



# Survey on Challenges and Future Scope of IOT in Healthcare and Agriculture

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**Abstract**— Application domains for IoT are wide spreading, from wearable devices to smart buildings and cities through agricultural and health monitoring to industrial predictive systems. Data are assimilated by mobile devices and sensor; RF technologies are used in data broadcasting and data gathering in sensor networks. Verification and optimization methods help sensor networks to be sustained and functioned in an efficient way. Big data methodologies offer predictive analytics, data mining explores advanced correlations of data, visualization solutions help to make the outcomes of data analysis easy to understand for the sake of decision support, etc. The IoT has plentiful applications in various fields. This survey paper covers the challenges and scope for Future upgradations of IoT in Health care and Agriculture sector.

**Keywords**— IoT(Internet of Things); Sensors; UID(Unique Identification); Precision Agriculture; Agriculture Drones; Livestock Monitoring; Smart Greenhouses

## I. INTRODUCTION

The internet of things is a system mechanical and digital machines, interconnected computing devices, objects, people or animals that are provided with unique identifiers and the ability to send data through a network without requiring human-to-human or human-to-computer collaboration.

The entire world is migrating towards IOT, in the coming years which will have a enormous impact on our lives. Beginning from appliances used at home to huge machineries used in industries, entirety will become smart. Others state it as the 'Next Generation of Internet' and professionals call it as the 'Next Digital Revolution' while [1].

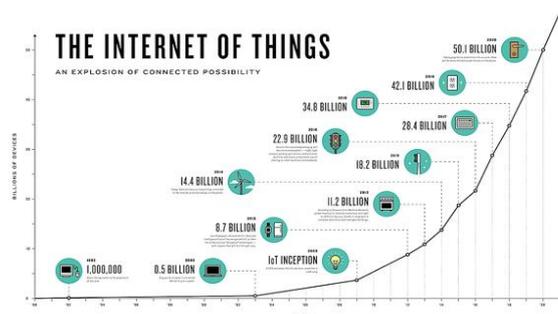


Fig 1: Trend of IoT

It supposed to change the entire way people communicate, work and live. It is going to have a significant impact on how the government and businesses interact with the world. Now there will be connectivity for everything, everyone and everywhere.

## II. HEALTHCARE IOT

Smart Healthcare connected infrastructure of software applications and medical devices that can communicate with several healthcare systems. IoT in healthcare connects patients and healthcare providers via software and technology, with a foundational mission to optimize for better health in an easier and faster environment. The IoT is an instance of technology that helps to build better relationships with patients and nurture their engagement in the process.

Health-monitoring using IOT devices range from heart rate monitors to smart beds, electronic wrist bands. The objective is to minimize manual interaction or human interference, creating opportunities for improved efficiency and accuracy, not to speak of economic benefits. Not only does it lead to safer and healthier patients, it paves way for innovation and allows physicians to devote their time to specialized and personalized healthcare. Being a vast ecosystem, the list is endless when it comes to IoT applications in the healthcare industry [2].

### A. Challenges

As the market for healthcare IoT rises, so do the challenges it needs to combat. There is humongous amount of data collected by a huge number of connected devices, which can pose quite a bit of a challenge to manage healthcare institution personnel. The question of security cannot be ignored, as data is exchanged with other devices. Unauthorized access to devices can cause harm to patients' health and safety. Authentication and encryption are the stepping stones to attain success in the battle against these challenges.

The ability of healthcare organizations to transform the data collected by IoT into meaningful insights will impact the future of IoT. It must be taken into account that IoT is not here to substitute healthcare providers but to provide them with the data it collects from devices, in order to facilitate diagnosis and treatment. It also helps in reducing inefficiencies in the healthcare system.

## III. AGRICULTURE IOT

The severity of climate change and global population necessitates the application of IoT in agriculture. Smart farming is basically a state-of-the-art system of growing food, the use of IoT technologies help farmers to reduce wastes and improve productivity. It comprises of modern ICT application (Information and Communication Technologies) for clean and sustainable growth of food for the masses. Specific IoT applications in agriculture include:



Fig 2: Smart Agriculture

- Precision Agriculture

It is a process that makes the farming technique accurate and controlled for growing of crops and raising livestock. The components used in this approach are sensors, automated hardware, autonomous vehicles, control systems, robotics etc...

