inventor, especially, on determination of non-obviousness.?

The issues of Patent Law about AI

E. Infringement

1. Similar concerns to the issue of inventorship of AI

2. Is it necessary to admit the legal personhood of AI to hold AI accountable for the result of patent infringement? What role should humans supporting the operation of AI to commit patent infringement be recognized under patent law?

Adaption of Patent Law to respond to the Challenges from AI

III. Adaption of Patent Law to respond to the Challenges from AI

A. Business Models

B. Amendment of Patent Act

C. The flexible interpretation of patent law

Adaption of Patent Law to respond to the Challenges from AI

Committee on Legal Affairs, European Parliament, Report with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)), A8-0005/2017, 27.1.2017

MOTION FOR A EUROPEAN PARLIAMENT RESOLUTION

EXPLANATORY STATEMENT

Intellectual property rights, data protection and data ownership

The resolution calls on the Commission to come forward with a balanced approach to intellectual property rights when applied to hardware and software standards and codes that protect innovation and at the same time foster innovation. Moreover, the elaboration of criteria for "own intellectual creation" for copyrightable works produced by computers or robots is demanded.

Adaption of Patent Law to respond to the Challenges from AI

Civil Law Rules on Robotics - European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)), Eur. Parl. Doc. P8 TA 0051, at ¶18 (2017) (hereinafter European Parliament Resolution)

Notes that there are no legal provisions that specifically apply to robotics, but that existing legal regimes and doctrines can be readily applied to robotics, although some aspects appear to call for specific consideration; calls on the Commission to support a horizontal and technologically neutral approach to intellectual property applicable to the various sectors in which robotics could be employed;

Adaption of Patent Law to respond to the Challenges from AI

¶ 52 of European Parliament Resolution

Considers that, whatever legal solution it applies to the civil liability for damage caused by robots in cases other than those of damage to property, the future legislative instrument should in no way restrict the type or the extent of the damages which may be recovered, nor should it limit the forms of compensation which may be offered to the aggrieved party, on the sole grounds that damage is caused by a non-human agent;

AI and Patent Infringement

IV. AI and Patent Infringement

A. The gist of patent law

1. The all-element rule and compensation

(1) Except for otherwise provided under patent law, anyone practicing the all elements (steps) without authorization should be liable for the loss of economic value derived from the patented invention.

(2) Compensation must return the patentee back to the economic status had the patent infringe not occurred.

AI and Patent Infringement

2. Objectives

(1) To secure the incentives of the patentee on innovation in the future

(2) To encourage the commitment of radical technical improvement and cumulative innovation

C. Will AI be disrupting patent law to hinder the fulfillment of the gist?

1. The first stage:

(1) AI just serves as an instrument or device

(2) Human beings take advantage of AI to infringe upon the patent

(3) The traditional interpretation of patent law may find the one using AI ultimately liable for the result of patent infringement

AI and Patent Infringement

¶ Z of European Parliament Resolution

whereas, thanks to the impressive technological advances of the last decade, not only are today's robots able to perform activities which used to be typically and exclusively human, but the development of certain autonomous and cognitive features – e.g. the ability to learn from experience and take quasi-independent decisions – has made them more and more similar to agents that interact with their environment and are able to alter it significantly; whereas, in such a context, the legal responsibility arising through a robot’s harmful action becomes a crucial issue;

AI and Patent Infringement

¶ AA of European Parliament Resolution

whereas a robot's autonomy can be defined as the ability to take decisions and implement them in the outside world, independently of external control or influence; whereas this autonomy is of a purely technological nature and its degree depends on how sophisticated a robot's interaction with its environment has been designed to be;

AI and Patent Infringement

¶ AB of European Parliament Resolution

whereas the more autonomous robots are, the less they can be considered to be simple tools in the hands of other actors (such as the manufacturer, the operator, the owner, the user, etc.); whereas this, in turn, questions whether the ordinary rules on liability are sufficient or whether it calls for new principles and rules to provide clarity on the legal liability of various actors concerning responsibility for the acts and omissions of robots where the cause cannot be traced back to a specific human actor and whether the acts or omissions of robots which have caused harm could have been avoided;

AI and Patent Infringement

¶ AC of European Parliament Resolution

whereas, ultimately, the autonomy of robots raises the question of their nature in the light of the existing legal categories or whether a new category should be created, with its own specific features and implications;

