AN APPROACH ON IoT BASED SMART AGRICULTURE FARMING

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Abstract

The growing demand for food in terms of quality and quantity has increased the necessity for industrialization and intensification within the agriculture field. Internet of Things (IoT) may be a highly promising technology that's offering many innovative solutions to modernize the agriculture sector. Research institutions and scientific groups are continuously working to deliver solutions and products using IoT to affect different domains of agriculture. Sensible way of automating the farming process is often called Smart Agriculture. The major emphasis is going to be on providing a favorable atmosphere for plants. These agricultural based lot systems will help in managing and maintaining a safe environment especially the agricultural lands. Environment real time monitoring is a crucial thing about smart farming. Graphical interface based software is provided to regulate the hardware system and therefore the system is going to be an entirely isolated environment, equipped with sensors like temperature sensor, humidity sensor. The controllers are going to be managed by a master station which can communicate with the human interactive software. The system will provide a smart interface for the farmers. This smart system can increase the extent of production than the present scenario. This system will realize smart solutions for agriculture and efficiently solve the problems associated with farmers. The environment won't be the barrier for production and growth of any plant and may overcome the matter of scarcity of farming production.

Keywords: internet of things; agriculture; devices/sensors; agricultural applications; temperatures moisture, climate

1. INTRODUCTION

Nowadays, we are surrounded by an outsized amount of “smart” sensors and intelligent systems
that are always inter-connected through Internet and cloud platforms; this is often the online of Things (IoT) paradigm that introduces advanced technologies altogether social and productive sectors of the society. Considering the worldwide market, companies compete to increase their profitability and economy by optimizing costs, time, and resources and, at the same time, trying to reinforce the services quality and thus the products variety offered to customers. the attention towards efficiency and productive improvements is coveted also within the agricultural sector, where the assembly dynamics and thus the resource management affect plant or crop types, irrigations, and disinfestations amount; keeping such production rhythms with none automatic control is perhaps getting to bring resource waste, rotten or abandoned crops, and polluted and impoverished soils. Innovative technologies are often useful to face problems like environmental sustainability, waste reduction, and soil optimization; the gathering and thus the analysis of agricultural data, which include numerous and heterogeneous variables, are of considerable interest for the likelihood of developing production techniques respectful of the ecosystem and its resources and therefore the identification of influential and non-influential factors, the likelihood of completing market research in regard to the forecast of future hard-predictive information, the likelihood of adapting crops to specific environments, and eventually the facility to maximise technological investments by limiting and predicting hardware failures and replacements.

2. There are four main components of IoT-

Low power embedded system- High performance and fewer battery consumption are the inverse factors that play an important role in the design of electronic systems. Cloud computing- Data collected from devices is stored on reliable storage servers so here cloud computing comes into action. Availability of massive Data- As IoT is extremely enthusiastic to sensors that are real time. therefore the usage of electronic devices is spread throughout every field that's going to trigger an enormous flux of data . Network connection- For communication, internet connectivity is important where each object is assigned by an IP address. A network connection is built between the devices with the assistance of those addresses Technology today has not reached its 100% capability. therefore the advantages and drawbacks of this technology are given below-

Advantages of IoT

- Utilization of Resources Efficiently
- Minimization of Human Efforts
- Time-saving
- Increase Data Collection

Disadvantages of IoT

- Security
- Privacy
- Complexity

IoT in Agriculture

The Internet of Things has the capacity to transform the lives of people within the planet in an efficient manner. The ever growing population would touch quite 3 billion in a few years. So to feed such an immense population, the agriculture industry needs to embrace IoT. The demand for more food possesses to deal with challenges that include excessive climate conditions, weather change and different environmental effects that result from farming practices. The destiny of Indian agriculture must be worked with understanding and excessive cease technologies which will expand production and furthermore regains the eye of farmers during this industry. So these smart farming techniques would assist farmers to scale back scrap and enhance capacity. It's basically a high tech and capital intensive system for growing crops in a sustainable manner for masses. This technology can help farmers to watch field conditions from anywhere with the assistance of sensors and may also irrigate fields with an automatic system. it's the appliance of data and Communication Technology into the sector of agriculture.

Structure of IoT in Agriculture

Basically this technique structure consists of three layers that are sensor layer, transport layer, application layer and therefore the functions of those layers are below –

1. **Sensor layer**- One of the challenges of the sensor layer is to obtain automated and real time transformations of the figures of actual world agricultural manufacturing into digital transformation or information which could be processed in the virtual world through different or various means. The data that they collect are-

Sensor information- Humidity, temperature, gas concentrations, pressure etc.
Products information- name, model, price and features.
Working condition - operating parameters of different equipment, apparatus etc.

2. The major challenge of the Information layer is to mark diverse kinds of information or data and gather the information and marked information in the actual world by means of techniques of sensing, after which remodels them for processing into digital information. This sensor layer includes some strategies- RFID tags, cameras, two dimension code labels, sensor networks.

Transport layer- This layer's task is to accumulate and summarize the info of agriculture acquired from the above layer for processing. It is believed as the nerve centre of IoT. This layer includes the combination of telecommunication management centre and also internet network, information centre, smart processing centers.

