Review: Industrial Internet of Things (IIoT) in Agriculture

Aman Devrath[1], Pooja Kadam

[1](MCA, BVIMIT, Navi Mumbai, India)
[2](Guide, BVIMIT, Navi Mumbai, India)
Corresponding Auther: Aman Devrath

Abstract : *Industrial Internet of Things (IIoT) is the utilization of Internet of Things (IoT) innovations in manufacturing. The thought behind IIoT is that the technologies ought to interface things to infrastructure. By this, it will be less demanding to get information from devices which will have greater perceivability on the manufacturing procedure. The information from the technologies utilizing IIoT will assist industries with picking up on wasteful aspects and issues sooner, sparing time and cash with the assistance of business knowledge endeavors. IIoT is the network of devices associated by interchanging innovations that outcomes in frameworks that can monitor, gather, investigate, and convey profitable new bits of knowledge more than ever.This paper furnishes a review of IIoT with its extension, advantages and difficulties in coming age. It additionally features the IIoT availability innovations and stage that uses IIoT for the business productivity. At long last, it additionally features how IIoT is useful in agriculture industry giving loads of advantages to the agriculturists.*
Keywords : *Industrial Internet of Thing, Industrial Internet, Internet of Things, IoT, IIoT*


I. Introduction

Industrial Internet of Things is the decoupling of devices from applications. This implies that it centers around technologies that interfaces things to infrastructure. Basically, industrial execution of Internet of Things is called as Industrial Internet of Things (IIoT). IIoT is a piece of Internet of Things that spotlights on devices and objects, utilized as a part of business settings. Devices can be utilized to detect or gather information from manufacturing systems to give better control of procedures.

Industrial IoT, otherwise called Industrial Internet, characterizes change in the business in the associated setting of machines, Artificial Intelligence, distributed computing et cetera. IIoT can enhance effectiveness and profitability by uniting splendid machines, advanced analytics, and individuals to work. It can likewise lessen the complex nature of the procedure in the business. [1][7] With the introduction of Industry 4.0, the vision of associated enterprise through interconnecting industrial resources through the web was satisfied. The smart gadgets speak with each other and create valuable insights. IIoT carried with it the benefits of advantage improvement, production integration, intelligent monitoring, remote finding, intelligent leadership and above all the component of Predictive Maintenance.

II. Working

IIoT has diverse parts like sensor nodes, a cloud server, IoT gateway and a web/application dashboard to display the information.

The general working of the IIoT device is: The Sensor Nodes/Actuators oversee gathering and exchanging the information to the gateway/control center. The gateway/control center pre-process the data and further passes the data to a web application/dashboard, which displays infographics.
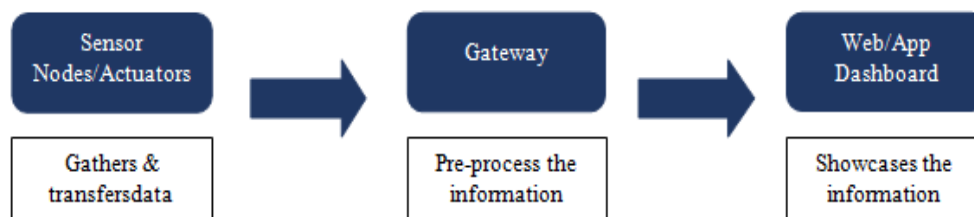
III. Benefits

IIoT will change the industry strategy. It will enhance quality, profitability, productivity in the manufacturing business bringing about quality items. This will be enhanced by joining Machine-to-Machine communication, big data analytics and technology. This is the motivation behind the modern organization's encountering operational and budgetary advantages in power and energy, oil and gas, manufacturing, medicinal services and aviation. IIoT will likewise make new business openings expanding efficiency & quality. Though there are numerous advantages, the greatest advantage from IIoT will be lessening of human errors and physical work, ascend in general productivity, improving operation proficiency and diminishment of expenses and time. [1]

Likewise, there are numerous favorable circumstances where IIoT will shine, Few of them are: Digitally-connected factory, Predictive Maintenance, Resource Optimization.[3]

IV. Scope

The market of IIoT is enormous. As per IndustryARC research into which was done in June 2016, the IIoT market is evaluated to reach $123 billion by 2021. Morgan Stanley, in 2015, evaluated that IIoT market size and effect will be $90billion to $110 billion by 2020. Accenture gauges the IIoT can add $14.2 trillion to the worldwide economy by 2030. Worldwide IIoT Market reports that IIoT will develop at a compound yearly growth rate(CAGR) of 7.3% until 2020.[1]

V. Challenges

There will be a great deal of difficulties while embracing IIoT. Morgan Stanley-Automation World Industrial Automation Survey, AlphaWise anticipated the difficulties the business may confront while receiving IIoT. Some difficulties that industry may confront are:
- Cybersecurity
- Lack of standardization
- Lack of skilled workers
- Data integrity
- Internal system barriers.

