SOUTH ASIAN JOURNAL OF ENGINEERING AND TECHNOLOGY

Full Length Article

Smart Irrigation and Soil Monitoring System Using Iot

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ABSTRACT: Agriculture has been the most important practice from very beginning of the human civilization. Traditional methods that are used for irrigation, such as overhead sprinkler and flood type, is not that much efficient. They results in a lot of wastage of water and can also promote disease such as fungus formation due to over moisture in the soil. Automated irrigation system is essential for conservation of the water and indirectly viability of the farm since it is an important commodity.In upcoming years this demand is likely to increase because of increasing population. To meet this demand we must adopt new techniques which will conserve need of water for irrigation process. In automation system water availability to crop is monitored through sensors and as per need watering is done through the controlled irrigation. The idea is to focus on parameters such as temperature and soil moisture. This is a Integrated and smart irrigation system using IOT based on application controlled monitoring system. The main objective of this project is to monitor the water supply and monitor the plants through a SMS

1 Introduction

Irrigation is a scientific process of artificially supplying water to the land or soil that is being cultivated. Traditionally in dry regions having no or little rainfall water had to be supplied to the fields either through canals or hand pumps, tube wells. Conventional irrigation methods had severe problems such as increase in workload of farm labor and often it lead to problem such as over-irrigation or under-irrigation, and leaching of soil.

To develop android based automatic Farming system capable of controlling many electrical appliances in an irrigation or field using android platform with a mobile handset, where data transmission is carried wirelessly. That's why design Wireless transmission media using Wi-Fi transceivers and its interfacing peripherals for wireless data communication between Mobile Handset and appliances is our need. Hence to create a database of user interface in order to characterize the electric signals to atomize farming system. And to develop the GUI interface to monitor and change the current status of field on any android smart phones. Another important point is not only monitor the temperature and maintain moisture level in the field for proper growth of plants but also save water, Energy and man power in the agriculture Sector. So we design such a system that will be efficient and effort reducing of the farmer.

Hence we design the System which is operated manually as well as automatically from remote locations by using Android.

2.Related Works

2.1 Automated Irrigation System In Agriculture Using Wireless Sensor Technology

Agriculture plays the major role in economics and survival of people in India. Nowadays Indian agriculture faces a two major problem. They are as follows we know government has promoted a free supply of electricity for farmers to run their motors and pumps for irrigation purpose. But it is found that the farmers misusing the electricity to run their home appliances such as radio, TV, fans, etc. This misuse of electricity has brought a considerable problem for government to supply free electricity. The main aim of this project is to design low cost Automated Irrigation System using a Wireless Sensor Network and GPRS Module. The Purpose of this project is to provide embedded based system for irrigation to reduce the manual monitoring of the field and get the information in the form of GPRS. This proposed system recognizes whether the free electricity has been used other than electric motors for pumping water and if so electricity is being misused, it shuts the total supply for the farmers through a tripping circuit. By using wireless networks we can intimate the electricity board about these mal practices. The development of this project at experimental scale within rural areas is presented and the implementation was to demonstrate that the automatic irrigation can be used to reduce water use.

2.2 Wireless Sensor Based Crop Monitoring System for Agriculture Using Wi-Fi Network Dissertation

The advanced development in wireless sensor networks can be used in monitoring various parameters in agriculture. Due to uneven natural distribution of rain water it is very difficult for farmers to monitor and control the distribution of water to agriculture field in the whole farm or as per the requirement of the crop. There is no ideal irrigation method for all weather conditions, soil structure and variety of crops cultures. Farmers suffer large financial losses because of wrong prediction of weather and incorrect irrigation methods. In this context, with the evolution of miniaturized sensor devices coupled with wireless technologies, it is possible remotely monitor parameters such as moisture, temperature and humidity. It develop and implement a wireless sensor network connected to a central node using Wi-Fi, which in turn is connected to a Central Monitoring Station (CMS) through General Packet Radio Service (GPRS) or Global System for Mobile (GSM) technologies. The system also obtains Global Positioning System (GPS) parameters related to the field and sends them to a central monitoring station. The sensor motes have several external sensors namely leaf wetness, soil moisture, soil pH, atmospheric pressure sensors attached to it. Based on the value of soil moisture sensor the mote triggers the water sprinkler during the period of water scarcity. Once the field is sprinkled with adequate water, the water sprinkler is switched off. Hereby water can be conserved. Also the value of soil pH sensor is sent to the base station and in turn base station intimates the farmer about the soil pH via SMS using GSM modem This system is expected to help farmers in evaluating soil conditions and act accordingly.

