



ARTIFICIAL INTELLIGENCE TECHNOLOGY: PATENT ABILITY OF IOT INVENTIONS

□ Komal Kapoor*
Uroosa Shahzad**

ABSTRACT

Internet of Things (IOT), generally implies to the virtual world created by the internet where it has enabled connectivity in the physical objects which a person uses regularly in the course of the day. Virtual assistants, Fitness trackers, Smart Refrigerators, Self - driven Cars etc all are some of the existing IOT inventions. The driving force behind the IOT inventions is Artificial Intelligence (AI) which employs computing and analytical ability to absorb information from immense data gathered by the IOT sensors and furnish precise results and smart solutions. Apparently, with the technological developments, the domain of AI-IOT is expanding day by day and more and more inventions are being carried out, endeavouring to improve the overall human wellbeing. Though the future of AI-IOT, as of now, appears to be promising, however, before arriving at any conclusion it is incumbent to consider the legal protections to such inventions in the light of the present Information Technology, Intellectual Property Rights regime and the forth coming Personal Data Protection Bill, 2019 in India. This paper, shall deal with the basic concept of AI, IOT, machine learning, the prevalent IPR Regime in India, particularly, the Patents Act, 1970. The paper shall further deal with the law relating to Software patents having primary focus upon the patentability of AI-IOT. The paper shall also embrace upon the consequences of the AI-IOT Patents to arrive at a logical conclusion as to whether the Patent Regime would encourage or in turn hamper the AI-IOT innovations.

Keywords: Internet of things, Artificial Intelligence, Patent

1. INTRODUCTION: MEANING OF IOT

Digitalisation across the globe has resulted into vast transformations in past few years. The Internet of Things was conceptualised in 1999 by a member of the Radio Frequency Identification Development (RFID). This concept gained more importance recently as it has become practically possible to devise and create innovative technologies in the era that has caused extensive growth in the mobile industry, ubiquitous communication, computerised data analysis, cloud computing etc.

Internet of things create a world that was probably beyond once imagination; wherein, billions of machines/objects are inter-connected and can sense,

share information and communicate over different Internet Protocol networks. IoT is primarily a wholesome interconnected network of devices consisting of identifiers, which makes M2M communication feasibly possible without any intervention of humans by usage of set standard communication protocols.

These devices that are interconnected have been programmed in a manner that the data can be regularly collected, analysed and same can be used for initiating action, serve as a basis for intelligently planning, managing and taking a decision. Presently, this Internet of Things have become integral part of world technological system. There cannot be a straight - jacket definition of Internet of things, however it is

*Assistant Professor of Law, Delhi Metropolitan Education, Noida; PhD Scholar, Rayat Bahra University, Mohali

**4th Year Law Student - Delhi Metropolitan Education, Noida

commonly defined as a nexus between various physical objects. One can easily state that, internet, in the era of technological revolution is not merely a network or interconnection of computers, rather it broadened its horizons into multiple network consisting of various type of machines / devices of all sizes and type, automobiles, smart phones, appliances useful in household work, toys/games, etc all are linked, all are in the process of communicating and data sharing in accordance with set standards.

The whole idea behind creating and intellectually developing IOT and AI lies in the fact of making machines and things interconnected at any point of time, without any boundation with respect to the networks or the services for which it is being used.

Internet of thing is nothing but interplay of diverse industries that come together like software, hardware, telecom and electronic industries to provide extensive opportunities to many businesses. This has enabled massive transformation in digital world in last few years and it's a continuing process as this has been beneficial to industrial experts in many aspects.

Future of digital world with rate at which internet of things are developing would be the world wherein number of interconnected sensors will soon reach trillions, working together with billions of smart systems / devices including tons of applications that will lead to new consumer and market behaviour. With advent increase in the demand for smart and intelligent machine solutions derived from IoT will increase the business of IT industries to trillions of dollars and would be much more beneficials for the businesses that are taking advantage of the IoT system.

