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IOT Based E-Crop: Smart Agriculture Monitoring System for Sri Lanka

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Abstract

In today's technological era in agriculture, automation is very much vital. Farmers in Sri Lanka use wireless sensor networks in monitoring many parameters in agriculture. Because of the erratic natural distribution of rainwater, agriculturalists find it difficult to control and monitor the distribution of water to agriculture fields throughout the farm or according to crop requirements. In Sri Lanka, there is no perfect irrigation system for every soil structure, weather condition and diversity of crops cultures. Sri Lankan Farmers face huge economic losses because of incorrect prediction of inappropriate irrigation systems and weather conditions. In this background, with the advancement of sensor devices organized with wireless technologies, it can remotely monitor parameters such as moisture, humidity and temperature. It creates and deploys a wireless sensor network that is connected to a central node the use of Wi-Fi, which in turn is associated to a Central Monitoring Station (CMS)through General Packet Radio Service (GPRS) or Global System for Mobile (GSM)technologies. According to the soil humidity sensor value the mote generates the water irrigator during the time-frame of water shortage. Once the field is sprinkled with satisfactory water, the water irrigator is switched off. Also, the pH sensor value of soil is directed to the base station and in turn base station intimates the planter about the soil pH via SMS using GSM modem This system is predictable to support planters in identifying soil situations and turn accordingly in Sri Lanka.

Keywords: CMS, Mobile Communication. Wi-Fi, Wireless Sensor Network, Base Station, Packet transferring

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I.Introduction

As the world is changing towards new technologies and applications it is a necessary aim to trend up in agriculture too in Sri Lanka. In the agricultural sector, several studies have been undertaken, and the majority of them propose using a wireless sensor network to aggregate data from multiple sensors deployed at various nodes and route it through the wireless protocol. The collected data provide information about the different environmental factors. Monitoring the environmental elements is not the complete solution to increase the harvest of crops. There are a number of other causes that decrease production. Therefore, automation must be working in agriculture to overcome these problems. To give answer for such issues, it is essential to develop a combined system that wills expand output in each stage. But, whole automation in farming is not reached due to numerous issues. Though it is practical in the investigation level, it is not given to the agriculturalists as a product to get profited from the resources. Therefore, this study deals about developing smart agriculture monitoring using mobile and ubiquitous computing in Sri Lanka.

II. Literature Review

An IOT based smart farming system was proposed for doing automation of various farming tasks. The smart irrigator, which moves on a mechanical bridge slider configuration, proposes automation. Through the GSM module, the smart irrigator gets signals from the smart farm sensing system. The discovered data is sent to a central database, where all crop information is processed and sent to the irrigator system for automatic action. [1]

Gives information about irrigation and has services like smart control and making a clever decision depending upon real-time data from fields. All of these processes will be managed remotely by any smart device, and interface sensors, as well as Wi-Fi, actuators, and other hardware devices, will be used to carry them out. The complete system was built utilizing infield sensors that collect data

from the farm and send it to the base station via GPS, where essential actions are calculated to control irrigation using the system's database. Scholar's measure soil-related parameters such as humidity and moisture as significant Scholars consider soil-related characteristics like humidity and moisture to be important determinants in crop growth. The system has two modes of operation: automatic and manual—factors for the growth of any crop. Auto mode and Manual mode are the two modes of the process of the system. In auto and manual mode, the system makes its own decisions and controls the installed devices, while the user can control the system's activities using an Android app or commands. [2]

Nikesh Gondchawar et al. [3] proposed work on IoT based smart agriculture. The goal of the study is to use automation and IoT technology to make agriculture smarter. A smart GPS-based remote-controlled robot will perform weeding, spraying, moisture detection, and other functions. It combines intelligent irrigation and control, intelligent decision-making based on precise real-time field data, and intelligent warehouse management. Thee warehouse's temperature, humidity, and theft detection are all monitored by it. All of the operations will be managed by a smart device, which will interface sensors, ZigBee modules, cameras, and actuators with a microcontroller and raspberry pi. Using the Raspberry Pi and wireless connection, all of the sensors and microcontrollers were successfully interfaced with three Nodes. For a smart irrigation system and a smart warehouse management system, this study uses a remote-controlled robot to address field activities, irrigation concerns, and storage challenges.

Climate data gathered and observed in the field, as well as meteorological data obtained through the internet, can be used to make a variety of positive crop productivity decisions.Crops will require a lot of water if the weather is hot, dry, sunny, and windy; yet, crops will require less water if the weather is cold, humid, cloudy, and there is little wind. Monitoring, management, planning, information

distribution, decision support, and control action are the six components of the previous study model. The study model described above analyzes data in order to provide improved decision support. [4]. Automated agriculture system proposed in [5] The motor is controlled by finding the moisture values from the moisture sensor and turning the lights in the green home ON or OFF depending on light sensors and actuators. The use of an automated system aids farmers in boosting crop yields.

