

ROLE OF IOT AND SENSORS IN AGRICULTURE

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INTRODUCTION

Revolutions in India marked the beginning of a completely new era in various fields, especially in agriculture. It started with the green revolution and has had a dramatic impact on incomes and food supplies in many developing countries. There were three industrial revolutions among which the third is the semi-automation revolution. We have set foot in the Fourth Industrial Revolution-the amalgamation of artificial intelligence and automated machines. This technological advancement can transform the world. This revolution can be constructive or detrimental or it may remain ambivalent.



WHAT IS ARTIFICIAL INTELLIGENCE?

Artificial Intelligence is defined as a branch of computer science that can simulate human intelligence. AI is implemented in machines to perform tasks that require human intelligence. According to the father of Artificial Intelligence, **John McCarthy**, it is “*The science and engineering of making intelligent machines, especially intelligent computer programs*”.

WHAT IS IoT

IoT or the Internet of things involves embedding sensors in traditionally used devices and enabling internet connectivity in them to collect a range of ambient data. If IoT is to be used to its full potential then AI is the key to unlock. At the core of IoT, it is all about sensors that are implemented by machines that offer the data streams through the connectivity of the internet. In an IoT system, sensors embedded in devices will create streams of data that will be reported to a central location. These devices collect useful data with the help of various existing technologies and then autonomously transfer the data between other devices.

WHAT IS IoT IN AGRICULTURE?

IoT in agriculture is assisting farmers in trimming down generated wastes and boosting productivity. That can come from the higher quantity of fertilizer that has been used in the number of journeys the agriculture vehicles have made. IoT is one of the types of technologies that help farmers to boost their productivity.

So, smart agriculture through IoT tools is essentially a hi-tech system of growing food that can be sustainable for the masses. It is the orientation and application of advanced Information & Communication Technologies in farming and agriculture.

HOW IoT WORKS

Internet of Things is not the result of a single latest technology; instead, several complementary technical developments provide capabilities that taken together help to bridge the gap between the virtual and physical world. These capabilities include Communication and cooperation Identification, Sensing, and Embedded information processing. Smart systems and IoT are driven by a combination of three things:

Sensors & Actuators, Connectivity, People & Processes

In the IoT ecosystem, two things are very important: the Internet and physical devices like actuators and sensors.

SENSORS

A sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment like temperature, humidity, water flow, the intensity of light, etc., and send the information to other electronic circuits or electrical instruments that can be measured and/or analyzed. Without the use of sensors, there would be no automation.

TYPES OF SENSORS

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Location Sensors :

These sensors are used to determine the longitude and latitude in the field with an accuracy of around one foot. These sensors use three satellites to calculate the location and are equipped with GPS as well.

Optical Sensors

These sensors use light to measure soil properties. These sensors use different frequency light reflectance to calculate the soil and properties such as soil texture, organic matter, the moisture content in the soil. They are also used to analyze the health of a plant based on its leaf

Electrochemical Sensors

These sensors are in use for a long time. These sensors identify the chemical properties of soil like pH and other nutrients. The electrodes of these sensors detect the ions present in the soil, and on its basis, it tells us the configuration of the soil

Mechanical Sensors

These sensors are used to identify the compaction of soil, and mechanical resistance of the soil. These sensors can be used to identify the force used by the roots of the plant for absorbing water and can help us in regulating irrigation interventions

Soil Electrical Resistivity Sensors

These are used to measure the change in on-resistance of soil due to changes in moisture content in the soil. They can also be used to identify the friction angle of soil and the physical characteristics of soil as well

Airflow Sensors

In this sensor prescribed amount of air is pushed into the soil at a defined depth. It is used to measure soil permeability. This is used to identify various soil parameters like moisture, compaction, the structure of the soil, etc

Agricultural Weather Station

These are the small blocks placed across the field to sense various parameters in the field, it may consist of many sensors like temperature, relative humidity, location, wind speed, solar radiation, and many more depending on your requirements

Yield Monitoring

A yield monitoring system is usually placed on the harvester, which measures the weight of food grain like wheat or corn. They provide the output based on time, distance, and even GPS and the accuracy is up to 30 cm

Weed Mapping

This can be performed with the help of image processing equipment placed over some vehicle or drone which takes the image or video of the field. This method can also be used to analyze the yield as well. The device is also equipped with GPS, which creates a map of the weeds, which can be manually or automatically picked from the fields



ADVANTAGES

1. They are invented to meet the increasing demand for food by maximizing yields with minimum resources such as water, fertilizers, and seeds.
2. They fulfill this by conserving resources and mapping fields.
3. They are simple to use and easy to install.
4. They are cheaper.
5. In addition to agricultural use, they can also be used for pollution and global warming.
6. They are equipped with a wireless chip so that they can be remotely controlled.

DISADVANTAGES

1. Smart farming and IoT technology require continuous internet connectivity. This is not available in developing countries such as INDIA and other parts of the world.
2. There is a presumption in the market that consumers are not always ready to adopt the latest IoT devices equipped with agriculture sensors.
3. The basic infrastructure requirements such as smart grids, and cellular towers are not available everywhere. This further hinders the growth of its use.

CHALLENGES

Challenges faced by AI and IoT in agriculture:

1. The main challenge is the adoption of AI and IoT in Agriculture.
2. Lack of experience with emerging technologies
3. High adoption costs
4. Most sensors are easily damaged by natural factors like storms & floods or animals.
5. Lack of experts in AI and IoT in agriculture.



CONCLUSION:

In this day and age, IoT is playing a very important role in every activity. By this, every activity in agriculture can be automated which eventually improves the efficiency of agriculture activities and increase the efficiency of utilization of resources.