3. Application layer- The function of this layer is to analyze and process the information collected for the cultivation of digital awareness of the actual world. It is considered as a fusion of IoT and agricultural market intelligence. Benefits of IoT in Agriculture IoT empowers simple gathering and therefore the executives of giant amounts of data which is gathered from sensors used and with the assistance of joining of distributed evaluating administrations like cloud storage, farming field maps and more information are often retrieved from anywhere and everywhere which enables live monitoring and connectivity which is end to end.

By the utilization of IoT creations expenses might be diminished to an astounding dimension that might thus expand productivity and survivability.

By the use of IoT efficiency level would be further expanded as far as utilization of water, soil, fertilizers, pesticides etc.

Applications of IoT in Agriculture

Precision farming Agricultural drones

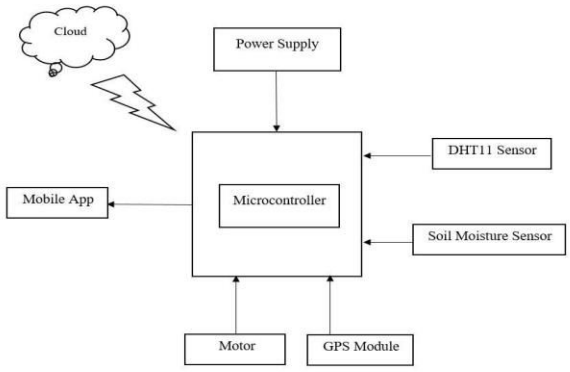
Livestock monitoring Smart greenhouses

2. OBJECTIVES

1. To update farmers with the new technology and to avoid manual labor.
2. To scale back wastage of water and enhance productivity of crops by providing them ideal conditions.
3. To satisfy the difficulties like severe weather and advancing global climate change , and environmental consequences resulting from intensive farming practices.
4. Design a software tool and connect it to the android application and cloud server.

3. Methodology

The basic building blocks of an IoT System are Sensors, Processors and applications. So the block diagram below is the proposed model of our project which shows the interconnection of these blocks. The sensors are interfaced with Microcontroller; data from the sensor is displayed on the mobile app of the user. Mobile apps provide access to the continuous data from sensors and accordingly helps farmers to take action to fulfill the requirements of the soil.



This research comprised on the following objectives:

Objective1: More focused state-of-the-art research work has been identified within the field of IoT agriculture.

Objective2: Characterize the prevailing IoT agriculture applications, sensors/devices, and communication protocols.

Objective3: Proposed a taxonomy that further highlights the adopted IoT agriculture methods and approaches.

Objective4: An IoT-based smart farming framework has been proposed that consists of basic IoT agriculture terms to spot the prevailing IoT solutions for the aim of smart farming.

Objective5: Identify the research gaps in terms of challenges and open issues.

Research Questions

The first step of this SLR is the definition of research questions and provision of this research status on IoT-based agriculture. This SLR addresses 8 research queries with their corresponding motivation represented.
Q1 what are the main targeted primary publication channels for IoT agricultural research?
In order to identify where IoT agricultural research is usually found also nearly nearly as good publication sources for future studies.
Q2 how has the frequency of approaches been changed associated with IoT agriculture over time?
Identify the publication with the time associated with IoT in agriculture.
Q3 What approaches are wont to address problems associated with IoT agriculture?
To find out existing IoT agriculture approaches reported within the existing IoT agriculture literature
Q4 What are the foremost application domains of IoT in agriculture?
Identify the most areas of agriculture where IoT technology is being utilized for monitoring, controlling, and tracking purposes.
Q5 What are the first focuses of the chosen studies?
To identify the many proposed solutions.
Q6 What sort of IoT devices/sensors are utilized in agriculture?
To identify the role of primary IoT devices/sensors.
Q7 Which IoT network/communication protocols are utilized in agriculture?
To identify the role of network and communication protocols.
Q8 Which IoT agricultural policies are implemented in several countries?

Software Tools

Arduino Ide (Integrated Development Environment)
Arduino IDE is an open source programming which is essentially wont to write & compile code employing a module that's Arduino. This is often a politician programming software which makes compiling code simple so a typical man can understand the training procedure. This software is quickly available for all operating systems like MAC, windows, Linux. Arduino Mega, Arduino Uno, Arduino Leonardo and more are a variety of Arduino modules that are available. It basically features a text editor which is employed for writing code, a text console, a message area, a toolbar with buttons for a few of the common functions. Sketches are called because the programs that are written using this software. Coding on this software mostly uses functions of c/c++.

