AN INNOVATIVE APPROACH TO ENHANCE THE AGRICULTURE WITH INTEGRATING ENERGY EFFICIENT DRIVEN TECNIQUES USING IoT

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ABSTRACT:

Agriculture has substantially contributed in the sustainability of humanity by promoting numerous varieties of crops during the last few decades and it has also made the agricultural practices more effective. Agricultural Industry also helps human financially on a long term basis for survival and also extensively contributed to the healthy and natural atmosphere. There has been a vast enhancement in the agricultural industry through the recent development in the technologies. However agricultural industry started facing notable hurdles in the distribution of agricultural procedures. Therefore there is a substantial need in developing an advanced technology to sustain agriculture in a long term and also for promoting the compatibility of ecology in order to increase the production of crops. Internet of Things (IoT) is novel platform that can efficiently monitor the agricultural ecosystem which indeed also assures production with high quality. Sustainable agriculture through an innovative technology named IoT is considered to be one of the most viable methods for conserving nature by fulfilling the fundamental requirements and meeting the needs of future generations. This paper primarily focusing on improvising the efficiency of agriculture and also at the same time reduces the human labour in the workstation. IoT along with artificial intelligence can be collectively used to expand and sustain the production of crops. This research paper proposes four different sensors that can monitor the farming activities on a real time basis by providing time to time updates and also besides that it can also provide several useful information such as soil moisture, pH of soil and water level.

Keywords: IoT, Smart Agriculture, Sensors, cloud Computing, AI

INTRODUCTION

Smart Farming future will be deployed on Internet of Things (IoT). There will be number of challenges and crucial part while transforming "Traditional to Modern Technology". While comparing traditional farming with smart farming is efficient, there are tremendous advantages such as can maintain data easily hence track of crops growth, maintain adequate water, reduces costs, increase productivity. IoT Technology is one of the rapidly demanding area and connected all peoples and things in anytime at anywhere. IoT is an intuitive interconnectivity between digital world and real world and used in various fields such as smart health services, smart education, smart city[1].

As long as population is growing and to avoid damage due to natural disasters, agriculture should grow to fulfill the need and accommodate the demand within our resources[2]. In 2050 the global population predicted as 9 billion and humans cannot able to present in farmland for 24 hours. So there is need of change in agriculture to satisfy more population. The farmlands should be monitor continuously due to unpredictable weather [4]. Some of the applications of smart farming are tracking of vehicle, monitoring livestock as well as storage, detection of water, precision farming, drones development and some other farm applications.

Fig 1:Smart Agriculture Applications

The Evolution of science and technology has increased the GDP constantly. Agriculture is important and should be sustainable to serve more techniques that Survive long term applications beneficial for humans.[6] Farming helps to protect the natural resources.

Smart farming are the milestones for the development of sustainable agriculture. Due to increase in population results in growing industrialization, enormous changes in climate adversely affect the agriculture. According to United Nation of Food and Agriculture Organization (FAO) prediction in the year 2050, there will be enormous need of resources for agriculture[7]. This section shows the impact of digital technologies results in environmental, economic and social growth in sustainable agriculture. Overall focuses on increasing demand of food, rapid changes in climate and to reduce the wastages of food and water results the need of smart agriculture.

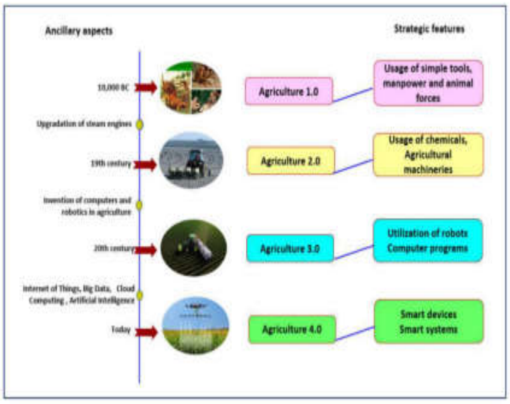

Fig 2: upgradation of Smart Agriculture

In existing system it has some drawbacks such as time and work done for processing, transportation and logistics[8]. In this paper, developed smart farming to overcome all these difficulties. The essence of biodiversity falls on existence of living things, data about environment, pesticides and fertilizers. This paper encapsulated various Technologies such as IoT, cloud Computing, logistics and Artificial Intelligence.

The rest of the paper is organized as follows: Section II presents the related work. Section III presents the animal intrusion system. Section IV describes the proposed model of the long-range surveillance intelligent rover. Section V provides the deep learning algorithms for animal classification. Section VI presents the results and discussions. The conclusion is presented in Section VII.