2.3 Implementation of Wireless Sensor Network for Automatic Irrigation by Using GPRS

An automated irrigation system was developed to optimize water use for agricultural crops. The system has a distributed wireless network of various parameters like soil-moisture, temperature sensors, humidity sensor, light etc. The total system architecture includes a set of sensor nodes, a base station, and an internet data centre. With an ATmegh32 microprocessor and embedded operating system, screen display, system configuration and GPRS based remote data forwarding. Through a Client/Server mode the management software for remote data centre achieves real-time data distribution and time-series analysis. Farmers go through large financial losses because of wrong prediction of weather and incorrect irrigation methods. In this paper, with the evolution of sensor devices coupled with wireless technologies, it is possible remotely monitor parameters such as moisture, temperature and humidity.

2.4 Application of Wireless Sensor Networks for Greenhouse Parameter Control in Precision Agriculture

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.

2.5 Design and Implementation of Real Time Irrigation System Using A Wireless Sensor Network

An automated irrigation system was developed to optimize water use for agricultural crops. The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants. In addition, a gateway unit handles sensor information, triggers actuators, and transmits data to a web application. An algorithm was developed with threshold values of temperature and soil moisture that was programmed into a microcontroller-based gateway to control water quantity. The system was powered by photovoltaic panels and had a duplex communication link based on a cellular-Internet interface that allowed for data inspection and irrigation scheduling to be programmed through a web page. The automated system was tested in a sage crop field for 136 days and water savings of up to 90% compared with traditional irrigation practices of the agricultural zone were achieved. Three replicas of the automated system have been used successfully in other places for 18 months. Because of its energy/autonomy and low cost, the system has the potential to be useful in water limited geographically isolated areas.

2.6 A Hybrid Wireless Networking Infrastructure for Greenhouse Management Using Arm

The technological development in Wireless Sensor Networks made it possible to use in monitoring and control of greenhouse parameter in precision agriculture. 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. All the parameters of greenhouse require a detailed analysis in order to choose the correct method. With the evolution in wireless sensor technologies and miniaturized sensor devices, it is possible to use them for automatic environment monitoring and controlling the parameters of greenhouse, for Precision Agriculture (PA) application. In the Field bus concept, the data transfer is mainly controlled by a suitable wired communication system, now can be replaced with the hybrid system (wired and wireless) to extract the benefits of both and to automate the system performance and throughput. ZigBee protocols based on IEEE 802.15.4 – 2003 for wireless system are used. The atmospheric conditions are monitored and controlled online by using Ethernet IEEE 802.3. Partial Root Zone Drying Process can be implemented to save water at the maximum extent. Online interaction can be made with the farmers by the consultant to give them the knowledge about this technique and implement it effectively in their farms to extract more yield with advanced technology.

3.Methodology

Hydroponic systems will not compensate for poor growing conditions such as improper temperature, inadequate light, or pest problems. Hydroponically grown plants have the same general requirements for good growth as field-grown plants. The major difference is the method by which the plants are supported and the inorganic elements necessary for growth and development are supplied.

Plants grow well only within a limited temperature range. Temperatures that are too high or too low will result in abnormal development and reduced production. Warm-season vegetables and most flowers grow best between 60° and 75° or 80° F. Cool-season vegetables such as lettuce and spinach should be grown between 50° and 70° F.

All vegetable plants and many flowers require large amounts of sunlight. Hydroponically grown vegetables like those grown in a garden, need at least 8 to 10 hours of direct sunlight each day to produce wells Artificial lighting is a poor substitute for sunshine, as most indoor lights do not provide enough intensity to produce a crop. Incandescent lamps supplemented with sunshine or special plant-growth lamps can be used to grow transplants but are not adequate to grow the crop to maturity. High intensity lamps such as high-pressure sodium lamps can provide more than 1,000 foot-candles of light. The serious hobbyist can use these lamps successfully in areas where sunlight is inadequate. The fixtures and lamps, however, are very expensive and thus not feasible for a commercial operation.

