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WSN Based Green House Monitoring System

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Abstract: ***As we all know that agriculture play an important role for creating agricultural society or country . From the past century agriculture has been the primary occupation of man but due to natural factor of climatic condition farmers are facing lots of problems which may lead to tackle serious problems in their life so this paper presents the monitoring and control system for greenhouse through the Wireless Sensor Network (WSN).This system will help to control the various environmental conditions such as soil moisture, temperature and humidity extra this system will provide the best climatic condition for the growth of the plant.***
Keywords: Green house, monitoring, WSN, review

I. LITERATURE REVIEW

D.D.Chaudhary (2011) et al. proposed the technological development in Wireless Sensor Networks made it possible to use in monitoring and control of greenhouse parameter in precision agriculture. In last decades there have been tremendous advancements in technology for agriculture and growth of final yield. Due to uneven natural distribution of rain water it is very crucial for farmers to monitor and control the equal distribution of water to all crops in the whole farm or as per the requirement of the crop. There is no ideal irrigation method available which may be suitable for all weather conditions, soil structure and variety of crops cultures. Green house technology may be the best solution for this solution. All the parameters of greenhouse require a detailed analysis in order to choose the correct method. It is observed that farmers have to bear huge financial loss because of wrong prediction of weather and incorrect irrigation method to crops. In this contest with the evolution in wireless sensor technologies and miniaturized sensor devices, it is possible to uses them for automatic environment monitoring and controlling the parameters of greenhouse, for Precision Agriculture (PA) application. In this paper, we have proposed and analyse the use of Programmable System on Chip Technology (PSoC) as a part of Wireless Sensor Networks (WSN) to monitor and control various parameter of green house.

Marwa Mekki (2015) et al. presented Wireless sensor networks (WSN) could be used to monitor and control many parameters of environment such as temperature, humidity, and radiation leakage. In greenhouse the weather and soil should be independent of the natural agents. To achieve this condition a wireless sensor nodes could be deployed and communicate with a central base station to measure and transmit the sensed required environment factors. In this paper a WSN was implemented by deployed wireless sensor nodes in a greenhouse with temperature, humidity, moisture light, and CO2 sensors. The proposed model was built and tested, and the result shows an excellent improvement in the sensed parameters. To control the environmental factors, the used microcontroller programmed to control the parameters according to preset values, or manually through a user interface panel.

Choppara Manendra Babu (2016) et al. described the modern agriculture techniques plays a major role in rural areas where people also looking for an automated system which can monitor the crop status and can proceed with the required action. The system proposed in this paper describes about an implemented report of a remote monitoring and controlling station for Agriculture fields by using a Wireless communication established between the crop lands and monitoring station. In this paper, the system used 802.15 ZigBee as wireless communication carrier. The crop can be monitored in various aspects like environmental temperature, relative humidity in air, soil moisture in the land and the light condition on the plants, where the light will be more important concern for some kind crops. All the sensors can be interfaced to the monitoring station through wireless medium to exchange the data about the sensor readings. And the controlling task can be fulfilled in this paper by controlling the agriculture induction motors as well LED lighting strip for night time working if required.

Hugo Sampaio (2017) et al. proposed a greenhouse monitoring system using hierarchical wireless sensor network (WSN) is presented in this paper. The main parameters required to monitor and control a greenhouse are air humidity and temperature, ground moisture and environment lightness. For the data gathering of these parameters, a hierarchical WSN is presented in this work. In this configuration, the sensors, aggregated with all gathering functionalities, processing and wireless data transmission capabilities, denoted as sensor nodes, are in the lowest level. The router nodes are provided in the middle level to transmit data from sensor nodes to a controller named coordinator node.

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The coordinator node, in the highest level, is used to communicate with a central base, where all data received are analyzed. The details of a simple implementation of this monitoring system are presented. Many tests are carried out and the results showed that developed monitoring system is working well.

Ozlem Alpay (2017) et al. described smart systems are systems used by new technologies that facilitate human life. Smart greenhouses have an important place in smart agriculture application. In this study, the amount of energy and water consumed for controlling the climate parameters of a greenhouse has been predicted by using data from node packets placed in the greenhouse. Node packs are placed in star topology using wireless sensor network. Climate parameters are greenhouse internal temperature, relative humidity and soil moisture. For this purpose, temperature and humidity sensors have been used. Output data has been obtained by applying fuzzy logic method to received input data from sensors. The user remotely has controlled and monitored the greenhouse via the developed Android-based interface.

