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Farm Field Monitoring Using IoT -A Survey Paper

Achyuth Simha[1], Arshad Nadeem[2], Manvith Ravishankar[3] and Navaneeth Raj[4] , Bhavani K[5]
[1,2,3,4]*Student, Dept. of Information Science and Engineering, Dayananda Sagar College of Engineering, Bangalore,Karnataka, India*
[5]*Assistant Professor, Dept. of Information Science and Engineering, Dayananda Sagar College of Engineering, Bangalore,Karnataka, India*

Abstract— India is said to be a land of agriculture. Engineering techniques in agriculture bring a lot of advantages to the farmer. Inorder to overcome future food scarcity due to overpopulation across the globe agricultural practices need to be transformed and this can be done using an IoT based farm field monitoring system.

This paper aims to provide the farmer with a IoT system with which the farmer can easily keep a track of the necessary requirements for the crop and provide the same to increase the crop yield and reduce the crop loss. The main aim is to provide the farmer with the factors that have an effect on the crop growth like soil moisture, humidity, temperature, sunlight etc and also provide with a small system that can handle all the above factors by keeping it at optimum levels to get a good crop yield.

INTRODUCTION

The Internet of Things is a new and upcoming way of implementing technology. It involves connecting a set of computers and devices and transferring data between each other. Abbreviated to IoT , this phenomenon has a variety of applications and its maximum potential is yet to be figured out. It gives control from human to human or human to machine and lets the user be involved to a great extent. Farming is one of the oldest professions in the world. In India, especially, it is one of the largest sources of employment ,income and revenue. Farming using IoT is a concept that can have great potential depending on how well it is implemented.

Farm fields can be monitored and controlled using IoT. It can help in research as well as to generate greater output of crops as well as better crops in terms of crop health. Using an app to monitor day to day progress of a plant's growth , we can find out how a plant grows based on conditions which we can vary at the palm of our hands. These conditions include temperature, amount of light, soil moisture content and humidity. Implementing this idea on a large scale will prove challenging at first but with mass production and reduced costs, we could be able to see more income and less workload for all parties involved.

LITERATURE SURVEY

[1] This research paper proposes the development of an integrated system to improve and optimise productivity ie; production per hectare through real time monitoring and automation of agriculture. This integration reduces the delay between collection and transformation of data from sensors to servers which they can make a decision regarding the conversion of actuator state. However, the major drawback of this proposal lies in the financial non feasibility in implementation of integrated systems. Even though they have been implemented for scientific research, handling of such systems expects a lot of knowledge from the farmers regarding sensor data implementation.

[2] This paper focuses on the applications of Information Communication Technology(ICT) in the field of food technology vis-a-vis commercial farming. It channelises the efforts to obtain the best source of dietary needs through microalgae(Spirulina) culture and production given the fact that Spirulina is an important natural protein source. Algae horticulture employs device to gateway model for machine to machine communication (M2M). It results in a significant decrease in production cost and increases the yield of harvested crop. This paper however faces a serious challenge in gaining acceptance for algae as a dietary source. Sensors required have to be of a very high quality since algae cultivation offers a very little margin for error in optimising temperature and humidity thus posing a question of scalability.

[3] Agricultural land is decreasing due to industrialisation and residential buildings being built on cultivable land. With the population set to reach 9.7 bn by 2050 , this paper proposes an IoT based model of "Precision Farming". It involves cultivation inside a fully covered steel structure called a Poly House . The cultivation is carried out in a completely controlled manner and results in considerable decrease of crop failure. This model takes into consideration additional parameters such as soil pH, motion detection and air temperature. Given the heterogeneous nature of soil in India and varying temperature during similar seasons across geography this model finds very little scope in large scale implementation. In addition to these sectorial issues the capital venture costs are also projected to be high, stacking more odds against this model.

[4]The main feature of this paper is monitoring temperature and humidity in agriculture using sensors CC3200 single chip and a CC3200 combined with a camera module to capture and transfer the images through MMS using Wi-Fi to a farmer's mobile. The CC3200 is portable, low power battery operated , secure and provides fast connection. The humidity sensor HDC1010 monitors real time farm field air humidity. The camera module shares the images through GPRS.The main drawback of this model is that all the sensors used are low cost and the semi conducting material has low capacity to endure harsh conditions of an agricultural field. This decreases the durability of the setup and will need frequent replacements.

[5] This research paper employs a smart GPS based remote controlled robot to perform operations such as soil moisture sensing , weeding and spraying insecticides. The robot is equipped with intelligent accurate real time data and warehouse management. It is performed by integrating sensors with raspberry pi and ZeeBee modules. The paper fails to focus on irrigation problems and manufacturing the smart robot in a large scale is expected to cost high.