LITERATURE SURVEY

In this section presents detailed view about previous aspects of smart farming. This section encapsulated various range of methodologies and technologies. In 2050 the objective of Smart agriculture provides the attention towards expansion of productivity[9]. The growth of agriculture depends on the wireless sensor networks, edge AI, Internet of Things (IoT), cloud computing, data analysis, big data analytics and the deployment of drones and robots. These technologies shows improvement in human- machine Communication to improve global level environmental management and productivity in agriculture[10].

Various protocols Such as Wi-Fi, zigbee, LoRaWAN, SIGFOX are used to overcome data loss at the nodes. Information and Communication Technologies ICT acts link between physical and virtual layers. Data gathered from physical devices and make decision for smart farming. With the use of different types of layers IoT provides efficient Communication. The processing layer act as sense layer as well as management layer. It receives the data from sensors and stores the data, analyse it and process the data which performs the following tasks such as management, analytics for the massive amount of data. The presentation layer concentrates on focusing visualization and helpful in digital logistics, smart cities, Traffic system. Network layer split into two types. One for Communication that is named as Access and another for Gateway that is named as core.

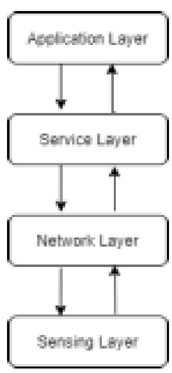

Fig 3: Layers of IoT Architecture

The most significant quality of the framework that was used in this research work is that the mobility of the mesh points. The authors had a strong notion that the above discussed framework can provide more easiness to the Internet of things networks and it can lay the foundation for the development of several other innovative things. The ns-3 simulator was used the investigators in order to simulate the recommended framework. Thus the study results found that the endorsed protocol gave consistency to the internet of things network during simulation and it comprises of the mesh points. The research also indicates that the overhead system reduces the average value of the delay parameter. Nevertheless the non-delay sensitive traffic that includes sensing data was used by most of the Internet of things. Lastly the study concluded that worthy coverage and dependability to mobile condition was achieved by using the proposed framework.

IoT paper focuses on designed and offered a novel avant-garde technology for the purpose of wireless mutual communication called ZigBee. On the basis of the above mentioned technology the authors created the software and hardware primarily for tracing the system that are related to underground persons. The researchers also described the architectural design of the proposed system that contains gateway node, reference node and also a location node. The investigators connected all those three nodes through the upper monitor. The location system was chiefly used in this research for collecting the data concerning the underground miner and the comment was provided to the upper monitor for the purpose of detecting, chasing, testing and examining the underground personnel.

Wireless Local Area Network (WLAN) and the Wireless Sensory Network (WSN). Nevertheless tracing the above mentioned problem in relative to Internet of Things is quite unique and challenging. The researchers introduced an innovative energetic game in which the particular and more suitable strategy in order to play the game as per the state of game was designated by the nodes and additionally the energy level was boosted for raising the efficacy every time when the effectiveness was reduced. The strategies were developed in the overhead discussed model on the basis of the contemporary state of game and also based on the availability of capitals. The simulation was carried out by the researchers for validating the performance of the proposed model. Thus the result analysis revealed that the enhancement of utility and the equality in sharing of channels were achieved by conducting a simulation. In addition to its effectiveness in consumption of power was also achieved in the dynamic model through the simulation.

METHODOLOGY

Due to Natural Disasters and consequences of epidemic events, there is scarcity and lack of food resources in the world. IoT plays a major role to increase the food productivity and to overcome the backlogs of deployment in agriculture field. Iot become an essential part in our daily routine. Agriculture uses 85% of fresh water all over the world. The proportion of water utilization in agriculture leads a problem towards growing population.

Smart agriculture focus on weather, soil moisture, ph value and water level that are critical reason for present agriculture declines. IoT based agriculture has greatest advantages that are Continuous monitoring of agriculture field without human resources. The advantages of smart agriculture are Field mapping or data collection, Predictive analytics, Data saving, Tracking and monitoring, Labor work.

For the proposed work we are utilizing IoT Sensors such as DHT22 Sensor for air Temperature and humidity sensor, Capacitive Soil Moisture Sensor for soil moisture, water level sensor finds the quantity of water needed for crops in the field and limit the overflow of water, Soil's PH value.