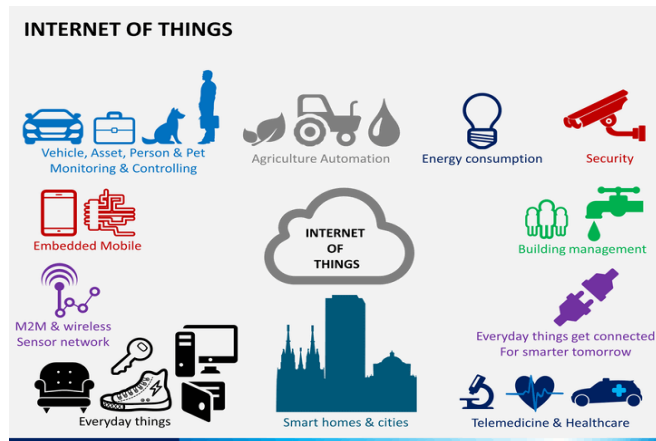


Figure 1- Examples of Internet of things

Internet of things can be easily categorized into three categories which are stated below:

- a) P2P- People to people
- b) P2M- People to Machine / devices
- c) M2M- Machine to Machine Communication, via internet.

Digital world expanded due to internet and IoT will connect this virtual world to the physical world. Physical devices that are linked to internet constitutes IoT that collects information around their scenario using sensors embed, also sharing and collecting of data, and thereafter it also enables categorical analysis of such data.

The major areas in which IoT business is spreading its web are smart cities projects for controlling and managing vehicular congestion, monitoring and maintaining infrastructure, enhancing national security and internal security, farming, health care etc.

2. CHARACTERISTICS OF IOT

Before moving further, it is incumbent to first discuss the fundamental features of Internet of Things which are as follows:

1. **Interconnectivity:** The first and the foremost characteristic of Internet of things is its capability to connect the global material with the communication infrastructure. It is very appreciable that while having a stringent privacy policy and various constraints, the IOT has been

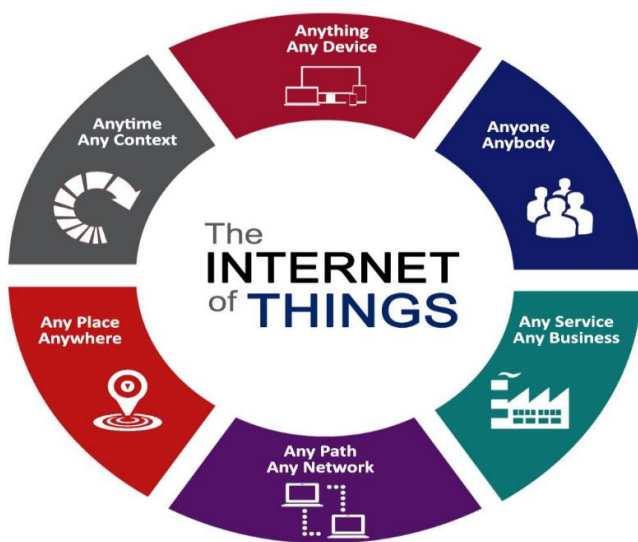


Figure 2: Horizons of IoT

flourishing and has capability of providing services related to things.

2. **Things related - services:** The IoT even within the constraints of things have capability of providing thing- related services, like protecting privacy and maintain consistency amongst devices along with connected virtual things.
3. **Dynamic Changes:** Under IoT the changes in the state and functioning of the devices can be noticed dynamically, for example: sleeping and waking up patterns, interrelated and/or disconnected, also speed and live location applications. Needless to say that the number of the connected devices can alter in manner which is very dynamic.
4. **Heterogeneity:** The machines that are connected with IoT and artificial Intelligence are primarily heterogenous as these are operative on a variety of platforms using diverse networks.
5. **Safety:** Safety is one of the major characteristics that is to be taken into consideration while designing any IoT device. Both, creator and recipient of IoT must strategize for safety. Safety includes protection of our privacy as well as the data and physical well being.
6. **Enormous scale:** Another important characteristic of IOT is that the devices that needs to be managed and analysed is very enormous.

3. IOT, ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Prior to actually exploring the issue if, Artificial Intelligence innovations fulfil the patentability criterion as provided under various sui generis systems, it would be incumbent to first recognise the functionality of AI algorithms.

