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Smart Farm Management using Raspberry-Pi and Internet of Things (IoT)

Ranjitha K[1]

P.G. Student, Department of Computer Networks and Engineering, SJB Institute of Technology, Bengaluru, Karnataka, India[1]

ABSTRACT: Sensor networks and their usage in Farm Monitoring is the most useful innovation for the people of India. As agriculture is the main source of livelihood, there is a need to increase the productivity with decrease in cost, time and human effort. The Information collected from agricultural fields are stored in the database and can be monitored using Internet of things (IoT). In the circumstances of Farm Management System for agriculture with security, the challenging issue is to integrate Raspberry pi with IoT and sensors to increase the efficiency of the agricultural work. As outcome of challenge, temperature, humidity, soil moisture content and fire if occurred in the field are monitored. In the current agriculture system the specification such as temperature, moisture humidity and fire are detected manually .The disadvantage of this method is increase in labour cost, time and also monitoring cannot be done continuously. Manual Labour is compulsory in the farm. In this paper irrigation process is carried out automatically using different sensors. Soil moisture sensor is used to detect the moisture content in soil, if soil moisture is less in the field then water pump is switched on automatically with the help of relay. Temperature and Humidity is measured by the DHT11 Module. Master-Slave communication protocol is used in the architecture in which one device (known as master) controls single or multiple devices (known as slaves). Smart farm monitoring using IoT collects the data from different types of sensors which act as slaves and then send it to main server using Raspberry pi which is a master and these parameters can be monitored using LCD display.

KEYWORDS: Sensor Networks; Raspberry pi; IoT, Agriculture

I. INTRODUCTION

Farming needs technical solution to increase the productivity, while the environment impression reduces by decreased application of agro-chemicals and increased usage of nature favorable management practices. An advantage of this is the decrease of production cost. The rapid technological approach and evolution in recent years extremely enables the achievement of these goals by eliminating many hurdles for enactment, including reservations by agriculturalist themselves. Technical Manufacturers, farmers, and researchers, all together, are combining their energy to find systematic elucidation, advancement in productivity and decreased cost. The aim is to combine latest research and development concerning novel sensors and their usage in Farming. Sensors in farming are based on requirements of the farmers according to agricultural actions that need to be addressed. Sensor networks address a wide range of farming task, including, but not limited to, recent developments in certain areas. The different forms of agriculture like irrigation, green house, organic farming, park, smart farming should adapt new technologies to overcome the problems which are observed from old methods. The proposed system consist of wireless sensor network technology which is fast growing in every field including agriculture. This system is technically efficient and can be used by every individual. In the plant field different sensors are deployed at appropriate locations to measure the actual conditions of the plants, so that the farmer can easily check the environmental conditions instantaneously with the help of web app. Despite the fact that our nation claims to have created regarding science and innovation, unpredictable power supply or finish breakdown for a considerable length of time together as daily routine. Nearly Sunlight based power is in effect progressively used worldwide as a sustainable wellspring of vitality. India has tremendous undiscovered solar offmatrix openings.

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II. RELATED WORK

To build an agriculture system, sensor nodes and gateway based wireless sensor networks are deployed in the agricultural field. Sensor node is a microcontroller based Arduino including wireless module and connected sensors [1]. Data acquisition, ecological monitoring, and precision farming can be done by usage of multilevel sensor network as described in the paper WSN in agriculture [2]. While considering different factors for agriculture like electricity andsunlight water is one of the major requirement, so conserving existing water resources and managing it for agriculture is very important. Conservation is possible by using cloud based analysis and monitoring farm using IoT [3]. Farming depends on different aspects like weather, yield and so on. In spite of varying weather condition agriculture can give better production by using big data analytics and distribution channel [4]. Robotization is one of the developing advancements developing in every one of the fields, all things considered in this paper mechanized control highlights with most recent electronic innovation is proposed. Microcontroller which turns the directing engine ON and OFF on recognizing the moistness substance of the earth will enable the GSM to telephone line to gauge the temperature and mugginess through applications [5]. To make agriculture more advanced Zigbee network, protocol stack, WSN, and Zigbee applications are utilized with sensors in crop field area [6]. There are many methods adopted for smart agriculture and analysed how the automated system is used to make effective utilization of water resources for agriculture using GSM [7]. Automatic irrigation system is a good thought but the problem is over or under watering hence the need for regular irrigation system is proposed in the IoT based smart irrigation system [8].

III. PROPOSED SYSTEM

This paper work aims to estimate the quality and accommodate the mercantile soil sensors to create an appropriated Farm Management System. The system consists of two subsystems called the master and slave, Raspberry-pi is the master node and wireless sensor units act as slave node. They are bundled with an experiment sensor to detect the wetness in the soil. These sensors are then integrated with the Raspberry pi. The analog signals received from the sensors are sent to the ADC (analog to digital converter). Then the converted data is sent to the raspberry pi. IOT embedded web based application is developed for monitoring and controlling the devices remotely any time and from anywhere. The information collected from the sensors are stored in the database or the servers. Proposed framework assist client with enhancing standard and size of their homestead yield by watching encompassing temperature, dampness, soil dampness content, and furthermore recognizes fire if happened in the ranch by any way. Every task mentioned is performed without human interaction. By using wireless sensor networks and IoT system can be efficient.Farm Monitoring System is mainly made of three parts: sensor networks, raspberry pi and IoT Interface. Fig. 1. Illustrates the system architecture that describe how the farm monitoring system for agriculture work.