IoT Sensors

DHT22 sensor

DHT22 sensors are intended for measuring Air Temperature and humidity. This sensor calibrates digital output. The efficient features of sensors are high precision temperature measurement devices, high performance 8-bit Microcontroller, excellent quality, Fast response, Strong anti-jamming capability and high cost. It is highly demanded sensor because of the design for analog sensor which easily interfaces with Arduino expansion board.

Fig 4: DHT22 sensor

Specifications:-

- Supply voltage: 5V
- Temperature range:-40-80℃ resolution0.1℃ error <±0.5℃
- Humidity range:0-100%RH resolution0.1%RH error±2%RH
- Sequence of the line:VCC,GND,S
- Size: 38 x 20mm

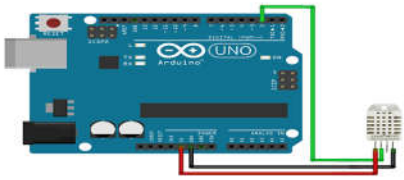

Fig 5: Interfacing Arduino with DHT22 sensor

Soil moisture sensor

The soil moisture level is determined using the capacitive soil moisture sensor. It uses the amount of water in the soil to determine its moisture content. The soil moisture sensor measures the amount of water in the soil by measuring capacitance rather than resistance.

An analog output, greater corrosion resistance than resistive sensors, low power consumption for microcontroller interface, and operation at 3.3 or 5 volts are the key characteristics of capacitive moisture sensors.

The advantage of this sensor is common fork resistance sensor is the probes of resistance sensor lies inside the soil that has conductive bare metal which allows current flows in the circuit.

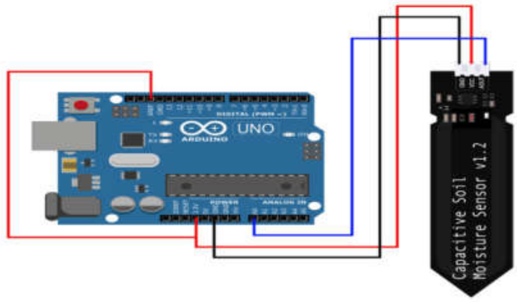

Fig 6: Interfacing Arduino with Soil moisture sensor

The probe in the sensor which lies inside the soil should be monitor. The horizontal line indicates how much depth the probe lies in the soil. The green part of the sensor shows how much depths insert the sensor inside the soil. We have to check that the electronics at the top of the probe are not subject to water or water splashing to avoid damage. The various experiments conducted with different types of soil from dry to wet with this sensor.

One of the Real time example for smart plant watering system is explained here. Whenever plant needs water, the plant sends signal to the user.

Fig 7: Example prototype for Arduino with Soil moisture sensor

Water level Sensor:

Water level sensor is used to determine water level. From the water level sensor we can obtain directly water range in analog values. In built ADC in Arduino UNO converts analog value into digital value. With the help of innovative method, measure soil for 3 major states:

1. When the water is dry, the plant should be watered.
2. When soil obtains correct water level for plant.
3. When soil obtains more water than desired level, so that it will be wet.

Based on that data, the tabular below defines the following ranges of water in soil

S.NO	Range	Water level in Soil
1.	< 275	Too wet
2.	275-380	target range
3.	>380	dry enough

Tab1: Water level in Soil

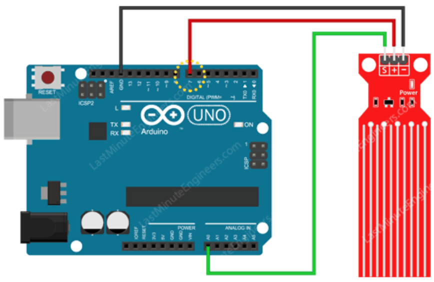

Fig 8: Interfacing Arduino with water level sensor

Soil PH sensor:

Soil pH is a measurement of the **acidity** or **alkalinity** of the soil. Soil ph sensor is both water proof and dust proof sensor, they can measure soil ph value from the range 3 to 9. A pH value is actually a measure the parameter of **hydrogen ion concentration**.

Fig 9: Soil PH sensor

Soil PH value differs from one form to another form, for example Rain has change its acidity conditions and some fertilizer's alters soil PH value. The important applications of these sensors are smart agriculture, industry, environmental monitoring, sewage disposal, and animal monitoring. Different pH values are shown in the figure.