Artificial Intelligence refers to a series of algorithms known as Machine Learning which allows computer systems to absorb the information from the available data without being programmed or specifically coded. Machine Learning algorithms are made in such a manner that they are capable of extracting knowledge from highly complex data sets from the prevalent patterns and correlations from experience. Machine Learning can be supervised, unsupervised and reinforcement learning. In supervised

learning, the data is characterized with the correct answer and algorithm is created in such a manner that it learns the patterns in the data and predicts about new data which was previously not seen. In Unsupervised learning, there is nothing like labelling of correct answer with the data. The algorithms are made in such a manner that they find patterns in the data without having any hint of correct answers. Reinforcement learning on the other hand include the algorithms perform such a task which helps in maximising the payoff. It can be like teaching a robot to take complex decisions while playing soccer.

Machine Learning Algorithms are designed in following stages:

1. Gathering enormous amount of data for training the algorithm. Such data must be of high quality like the data that is stored by the sensors on Internet of thing devices.
2. After gathering the data, the other important stage is pre-processing the data which primarily includes wiping out irrelevant data and minimizing dimensions.
3. The other important stage of designing the machine learning Algorithm is of programming the algorithm with the available data.
4. Without the fourth stage, all the above stages would become redundant. The final stage is of gathering a model or trained algorithm that would help in producing solutions as and when the input data is revealed to it. It would not be wrong to say that although the Machine learning algorithms come with the final results, however, the intellectual creation of the creator always play a vital role.

4. PATENT SYSTEM IN INDIA

1911 is the year when the narrative of Patent law in India was started. It was when the Indian Patents and Designs Act, 1911 was enacted. The current Patents Act, 1970 became enforceable in the year 1972, consolidating and amending the subsisting law which related to the Patents in India. The Patents (Amendment) Act, 2005, amended the Patents Act, 1970 wherein product patent was extended to all fields of technology including drugs, food, micro organisms and chemicals. The provisions which relates to Exclusive Marketing Rights (EMRs) has been repealed,

and a provision for enabling grant of compulsory license has been introduced, after the amendment. The provisions relating to pre-grant and post-grant opposition have been also established.

4.1 Criteria of Patentability under Patents Act, 1970

The inventions which cannot be patented are clearly set out in sections 3 and 4 of the Indian Patents Act, 1970. That takes us to the issue: in India "what can be patented"?

It has to be noted at the beginning that the solution to this is not set in stone. No definitive list exists as to what may be patented. However, there are certain conditions that need to be met to make an invention patentable. An invention's patentability is based on its ability to satisfy the requirements.

The following criteria determine the patentability of invention in India:

1. *Patentable subject matter:*
2. *Novelty:*
3. *Inventive step or Non-Obviousness:*
4. *Capable of Industrial Application:*

The above are the statutory criteria for an invention's patentability. Besides this, the disclosure of an enabling patent is another significant requirement for securing a patent. Enabling patent disclosure implies that the draft specification of the patent must properly reveal the invention in order to allow the invention to be carried out without undue effort by an individual skilled in the same field as the invention concerned. If an enabling patent is not disclosed in the patent specification, then a patent will most likely not be issued.

4.2 Whether Internet of things or inventions pertaining to algorithms are Patentable?

Inventions which come under the domain of Sec. (3) of Patents Act, 1970 and also the Inventions which are falling within the ambit of Sec. (1) of Sub-sec. 20 of Atomic Energy Act, 1962 are not considered as inventions which are patentable.

Section 3(k) of the Patents Act, 1970 enumerates that a mathematical or business method or a computer program per se or algorithms. Software

programmes as such aren't supposed to be given a patent, pursuant to Section 3(k) of the Indian Patents Act, 1970. Nevertheless, the controller may be allowed to grant patent which reveal the software programme integrated with hardware devices, like Internet of Things.

With respect to India, Internet of Things filings of patent have increased dramatically in the past few years. According to a previous study performed by the National Association of Software and Service Companies more than five thousand applications in the Internet of Things domain were lodged between the years 2014 and 2019. Although greater than eighty percent of the said patents may be applied to the Industry 4.0, the remainder relates to the sector of healthcare. As per the statistics of the industry which are available, India's IoT is projected to cross 2 billion connections which produce revenue up to 11.1 billion dollars in the upcoming two years.