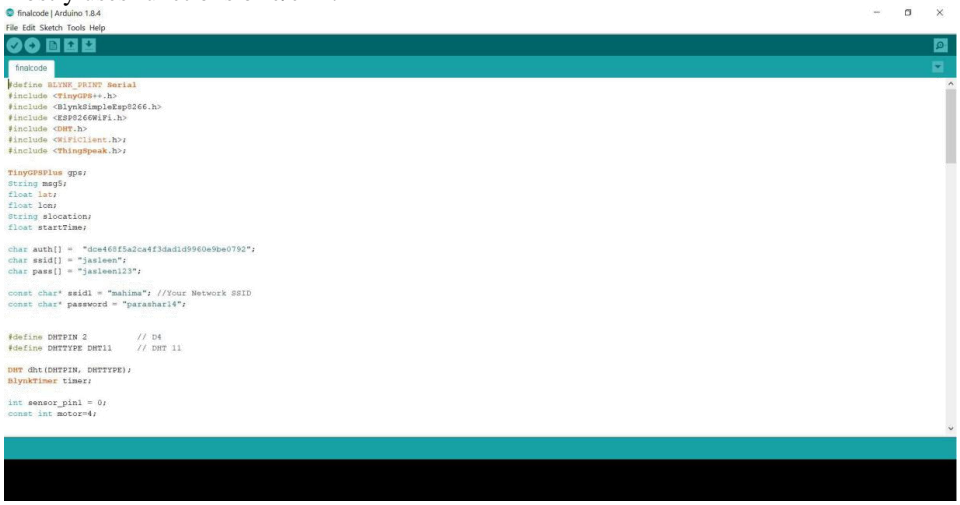


Figure 1.3 Sketch Area of Arduino

Blynk
It was designed for IoT. This app has capacity to remotely control hardware and also shows sensor information. This app also helps to see and store data. This platform contains 3 main elements:
Blynk app- With the assistance of varied widgets amazing interfaces for the projects are often created.
Blynk Server- Establishes a communication network between Smartphone and hardware.

Blynk Libraries- All incoming and outgoing commands are processed and also enables communication between server and process

Features

1) Has similar API and UI for supported hardware and devices.
2) With the utilization of WiFi, Bluetooth, GSM, USB connects to the server.
3) Direct manipulation of pins with no code writing.
4) With the utilization of virtual pins of this app it's easy to feature functionalities and integrate.
5) By the utilization of bridge widget it's possible to possess device to device communication.

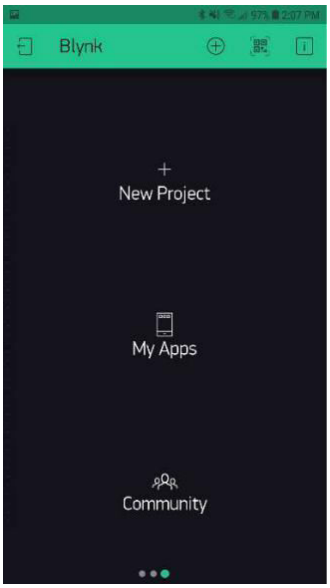


Figure 1.4 Blynk App

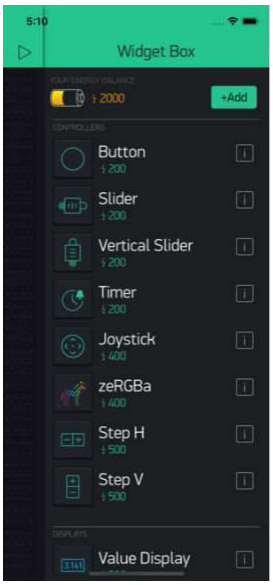


Figure 1.5 Widgets of Blynk app

Thingspeak Cloud Server

It is an open source application. This platform provides services that allow users to see , analyse & aggregate live data streaming on cloud servers. It presents instant visualizations of data published by different devices to the present cloud server. it's the capacity to execute MATLAB code on this server and that we can perform online evaluation and processing of statistics because it comes in. It's regularly used for prototyping. On the left side there are smart devices that live at the sting of the network. These devices collect information and include things like pulse monitors, wireless sensors, wearable devices etc. within the middle there's a cloud where data from different sources is analysed in real time. The proper side depicts the algorithm development connected with IoT application.

Features of Thingspeak

• With the utilization of IoT protocols devices are easily configured to transmit data to the cloud.
• In actual time the info of sensors are visualized 6 Collect data on demand from sources.
• is sensible of IoT data with the facility of MATLAB.
• Builds IoT system and prototype without developing softwares and servers.

Figure 1.7 Plots in Thingspeak

Conclusion

The proposed model explores the utilization of IoT (Internet of things) within the agriculture sector. This model aims at increasing the crop yield by helping in predicting better crop sequence for a specific soil. Thingspeak helps in real time sampling of the soil and hence the info acquired are often further used for analysing the crop. we've also taken many readings of the soil moisture, temperature and humidity of the environment for various days at different times of the day. Data on the cloud also helps the agriculturists in improving the yield, evaluating the manures, illness within the fields. this technique is cost effective and feasible. It also focuses on optimizing the utilization of water resources which combats issues like water scarcity and ensures sustainability. This model focuses on the use of IoT in agriculture and therefore the solutions proposed during this paper will improve farming methods, increase productivity and cause effective use of limited resources.

Future Scope

The future scope of this project could include a variety of soil sensors like pH sensor, Rain sensor and then collecting and storing the data on cloud servers. This would make the predicting and analyzing processes more accurate. It also includes making different data mining algorithms suitable for data analysis in agriculture.

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