Roselle B. Anire (2017) et al. presented the development of wireless sensor network applied in greenhouse monitoring is presented. The greenhouse monitoring system was developed by integrating environmental sensor such as temperature, humidity and soil moisture in a microcomputer Linux board which is the Raspberry Pi 3. Sensor calibration is also presented to ensure the data accuracy for a controlled environment. Utilizing the WiFi capability of the Raspberry Pi 3 established the wireless network between the nodes and the data aggregator. An environmental monitoring platform is created for the deployment of the sensor nodes and evaluation of the Greenhouse Monitoring System in an actual controlled chamber.

M. Lavanaya (2018) et al. proposed soil nutrients play a vital role in the getting good yield for crops and to get quality product. In India till now the crops are grown with the help of traditional methods. As we all aware due to the increase in population requires an implementation of some new methods, which considerably give good yield of crops with less expense. The objective of this work is to propose such method for soil nutrients monitoring and management with automated irrigation using pH sensor which in turn identify pH value of soil using Arduino and Zigbee with IoT and Wireless Sensor Network. The proposed automated system designed with an objective of seed selection using pH value which can be considered as endeavour. water conservation, maintaining necessary temperature inside the greenhouse, which helps plants to get necessary warmth, nor too cold or hot and choosing necessary fertilizer for plants through which over feed or under feed of fertilizers can be avoided.

Mr. Dattatraya Shinde (2018) et al. presented greenhouse parameters monitoring and controlling plays a very important role for quality production of crops. The purpose of this system is to design a simple Raspberry Pi 3 based circuit to continuously watch & read the values of Soil moisture, Humidity, Temperature and light of the environment that are constantly changed and controlled in order to get maximum development of plant. In this paper we present a system to monitor soil quality with the help of wireless sensor nodes. The data is acquired from each sensor used in this system. In past Attention was needed for a farmer to protect his field from different disasters caused either by human or by nature. Efforts of human are not sufficient and also farmer has to pay for manpower. Here we are using few sensors to monitor the field are Temperature sensor, Humidity Sensor, Soil Moisture sensor to check whether the field is dry or wet and a LDR to verify the lighting at that place. This system maintains the soil quality which is required to grow the particular crop properly. By using this project the farmer can Predict &Analyze the greenhouse parameters. Tomatoes & Brinjals these two crops are selected for the prediction & Analysis. Two samples of crops are taken and the system had been verified for these crops in greenhouse environment. Finally total power consumption and total expenditures consumed per year is estimated for controlling devices. Because of this the farmers will be able to predict the total amount for controlling action of crops for next year. By using this system it is seen that with controlling action the product quality & quantity is increased than crops grows without controlling action.

Puspitasari (2018) et al. proposed Indonesian Statistic Agency in 2010, Indonesian population reaches 237.641.326 million people, and increase to 261.890.900 million people in 2017. Because of the large population number, it is necessary to increase the number of food. In this case, Greenhouse, as a modern technology is used to support the demand. Greenhouse is a modern way (or tools) in a farming technique. Farmers could use the greenhouse with any horticultural plants without considering the season. Wireless sensor network can used to monitor and control the greenhouse's temperature, air humidity as well as soil moisture. Multi-hop routing technique is designed to allow communication among nodes and communication between node and sink node. The BER (Bit Error Rate) value gained is 0.2 or 20% from 1000 times of data transfer with 200 times of error. In this research, NRF24L01 was used as the transmitter and receiver device in this research. The specification is 2.5 meter for maximum range, using a multi-hop routing for the communication, and the output power is 0 dBm. This is intended to minimize the chance of data transfer failures.

Mimi Suhana Abd Aziz (2019) et al. described greenhouses in agriculture have their own pace of revolution by sensors, actuators, monitoring and control systems.

As many greenhouses nowadays have standalone monitoring applications, this project proposed an integrated real time monitoring application framework for a smart greenhouse in order to create an autonomous, self-regulating system that can be remotely controlled by the user through the internet. The solution for this integration consists of sub nodes for Green Energy House, Green Garden Management with the humidity parameter, and Aquaponic Management. The Aquaponic Management comprises of hydroponics management for ambient temperature and humidity, turbidity and electric conductivity. These systems were also integrated with fishpond management that is capable to monitor the pH value, water turbidity and water temperature. All sub nodes will send and receive signals based on data access networks with cloud computing and the development of webbased interfacing for control and monitoring. The design methodology using the Arduino as the controller device and the data communication using the Long-Range Radio (LoRa) Network technology. Beyond this framework development, investigation in depth has been done

II. CONCLUSION

Setting up a greenhouse that uses the WSN monitoring and controlling system will minimize human error as well as labor cost and maximizing the production. India having the main occupation as agriculture and also the main aspect for its economy, this project will strengthen the farmers and the country financially. It is so affordable and convenient that anyone can use this system to grow the plants they want in any environmental condition. It also being eco-friendly has no damage to the environment.