- Agriculture Drones

Agriculture industries have turned out to be major industries in which they can incorporate drones. Agricultural aerial and ground-based drones are being used on farms for spraying and health assessment, time-effective and productive crop monitoring, irrigation, soil analysis, and even planting.

- Livestock Monitoring

Livestock Monitoring aims to monitor animal infections, transportation activities, annual milk, and regular vaccination. Losses caused by animal diseases will be monitored and necessary precautions will be taken earlier and comprehensive.

- Smart Greenhouses

It is a micro-climate controlled, for optimal plant growth it is used as a self-regulating environment. Weather conditions within greenhouse, like temperature, soil moisture, humidity, are monitored constantly. Minor deviations in these climatic conditions trigger automated actions. Evaluation of these actions will be used to check the variation and remedial action has to be taken for maintaining ideal conditions for better growth of plants.[3]

#### A. Challenges

- Capturing huge volume of generated heterogeneous data by IoT sensors and performing the same for a large number and other activities involving various studies of crops.
- Including all commercially available sensors, weather stations, camera, it also Supports the integration and use of any IoT device leads to bring-your-own sensor model of operations. This will facilitate farmers, growers, and scientists to take advantage of cheaper/more capable IoT sensors, as well as individual preferences and budgets.[4]
- Integrating historical crop performance data produced by past studies (such data and results are typically available in CSV files that make it harder to use, analyse, explore, and share) and heterogeneous data from such a great variety of IoT devices.[5]

### IV. FORTHCOMING PLANS

#### A. *IoT in Healthcare*

The IoT can redefine how healthcare is delivered to the end customers. The development of smart, wearable devices such as the Apple Watch can make healthcare more accurate, timely and precise. Such devices provide accurate and real-time information to healthcare providers to take action, if needed.

- Intelligent Implantable Medical Devices

Pacemaker manufacturers can implant intelligent sensors that can transmit vital information on the health of the person wearing it, the makers can get status on the working of the pacemaker and can alert the customer if the pacemaker needs to be replaced or repaired.

- Intelligent Personal Medical Devices

Smart devices bring a lot of benefits, such as patients not required to visit a clinic for monitoring basic vitals such as weight, blood pressure, heart rate and pulse. The devices transmit the information to the doctor and the doctor can prescribe medication, accordingly. Smart devices transmit vital health parameters and also provide intelligent alerts to the persons wearing it. For example, the Lumbo Lift device measures your posture and sends an alert when you need to correct your posture.

- Instant Information

Intelligent devices can provide instant response based on your health requirements. For instance, after a hard day at work, when you are exhausted, your watch could measure vital parameters and provide customized recommendations on diet and the type of relaxation exercises that you might be in need.

#### B. *IoT in Agriculture*

Farmers need to face various challenges: an increasing global demand for food, fluctuating weather conditions, and a limited supply of water and fossil fuels. In addition, unsustainable farming is leading to negative environmental impacts. Future farming needs to be more efficient and reduce environmental pollution at the same time.

- Precision farming

Precision farming is a new farming technique tailored to the specific conditions of every field, which uses automatic control, sensor integration, and information processing and network communications capabilities. To facilitate a suitable growth

environment for the plant in a more energy-efficient and cost-saving way, farmers could utilize the system for factory automation management and remote monitoring.

The objective of precision farming is not only to generate data via sensors, but also to analyse the generated data to evaluate required reactions.