AI and Patent Infringement

¶ AI of European Parliament Resolution

whereas, notwithstanding the scope of Directive 85/374/EEC, the current legal framework would not be sufficient to cover the damage caused by the new generation of robots, insofar as they can be equipped with adaptive and learning abilities entailing a certain degree of unpredictability in their behaviour, since those robots would autonomously learn from their own variable experience and interact with their environment in a unique and unforeseeable manner;

AI and Patent Infringement

¶ 53 of European Parliament Resolution

Considers that the future legislative instrument should be based on an in-depth evaluation by the Commission determining whether the strict liability or the risk management approach should be applied;

AI and Patent Infringement

¶ 54 of European Parliament Resolution

Notes at the same time that strict liability requires only proof that damage has occurred and the establishment of a causal link between the harmful functioning of the robot and the damage suffered by the injured party;

AI and Patent Infringement

¶ 55 of European Parliament Resolution

Notes that the risk management approach does not focus on the person "who acted negligently" as individually liable but on the person who is able, under certain circumstances, to minimise risks and deal with negative impacts;

AI and Patent Infringement

¶ 56 of European Parliament Resolution

Considers that, in principle, once the parties bearing the ultimate responsibility have been identified, their liability should be proportional to the actual level of instructions given to the robot and of its degree of autonomy, so that the greater a robot's learning capability or autonomy, and the longer a robot's training, the greater the responsibility of its trainer should be; notes, in particular, that skills resulting from “training” given to a robot should be not confused with skills depending strictly on its self-learning abilities when seeking to identify the person to whom the robot's harmful behaviour is actually attributable; notes that at least at the present stage the responsibility must lie with a human and not a robot;

AI and Patent Infringement

¶ 57 of European Parliament Resolution

Points out that a possible solution to the complexity of allocating responsibility for damage caused by increasingly autonomous robots could be an obligatory insurance scheme, as is already the case, for instance, with cars; notes, nevertheless, that unlike the insurance system for road traffic, where the insurance covers human acts and failures, an insurance system for robotics should take into account all potential responsibilities in the chain;

AI and Patent Infringement

¶ 58 of European Parliament Resolution

Considers that, as is the case with the insurance of motor vehicles, such an insurance system could be supplemented by a fund in order to ensure that reparation can be made for damage in cases where no insurance cover exists; calls on the insurance industry to develop new products and types of offers that are in line with the advances in robotics;

AI and Patent Infringement

2. The second stage:

(1) Human beings work with AI to infringe upon the patent

- Direct Infringement
- Indirect Infringement

(2) Possible questions under the phenomenon

- Who should be liable for patent infringement
  - A human being as the responsible party
  - AI, not qualified as legal person/entity, can't be liable for the human agent or itself but might be interpreted as the electronic agent of a human being.
- Joint autonomous contribution to patent infringement

AI and Patent Infringement

- AI didn’t share the full attribution of humans, at least, on part of which relate to the aspect of patent infringement.
- Liability Structure:
  - Causation
  - Vicarious Liability
- Liability division among the users, the developers and trainers: Contract

AI and Patent Infringement

3. The third stage: acting like humans

(1) AI independently infringes upon the patent without the interference of humans

(2) The broadest interpretation of causation and vicarious liability still failed to equitably cover the type of patent infringement

(3) It is due time to admit the status of a legal person to the AI at third stage

(4) According to the jurisprudence of governance of legal persons, the persons or entities contributing to the operation of the AI are possibly regarded as the responsible ones for liability under patent infringement

- Beyond the consideration of causation
- Based upon risk management and legal certainty
- Insurance and compensation fund plan

Conclusion

V. Conclusion

- On patent infringement, if we shift our concerns from the physical feature of a patent claim to the economic value derived from such the claim, the all-element rule may be interpreted as a new way.
- In terms of the economic value of a claim, when a human being and AI jointly contribute to patent infringement at the second stage, the human indeed illegally catch the full interest of a claim. AI's autonomous decision is made to fulfill the commercial plan the human actor expected. As a consequence, the human actor should be liable for patent infringement.
- The fully autonomous AI committed infringement on the patent at the third stage. In order to make liability of patent infringement correspond to economic interest through illegal exploitation, it is necessary to admit the status of legal person /entity of AI as a responsible party for patent infringement .