Of every one of these difficulties, it is anticipated that cybersecurity and absence of standardization will be the most troublesome test while embracing IIoT, as stated in the survey by Morgan Stanley and Automation World magazine. Cybersecurity and data security is the biggest concern for companies. Since each device will be connected to produce large amount of data, the data may not be secure. For this, companies may need to redesign security architectures. Data Integrity will likewise be an immense test as well. Since there will be different information source types, enormous information volumes. Although information is the key in IIoT, yet honesty of that information is the primary test that industry will confront.

Absence of skills is another real reason behind why organizations are not prepared for the IIoT. There is restricted access to the correct abilities and mastery. [1]

VI. Use Case

6.1   UPS Maintenance by Predictive Analysis

Assume, a major campus park has an UPS (Uninterrupted power Supply) framework that is intended to deal with the power needs of considerable number of workplaces if there should arise an occurrence of intensity cuts. There are a few hundred batteries that are associated with the inverter for guaranteeing the power supply.

In the event that the level of refined water/electrolyte goes down or their terminals should be cleaned, the batteries require support. In the event that there are a few issues in the batteries, the power reinforcement for whole building can be imperiled.

For this, an IoT Solution can help discover arrangement, by perusing the parameters (water level, electrode condition and so on.) of the battery with the assistance of sensors joined to every battery. Presently, this data can be additionally sent to the control room through the IoT gateway and cloud.

This IoT Solution can help understand any issue in the batteries before any occasion of shutdown happens. [10]

6.2   Harvesting maximum amount of energy from sun by using solar panel

There are number of solar panels introduced in an open field by a company. The solar panels ought to take after the movement of sun from east to west, to collect the maximum amount of energy. The panels won't proceed onward their own. Somebody ought to physically adjust the solar panels to the sun's position.

The suggestion presently is that the system isn't working at its ideal proficiency. For the framework to work at its ideal effectiveness, it is required that the solar panels ought to take after the sun's way or direction for the duration of the day with no manual mediation.

Now, to take after the sun's way, the actuators of sun-oriented boards come into picture. The sensors assume less critical part. The IoT system utilizes a algorithm that can decide the sun's situation at each occurrence of the day and the solar panels are motioned to move in the sun's course. [10]

6.3 Drones

Drones are the unmanned aerial vehicles, which convey numerous sensors with it. These sensors help catch colossal measures of important information. They utilize the sensors to catch the information, and afterward the information is stacked in the software associated with it.

Drones can be utilized to direct land surveys, for e.g.: construction organizations can utilize automatons to guarantee the development is on plan by leading their development arrive studies. This information can be stacked into a programming to get an alarm message on the off chance that anything leaves put. Indeed, even the agriculturists who can't study their territory frequently, can utilize drones for guaranteeing safety. [4]

6.4 Farming in the future

The farmers can utilize drones for directing studies of their territory. This can work for little terrains. In any case, for gigantic homestead lands, makes the utilization of IIoT powerful. IIoT can be utilized to expand the profitability to the greatest and guarantee the nature of the nourishment doesn't diminish by utilizing IIoT track and follow innovation to screen cultivating activities from the season of collecting till the conveyance.

IIoT can be useful to farmers since it can help in monitoring the livestock. Also monitor theplant & soil for best returns. It will also reduce the labor costs since IIoT can help ranchers identify where their cattle are.[4][6]

VII. Iiot In Agriculture

The Industrial Internet of Things (IIoT) is driving another industrial revolution – and this current one's focused on the automation of industrial procedures. A wide range of ventures are influenced, and agriculture is no exemption. Keen cultivating advancements guarantee to enable farmers to monitor livestock, evaluate crop growth and soil quality, restrict water utilize, control temperature, and the sky is the limit from there, with the goal that raising harvests and creatures is less demanding than any time in recent memory.[9]

The term AgriTech is characterized for the utilization of technology in agriculture, horticulture for the motivations behind enhancing yield, proficiency and profitability.

7.1 Scope:

The farming business will without a doubt turn out to be more imperative than any other time in near future. As indicated by the United Nations Food and Agriculture Organization, the world should create 70% more sustenance in 2050 than presently, with a specific end goal to encourage the developing populace.

There are numerous factors, for example, environmental change, constrained arable land, water shortage, work request, trouble relocation, failures of crops results in flare-up in nuisances and illnesses, and different factors will additionally bother the demand for worldwide food generation. To take care of this demand, innovation will assume an essential part, as farmers and rural organizations are swinging to the Industrial Internet of Things. [6]
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7.2 How will it help agriculture?

Global farm equipment manufacturers are taking a gander at capitalizing on the ongoing advances in IIoT by fitting their cultivating equipment with sensors and telematics (a device which merges telecommunications and informatics) answers for enabling farmers to execute accurate farming practices with a target to oversee and track their fleet of machinery and accumulate continuous information on equipment status.