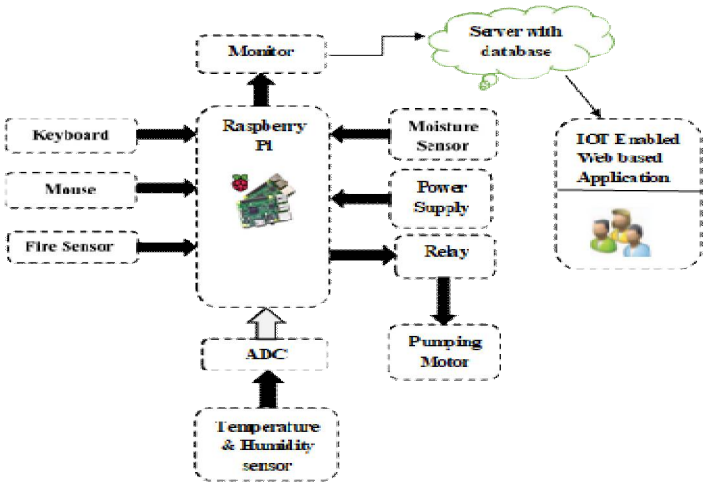

Fig. 1. Architecture.

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IV. EXPERIMENTAL RESULTS

Farm monitoring system for farm application consists of wireless sensing devices that are placed in agricultural areas to gather data such as moisture, temperature, humidity and fire. The gathered information are communicated to Raspberry pi via Wi-Fi using Master Slave communication model. Raspberry pi, which acts as a master node, controls its devices or process known as slaves. This process consists of functions like storing data, collecting data from slaves, computing and integration of data.The raspberry pi can establish a Wi-Fi network and run the communication model that is used to collect data from sensors to raspberry pi and from pi to the server. The user alliance that is the web application based on IoT platform allows users to maintain agricultural data in actual time.The primary preferred standpoint of the proposed framework is that the cost of the setup progressively is low as raspberry-pi and other computerized sensors with web of things are utilized. The framework can without much of a stretch conclusion the encompassing condition. The application of the proposed system come in the areas of agricultural fields, agricultural research stations, cultivation areas and nursery plants. Fig. 2. Represents the architectural representation of the farm monitoring system. The system setup shows how the sensors can be deployed in the agricultural field by taking a planter for example. The setup can be useful in any kind of the agriculture field and can get better yield.

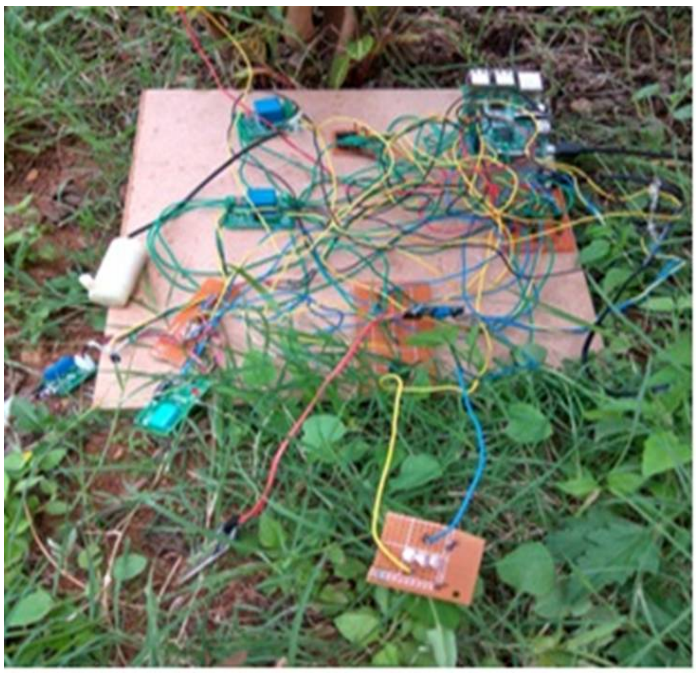

Fig. 2. Farm Management System using IoT.

V. CONCLUSION

This smart farm monitoring system is a very important system as it supports farmer by providing automated irrigation system with automatic sensing techniques. Farmer can get the information about the agricultural field like humidity, temperature and moisture content of the sand by the web application developed. Practical applications of sensors manufacture tools to reach the goal of the farm monitoring system. The rapid technological approach and evolution in recent years extremely enables the achievement of these goals by eliminating many hurdles for the enactment, including reservations by agriculturist themselves.

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