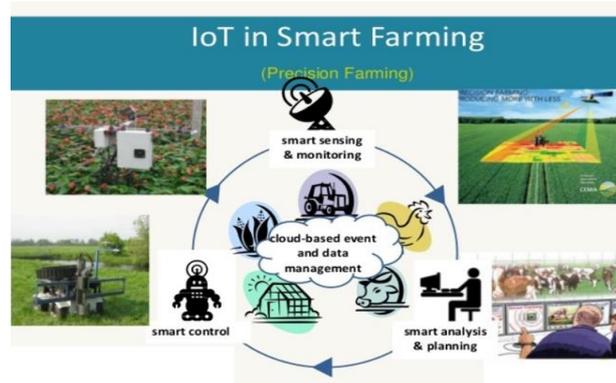


Fig 3: Precision farming

Precision Agriculture utilizes the natural resources more efficiently by collecting real-time data on crop development, weather, soil, and air quality. This supports agriculture workers and farmers to take intelligent decisions with regards to planting, fertilizing, and harvesting crops. Farmers can effectively use information to achieve greater yields and hence earn greater profits by adopting this technology.

- Agricultural drones

Recent methods of biologic pest control are more precise and cost effective. The enormous effort of permanent caretaking is supported by new technologies. Drones with multinetwork connectivity can detect nutrient and water deficits, and analyze soil conditions and the degree of ripeness of crops. The detected data is transferred to the software application used by farmers, instantly through a GSM network and enables a resource-saving, eco-friendly precision farming of the land.



Fig 4: Drones

The benefits of using drones include, easy usage, crop health, time-saving, integrated Global Information System mapping, and to increase the growth of yields. A modern renovation to the agriculture industry will be provided by applying appropriate method and based on data collection and processing proper planning can be done.

Farmers can enter the details of the type of field they intend to study using drones. Based on the entered details and selected altitude or ground resolution data will be generated. The data collected by the drone can be drawn on various factors like counting of plant and prediction of yield, measurement of plant height and plant health etc... Drones gathers data and images that are warm air, visual and multispectral during the airlift and then lands at the same initial location.

- Livestock monitoring

The information such as location, well-beingness, and health of cattle is gathered by farmers using IoT applications. The gathered data assists them to identify the state of livestock, such as, sickness in animals; so that they can be separated and spread of the disease can be avoided to the cattle.



Fig 5: Livestock monitoring

Sensors also have the potential to be mounted on animals. It can alert a farmer that an animal is sick, thereby preventing the spread of disease. with the help of IoT based sensors, ranchers can locate their cattle and this reduces labour costs by a substantial amount.

In the future, Drones can be used for Hill farming from the skies; they can locate and identify animals or monitor grass use. Even animals can be taught to follow a drone so that hands-free herd can be implemented. While the costs of drones and other precision technologies have been a barrier for investment for many hill farmers, because of potential environmental benefits this system could be introduced in future.



Fig 6: Hill farming

- Smart Greenhouse

This farming technique boosts the yield of vegetables, crops, fruits etc. The two ways to control environmental parameters in Greenhouses: either through proportional control mechanism or a manual intervention. Since manual intervention are not much effective and leads to the following: production loss, labour cost and energy loss. Embedded systems using IoT controls the climate and also monitors intelligently.

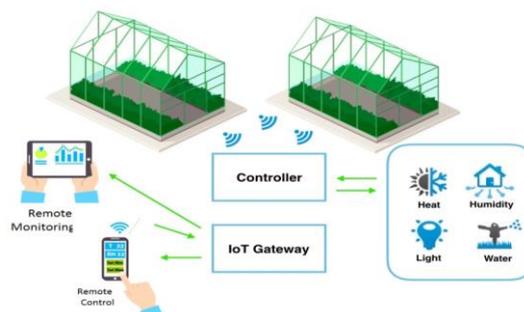


Fig 7: Smart greenhouse

Various up-gradations can be further made to Smart Greenhouse so that, it could be used in wide agricultural applications. It can be placed and operated in varied environmental conditions to grow any kind of vegetation. Non-conventional energy sources such as wind mills, solar panels are utilized to supply power to the automatic greenhouse tools and peltier effect for cooling purpose. Soil-less farming can be implemented to further increase the nutritional value. Integration of farming with IoT can make it much more cost-effective and efficient activity. It has an optimistic future scope in agriculture domain and will create a revolution in the way the agriculture is carried out.[6]

## CONCLUSION

The main purpose of this paper is to discuss the challenges faced in Healthcare and Agriculture domain. IoT has the potential to dramatically increase the availability of information. In Future, how Healthcare and Agriculture sector using IoT can be improved is discussed.

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