Adequate spacing between plants will ensure that each plant receives sufficient light in the greenhouse. Tomato plants pruned to a single stem should be allowed 4 square feet per plant. European seedless cucumbers should be allowed 7 to 9 square feet, and seeded cucumbers need about 7 square feet. Leaf lettuce plants should be spaced 7 to 9 inches apart within the row and 9 inches between rows. Most other vegetables and flowers should be grown at the same spacing as recommended for a garden.

Greenhouse vegetables, whether grown in soil or in a hydroponic system, will not do as well during the winter as in the summer. Shorter days and cloudy weather reduce the light intensity and thus limit production. Most vegetables will do better if grown from January to June or from July to December than if they are started in the fall and grown through the midwinter months.

Providing the plants with an adequate amount of water is not difficult in the water culture system, but it can be a problem with the aggregate culture method. During the hot summer months a large tomato plant may use one-half gallon of water per day. If the aggregate is not kept sufficiently moist, the plant roots will dry out and some will die. Even after the proper moisture level has been restored, the plants will recover slowly and production will be reduced.

Water quality can be a problem in hydroponic systems. Water with excessive alkalinity or salt content can result in a nutrient imbalance and poor plant growth. Softened water may contain harmful amounts of sodium. Water that tests high in total salts should not be used. Salt levels greater than 0.5 millions or 320 parts per million are likely to cause an imbalance of nutrients. The amateur chemist may be able to overcome this problem by custom mixing the nutrient solutions to compensate for the salts in the water.

Plants require oxygen for respiration to carry out their functions of water and nutrient uptake. In soil adequate oxygen is usually available, but plant roots growing in water will quickly exhaust the supply of dissolved oxygen and can be damaged or killed unless additional air is provided. A common method of supplying oxygen is to bubble air through the solution. It is not usually necessary to provide supplementary oxygen in aeroponic or continuous flow systems.

Green plants must absorb certain minerals through their roots to survive. In the garden these minerals are supplied by the soil and by the addition of fertilizers such as manure, compost, and fertilizer salts. The essential elements needed in large quantities are nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur. Micronutrients - iron, manganese, boron, zinc, copper, molybdenum, and chlorine are also needed but in very small amounts.

In a garden the plant roots are surrounded by soil that supports the growing plant. A hydroponically grown plant must be artificially supported, usually with string or stakes. Thus Humidity and temperature measurement are used to control the elements for the survival of plants.

They are necessary for the weather analysis and forecasts, especially for agriculture.

Humidity and temperature measurement are used to control the elements for the survival of plants. They are necessary for the weather analysis and forecasts, especially agriculture. Monitoring and controlling the humidity and temperature of the environment is a must to save the plants from drought and extremes temperature. A soil moisture sensor is used to detect the water level in the soil of the plants. It has two output configurations, namely, high and low.

The pump is inside the single available tank in the prototype. The pump is used in irrigation and also in the cooling system. For the irrigation part, and as soon as the pump has started, the water will go through the water hose and then through the water sprinklers. Depending on the plant humidity and the water level sensors, the pump will continue or stops working. For the cooling part, the water needed to spray among the straw and by the fan, it helps in cooling the plant. Ultimately, a motor is used for the automated shading. The motor drives the shutter to reduce or increase the amount of sunlight inside the greenhouse; depending on the measured needs of the plant.Also, anyone can check the state of the farm remotely. The user is able to access the measurement and see the values of the sensors. The receiver system allows manual control.

4.Conclusion

In the proposed system, we propose a smart Agriculture System that can analyze an environment and intervene to maintain its adequacy. The system has an easy-to-upgrade bank of inference rules to control the agricultural environment. The proposed system mainly looks at inputs, such as, humidity, and soil moisture. In addition, the system deals with desert-specific challenges, such as, dust, infertile sandy soil, constant wind, very low humidity, and the extreme variations in diurnal and seasonal temperatures. The system provides increased productivity, enhanced safety, instant interventions, and an advanced life style. The system is ubiquitous as it enables distant access. The proposed system is an addition to the current state-of-art Internet-of-things.

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