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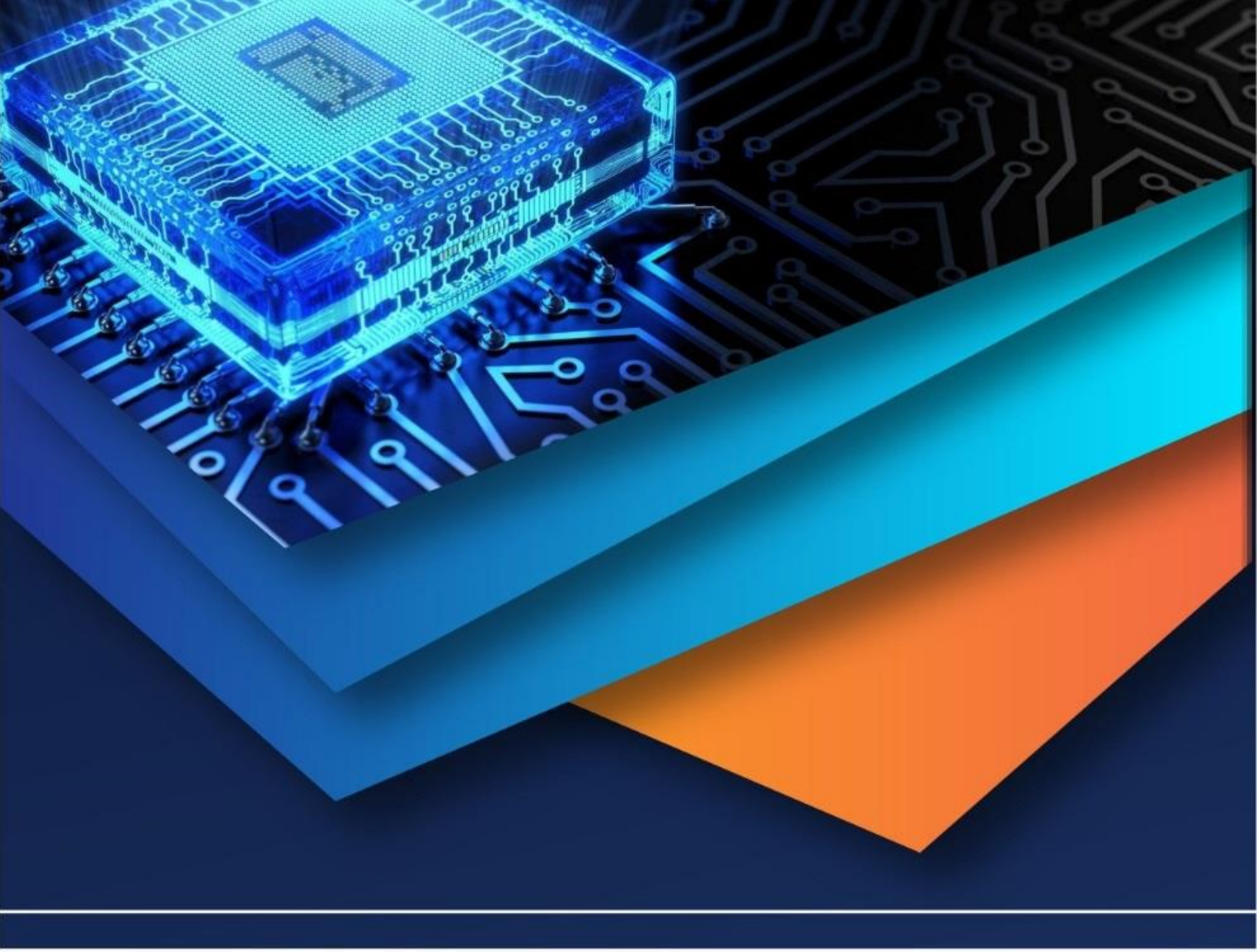

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