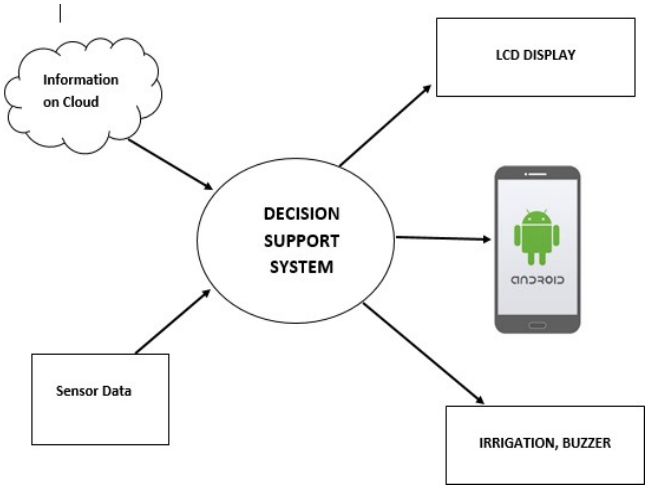
[6] This paper addresses the long standing issue of delay in relay of processed data over cloud platforms across long distances. It proposes a model which uses Long Range (LoRa) communication mechanism to send data from transmitter node to receiver node. The main disadvantage of this is that cellular devices have very poor battery life and there are several gaps in network coverage.

[7]In this paper wireless transmission in JSON format is used to maintain server database. The parameters are humidity, soil moisture and temperature. The farmers receive notifications periodically. This system is more suited in areas where there is water scarcity. It is verified to be 92% more efficient than the conventional system. Using PHP script automation of irrigation data is stored in MySQL database. Total power consumption for the automated irrigation system is 2Ah per day.

[8] The model proposed in this paper uses various sensors in the field and the data is connected to micro controller through RS323.The data received is verified and compared with the respective threshold values. If the data exceeds the value buzzer is switched on and the LED starts to blink. Farmer can view a detailed description of the data in the webpage. There is also an automatic mode where the controller gets switched on and off automatically.In manual mode the user has to press on and off buttons in the android application developed using GSM.

[9] In this paper three functions i.e. acquisition, collection and analysis of data such as temperature and soil moisture are performed by wireless sensors.Here,three main components constitute the architecture : a cloud platform ,WSAN component and a user application component. It contains three different types of nodes such as sensor node, a sink node and an actuator node. The benefits of a smart irrigation system are reduced water wastage and environmental aspects.

SYSTEM DESIGN

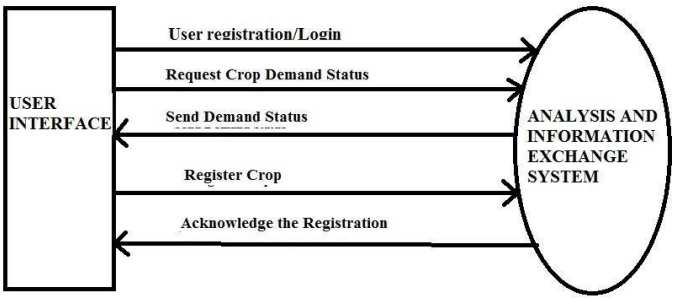


The picture above shows the system architecture. The arrows in the diagram shows the connectivity between the components. The information which is on the cloud and sensor data acts as input to the system and the output required is fetched through LCD display or any android application and any activities like buzzer sound, irrigation etc. The DSS includes a controller which is a circuit based and is programmed to action as per sensor data.

THE PICTURE ABOVE SHOWS THE DATA FLOW DIAGRAM FOR THE PRODUCTION SUPPORT

EXISTING SYSTEM

Farmers in India follow a traditional method of farming where they grow crops based on knowledge gained by their previous generations and fathers. As they grow the same crop throughout the year crop yield and market price mere luck to the farmers. Most of the farmers lack education and



hence they end up doing a lot of labour work or manual work. For instance, they check the water level in tank manually and

then switch on the water pump and once they find the overflow of water from tank they switch off the tank. Intruder detection is done manually to keep their crops on check which is done manually.

PROBLEM STATEMENT

As most of the work is done manually farmers find it tough in finding more number of labourers and paying them their debts. The fluctuation in the system leads to financial insecurity to the farmers.

PROPOSED SYSTEM

With the advent in use of technologies, we make use of existing techniques to monitor the farm field. The sensors, controllers, GSM technology reduces the labour work for farmers. The data gained through sensors which is stored in cloud will be shared in mobile applications and farmers can utilise the data and based on the data crop's yield can be monitored. To keep a check on intruders a detector is installed which gives a beep when intrusion is detected.

CONCLUSIONS

The aim of this paper is to reduce the farmer's work and enhancing the crop yield by providing with sophisticated method to keep track of the factors that have an effect on the crop growth. The farmer need not be at the site to monitor all the activities which saves a lot of time and energy.

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