IIoT sensors would give the intensity of information to agriculturists. Utilizing this information, the farmers can precisely discover and anticipate precipitation, soil sustenance levels, and harvest yields and have the capacity to turn away pest infestations and crop failures. [6]

7.3 Use Cases:

John Deere, a noteworthy agricultural equipment manufacturer, obtained an Artificial Intelligence (AI) start up by the name Blue River Technology. John Deere made this move fundamentally to advance its conventional crop spraying methods and to computerize and instruct its tractors how to cultivate. These tractors would now use cameras that accompany deep learning capacities; in this way, when they see a plant, they can

recognize it as weed and hit it with pesticide. On the other hand, if, the tractor sees a harvest, the calculation guarantees that the hardware fitted on the tractor splashes fertilizers over the harvest. [8]

7.3.1 Smart Greenhouse:

Smart Greenhouse is an automatic, small scale atmosphere-controlled condition for ideal plant development. Climatic conditions inside it, for example, temperature, humidity, soil dampness is constantly observed. Little varieties in these climatic conditions trigger mechanized activities. The computerized moves assess change and make remedial activity therefore keeping up ideal conditions for plant development. [5]

7.3.2.1 Architecture:

Smart Greenhouse involves sensors and actuators. These sensors and actuators are responsible for programmed automated activities. The sensors and actuators are associated with a micro controller, which additionally passes the data to a cloud (Greenhouse Control Center). The data from the cloud can be recovered through an application introduced in any device. [5]

Major components of Smart greenhouse:
- Sensors & Actuators
- Cloud Control Centre
- User Interactive Device

7.3.2.2 Working:

The micro controller contains two center points for sensors and actuators, a sensor hub and an actuator hub separately. A sensor hub reads all the sensor information and actuator hub reads all the actuator information. Both the hubs have an application which runs and conveys to the associated devices toward one end and an IoT application at the opposite end.

The application in the sensor hub peruses every one of the information from every one of the sensors and distributes the readings from the sensors to the IoT Application utilizing MQTT protocol. The application in the actuator hub subscribes to an arrangement of MQTT topics and sits tight for the message from these topics. Control Center is the backend for the Smart Greenhouse.

Control Center includes Controller Web Application, a web server and monitoring lambda functions. Controller Web Application is utilized to control Smart Greenhouse.

The Web Server, which is a streaming web server, is utilized to convey Smart Greenhouse status to interested organizations.

Diverse Conditions in greenhouse, for example, temperature and humidity are consistently observed by activating lambda functions through IOT rules engine.

The user interactive gadgets are the gadgets with which client can interface with the Smart Greenhouse utilizing a dashboard with the assistance of an application. The dashboard, which is web-based, demonstrates ongoing graph of temperature, humidity and soil moisture. Nursery fan, ventilation windows, overhead light, drove light and humidifier can likewise be controlled by the web-based dashboard application. [5]
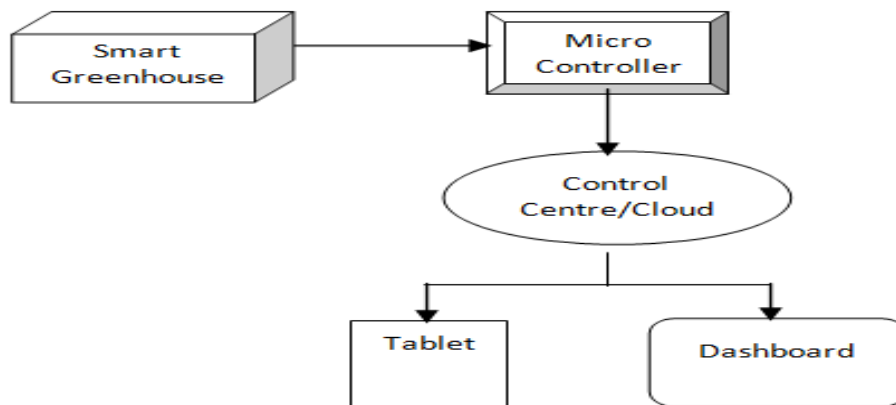
VIII. Conclusion

From this, we can reason that IIoT is especially helpful in the enterprises by utilizing IoT. It additionally helps in finding and diminishing the wasteful aspects, dangers and problems. Companies & industries are contributing heaps of cash on IIoT since it improves them by expanding the quality and quantity.

Thus, the IIoT rural applications are making it workable for farmers and agriculturists to gather significant information. Substantial landowners and little ranchers must comprehend the capability of IIoT advertise for farming by introducing brilliant advancements to build aggressiveness and maintainability in their preparations. The interest for developing populace can be effectively met if the farmers and additionally little ranchers execute horticultural IIoT arrangements in a fruitful way.

Though IIoT accompanies a thing that has loads of difficulties and issues, of which we can state that cybersecurity is the greatest test that each industry will confront, likewise security turns into a substantial hazard. Yet as time goes, technological advancements will lessen these dangers and might make the modern information secure.

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