This rise is driven by a variety of factors, including growing internet connectivity, declining cost of technology with increasing the popularity of sensor devices. It is important that new ideas continue to come and be patented, given the complex existence of space. Patenting seeks to define the novelty, the inventive stage and the industrial validity of the underlying invention. Since the aim of inventions changes from hardware to increasingly intangible forms, obtaining patent rights may become more difficult as all inventions in the IoT domain include software which is not patentable by itself in India under Section 3(k) of the Patents Act.

Patent filings by tech companies in the field of IoT have increased in number exponentially. The systems should be able to coordinate with each other using standardised technology, in order for IoT and its interoperability to operate at its optimal level. Nevertheless, the patenting of this standardised technology will have an impact on competitiveness in the marketplace and will impede the development of the IoT industry as a whole. This is owing to the belief that any party using a standardised technology patented by one would infringe the patent of the former party.

There are important issues and consequences which call for attention and requires to be elaborated prior to the adaptation of IOT on a large scale.

I. Security and Privacy

Partially mission-critical applications, trust and security mechanisms need to be addressed appropriately, as IoT has now become the focal point of the internet in near future. New issues pertaining to privacy, confidence and trust have cropped up. It is now imperative to ensure consistency of information especially in models which work on shared information basis and to ensure its usage in wide range of applications. It is to be further ensured that the devices are offering a platform which is safe for sharing information between the Devices and its users. Further a full proof security mechanism should be prepared for defining the protocols for compromised devices.

Table 1 displays the various protection and privacy criteria for various layers of IOT.

IOT LAYER	SECURITY REQUIREMENTS
Application	<ul style="list-style-type: none"> • Application-specific Data Minimization • Privacy Protection and Policy Management • Authentication • Authorization, Assurance • Application specific encryption, cryptography.
Services support	<ul style="list-style-type: none"> • Protected Data Management and Handling (Search, Aggregation, Correlation, Computation) • Cryptographic Data Storage • Secure Computation, In-network Data Processing, Data aggregation, Cloud Computing
Network layer	<ul style="list-style-type: none"> • Secure Sensor/Cloud Interaction; • Cross-domain Data Security Handling • Communication & Connectivity Security
Smart object/sensor	<ul style="list-style-type: none"> • Access Control to Nodes • Lightweight Encryption • Data Format and Structures • Trust Anchors and Attestation

Table 1: Different layer of Internet of Things and Security requirements

II. Usability v. Cost

Internet of Things generally employs technical systems to link devices with the internet and for expanding its scope, it should be ensured that the technology is cost effective and easily accessible.

III. Interoperability

Interoperability is the most fundamental value, in the conventional Internet; the primary step to access internet is devices are connected and are able to speak the same language of encodings and protocols. Various organizations employ various criteria to sustain and maintain their technology and platforms. Any use of standard interfaces between these various entities is becoming essential with heterogeneous devices and multiple data sources. This is particularly true of applications that promote different system boundaries and cross-organizational. The Internet of Things systems therefore must accommodate a high level of interoperability.

IV. Management of Data

Management of data is a central component of the IoT. When taking into account the interrelated universe of objects and the continuous sharing of all types of information, the quantity of information produced, the procedures associated with securing the information is vital.

5. CONCLUSION

Internet of things create a world that was probably beyond once imagination; wherein, billions of machines/objects are inter connected and can sense, share information and communicate over different Internet Protocol networks. IoT is primarily a wholesome interconnected network of devices consisting of identifiers, which makes M2M communication feasibly possible without any intervention of humans by usage of set standard communication protocols. This system of technological revolution i.e., IoT is flourishing extensively, not only in India but across the globe.

Prior to actually exploring whether AI innovations are patentable, it is important to recognize in depth how AI algorithms function.

Software programmes as such aren't supposed to be given a patent, pursuant to Section 3(k) of the Indian Patents Act, 1970. Nevertheless, the controller may be allowed to grant the documents of the patent which reveal the software programme integrated with hardware devices, like Internet of Things. There are important issues and consequences which need to be discussed before the mass adoption of the IOT can take place like security and privacy, data management etc.

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