III.Proposed Methodology

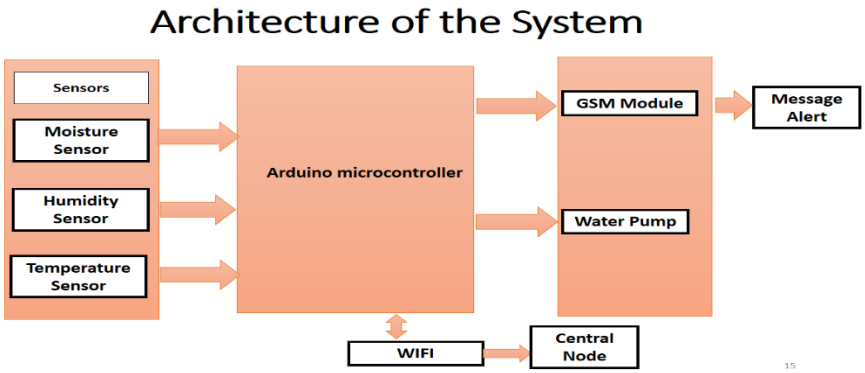

Figure 1

The following are the primary components of the proposed system. The system components could be identified as main hardware units, sensors, GSM Module, other hardware peripherals and software requirements of the system. In the proposed system, Sensors are used to collect data in the agricultural field during crop monitoring.

Temperature and humidity sensors, as well as soil moisture sensors, are among the sensors employed. The data acquired by the sensors is forwarded to the ATmega328 microcontroller on the Arduino. The information gathered can be shown on an LCD monitor. Webpage is constructed, and the data acquired by the sensors is periodically updated in it over Wi-FiThe microcontroller is connected to a GSM module, which sends a message to the farmer about the farm's state, and

the mote generates a water sprinkler depending on the value of the soil humidity sensor during periods of water scarcity. The water sprinkler is turned off once the field has been adequately watered.

Using Java code, this software application is written which has 2 main options pump on/off and status. This is done using GSM which can be used from any place framer is. Then he clicks on pump off it sends a message and informs to switch off the pump which will then intimate by sending a SMS that pump is switched off. Then farmer clicks on pump ON here 2 actions take place: If the field is wet and when the farmer switches on the pump, it will inform to switch on and intimates by sending a SMS that pump is ON but it senses that field is wet and switches the pump off and intimates pump off by sending SMS. If the field is wet and when the farmer clicks on switch ON pump, it will inform to switch ON pump and intimates by sending a SMS that pump is on. If the farmer wants to know the status of the field whether the soil is dry or wet and tank storage is low or high, the farmer can get to know these details by clicking on status. The farmer will receive a message as the tank is empty/full and water storage is high/low. There is another method controlling the field: If a farmer is not having an android mobile and farmer has no software application, a farmer can use normal mobile by sending normal text messages.

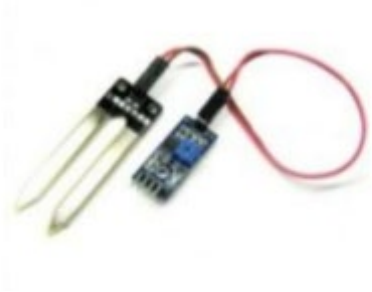

Figure 2: Soil Moisture Sensor

Table 1: Soil Condtion and output

Soil Condtion	OutPut
Dry	High/on
Wet	Low/Off

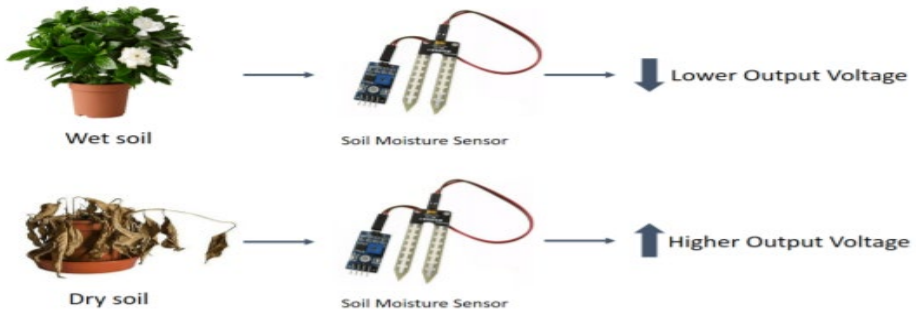

Figure 3: Soil Moisture Sensor Module

Temperature sensor

The temperature sensor's connectivity diagram is shown in the illustration.