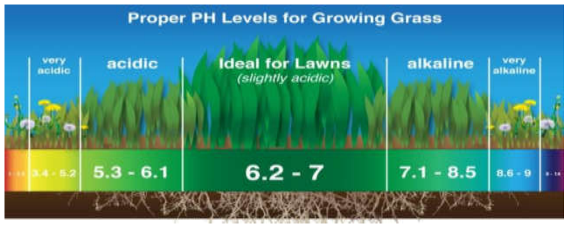

Fig 10 : Various levels of Soil PH sensor

The soil sensor is connected to RS485 or MAX485 module. It has 4 colour wires used for interfacing with Microcontroller**.** Figure shows how to interface with Arduino UNO. Arduino IDE is integrated development environment used for IoT applications efficiently with the help of library functions. Arduino consists of software code with its library function for developing code in arduino IDE. An Arduino platform is referred as sketch. It consists of two parts. They are setup() and loop().

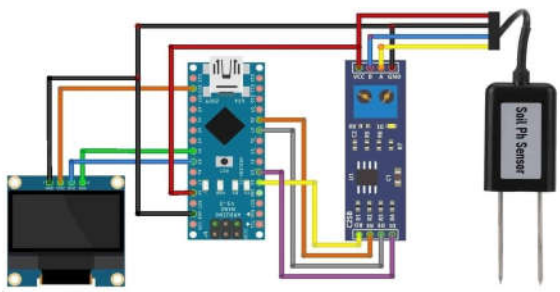

Fig :11 Interfacing Arduino with soil ph sensor

RESULTS AND DISCUSSIONS

Output of IoT Sensors in THINGSPEAK cloud

Temperature:

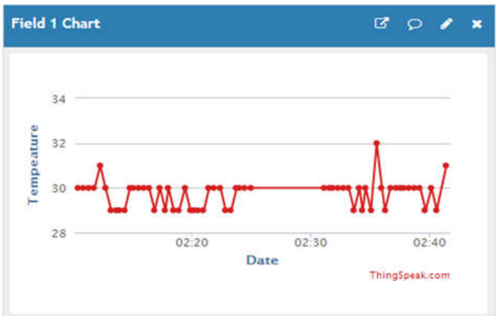

Fig 12: DHT22 sensor Output in THINGSPEAK cloud

Humidity:

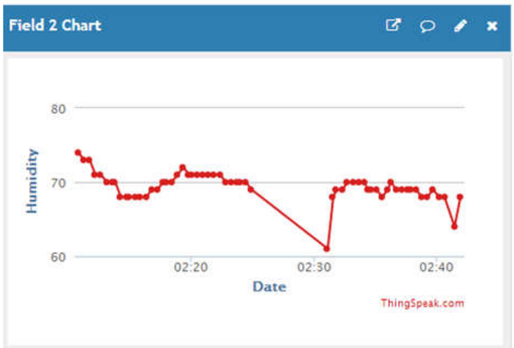

Fig 13: DHT22 sensor Output in THINGSPEAK cloud

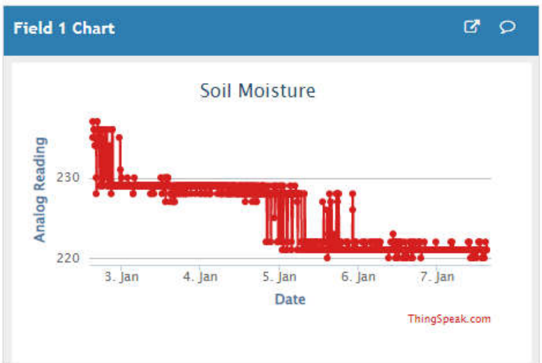

Fig 14: Soil moisture sensor Output in THINGSPEAK cloud

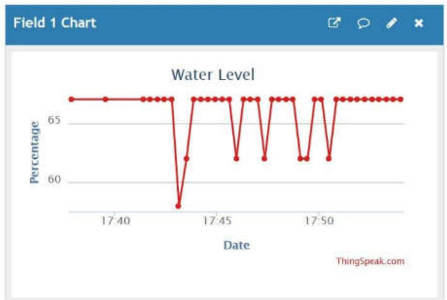

Fig 15: Water level sensor Output in THINGSPEAK cloud

CONCLUSION

With this help of advancements in technologies, can improve crops yield in agriculture. IoT is the novel approach to increase potential of agriculture as well as reduce human labor. IoT based smart farming system reflects in productivity, performance and efficiency. In this innovative farming paper we found the sensors parameter such as temperature and humidity, soil's moisture and ph value and water level in the soil. This can reduce existing problem occurs in agriculture because of unavoidable situation. In future work we propose some other parameters for getting better productivity and will focus on low cost, low power IoT based system. The proposed architecture helps to get low cost, high speed data acquisition system.

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