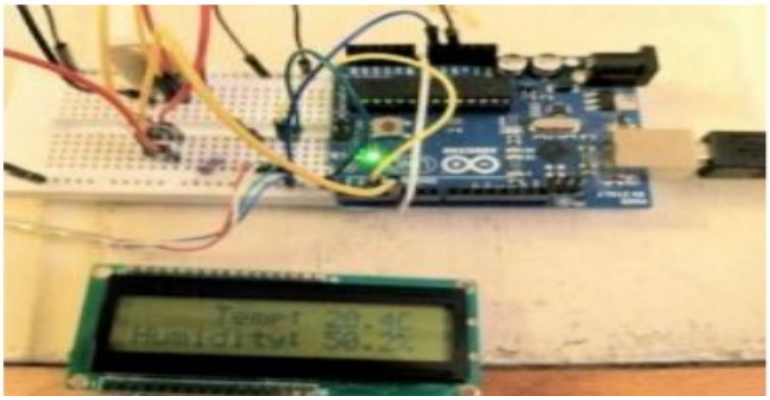

Figure 4:Temperature Sensor

The humidity and temperature are measured by the sensor, and the results are displayed on the LCD. To fulfill the high demand, it can measure the humidity and temperature of the surroundings.

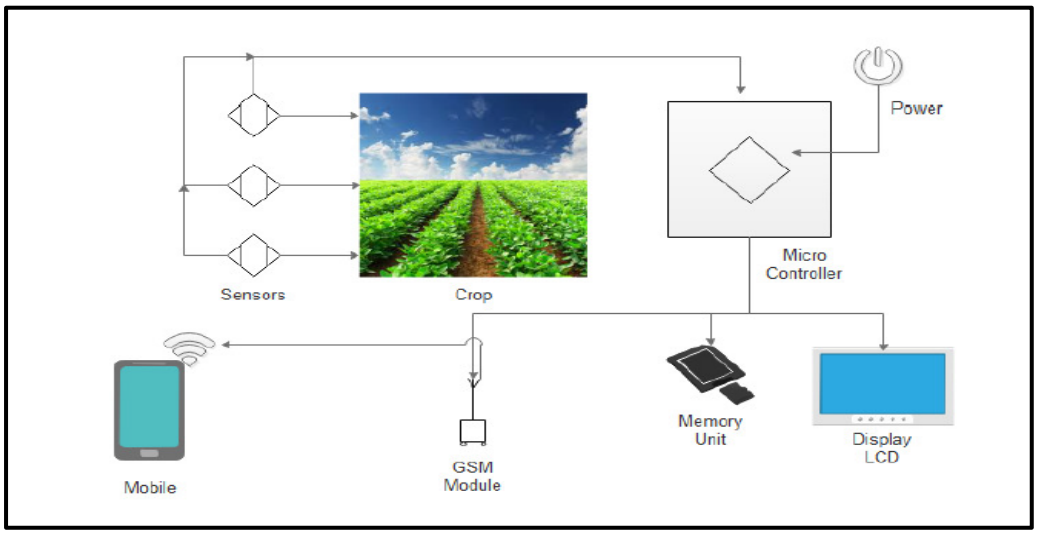

Figure 5: Model Diagram

IV.Discussion of the Findings

In Sri Lanka The Smart Agriculture Monitoring System is very feasible and cost-effective. The system is very economical in terms of power consumption and hardware component. The system helps in saving of electricity and water. It can be applied in large farming areas. With the assistance of GSM, By sending an SMS, the user can operate the motor from anywhere during the pandemic situation. The system helps in labor problem when there are no labors to work and eliminates man power. System can be switched into manual mode whenever required. It is very useful in all climatic conditions and all types of irrigation. It can be applied for variety of crops.

The Smart Agriculture Monitoring System was determined to be viable and cost-effective in terms of improving agricultural water supplies. This technique enables agriculture in areas where there is a scarcity of water, hence boosting sustainability. The developed IoT-based Smart Agriculture Monitoring System demonstrates how water consumption in agriculture can be reduce. The Smart

Agriculture Monitoring System can be customized to fit a variety of crop needs and requires little maintenance. The automated agriculture system's modular design allows it to be scaled up for greater farms. Other uses, such as temperature monitoring in compost manufacturing, are also simple to implement. The Internet controlled communication system provides a dominant decision-making device concept for adaptation to a number of cultivation scenarios. Furthermore, the Internet link lets the supervision through mobile telecommunication devices, such as a smartphone. Aside from the financial benefits of conserving water, the importance of preserving this natural resource justifies the usage of this type of IOT based crop monitoring system.

V. Conclusion and Recommendation

In Sri Lanka the Smart Agriculture Monitoring System can be very valuable for farmers since over as well as less water is not good for agriculture. Threshold values for climatic factors such as temperature, humidity, and wetness can be defined based on local environmental conditions. Based on the detected real-time data from the field and data from the climate repository, this smart System develops a water pump schedule. This technology can tell a farmer whether or no irrigation is necessary. It is necessary to have constant internet access. This problem can be solved by expanding the system to deliver suggestions to the farmer via SMS on his mobile phone via the GSM module.

VI. Future Work

This approach is utilized for large farm land to improve it further. The device can also be used to monitor soil nutrient levels and crop growth in each soil. Additionally, the system may be improved by including machine learning algorithms that can learn and comprehend the crop's needs, allowing the field to become a fully automated system.

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