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AUTOMATED IRRIGATION SYSTEM FOR AGRICULTURAL CROPS USING EMBEDDED LINUX SERVER

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Abstract: In a country like India, agriculture, the economy and plays an important role in the development of the country. Drip irrigation is today Water is nature's gift to mankind and it is unlimited and free, not permanently, because it must. Indian agriculture is dependent on the monsoon rains Have a reliable water. It is therefore possible to supply water to farms in the country; there is need for an irrigation system. Currently Era Farmers irrigate the land in a particular space in which the manual control mechanism by the use of irrigation in India this process is sometimes consumes more water or dry any crops due to delayed and sometimes reaches the water. Residence is required in individual regions as a way of conserving water, soil moisture sensors for irrigation controller that responds to a commercial irrigation industry a classic controller, or "friendly" program will be easier and a minimum number of keys or push-buttons to operate the controller when excluding zones where enough soil, irrigation water, which is needed to allow the regions to take place in the automatic irrigation system, Indicated moisture. It is important that measurement Irrigation scheduling is usually done to allow for the progress made in the register. In determining the moisture in the system, A key factor is the condition of the soil status of the soil is a critical factor which influencing the plant production. The basic objective of irrigation scheduling is to minimize water stress of the plant, that of Total Value of over irrigation and under irrigation.

1. INTRODUCTION

Agriculture is the mainstay of the Indian economy, the country's working population engaged in agriculture is nearly three quarters of the Half of GDP generated by agricultural production. Agricultural development greatly prime exponent, who depends on water Agricultural development in India is not very reliable or helpful in the rain. The Indian monsoon is known for its volatility. Nearly 85 percent Rainfall (June to September) and Southwest monsoon in South India in the fields provided in some areas to receive rain from the northeast monsoon (November to December).

Depending on the time of delivery as well as the shower space, which is uneven and often erratic the most common mismatching rain and crop water requirements. The rain was not enough to make even a single crop; Is arid and semi-arid part of the country. Moreover, the maximum coefficient of variation to the country's low-rainfall areas. As part of a country or any other recurring drought. Irrigation, therefore, is an integral part of the Indian agricultural interests.

2. NEED OF THE PROJECT

Food production technology continuous increasing demand for food requires rapid improvement. India, where the economy of such countries mainly based on agriculture and climate, we still cannot make full use of agricultural resources, these are isotropic. The main the reason is the lack of rain and a shortage of land and water reservoir. Continuous extraction of water from the earth and thus reducing the amount of water the land, which a lot of non-irrigated land in the region has been slow. Another very important reason for this is due to the use of unplanned water this is a substantial amount of water goes to waste. Using the manual technique of irrigation by farmers in the present era of India Farmers irrigate the land in which the control of a certain interval. This process is sometimes consuming more water or sometimes in water Pendant it was late due to dry crops.

Automatic irrigation system, which uses the motor and turn off the valves. These valves are easily automated using the control. Automating the farmer Nurseries irrigation farmers, regardless of the availability of the valves, which allow the perfect time to apply the right amount of water and off. In addition, the use of automation equipment fault of the farmers, the water saturated the soil to reduce runoff from irrigation can be avoided

Ensuring sufficient water and nutrients required by the crop during the day time, which may improve performance. A valuable tool for automatic irrigation greenhouse vegetable reduction planning and accurate soil moisture and irrigation is very special with a simple, accurate method. It helps Time to get the right levels of soil moisture, removal and storage of human error and increase their net profits.

In the existing system Farmers just due to erratic power motor on / off switch at odd hours, often need to travel to the fields. Existing aids auto start more like a farmer, especially when the farmer, unreliable and unable to communicate with the motor running than a motor pump sets; When he would get the power to run around and make sure that all motor pumps work. In some cases, motor pumps the effort involved in switching off the motor run longer than what is necessary. This leads to both wastage Electricity and water.

3. EXISTING SYSTEM

At the farm level irrigation systems, the water supply rate, and agricultural irrigation needs and schedules to meet the needs of the time. They Water from a water source for agricultural cropped areas to express it, and distribute it on the area being irrigated.

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At the trial level, microcontrollers and wireless communication in rural areas on the basis of an automatic irrigation system, provided for the development of the deployment. Intended to enable the use of automatic irrigation water can be used to reduce the need to prove that. To enable the plant root zone soil moisture and temperature sensors stationed a distributed wireless network that consists of a photovoltaic powered automatic irrigation system is. Each sensor node is a soil-moisture probe, a temperature probe, a microcontroller, data acquisition, and is involved in a radio transceiver; the sensor readings are transmitted to the microcontroller-based receivers. A soil moisture and temperature threshold value when they reached the entrance of the irrigation allows automatic activation.

4. PROJECT DESCRIPTION

The system consists of two major units, wireless sensor unit and wireless controller unit. Wireless sensor unit designed to acquire field parameters like soil moisture and soil temperature by using sensors. The WSU uses PIC CPU to convert the field parameter to digital value and sends over wireless using RF transceiver. The wireless sensor unit operated by a battery power supply. The CPU designed to works on low power. Each irrigation system can have more than two wireless sensor units. All wireless sensor units in a irrigation system constructed as a Wireless Sensor Network and respond to a wireless controller unit.

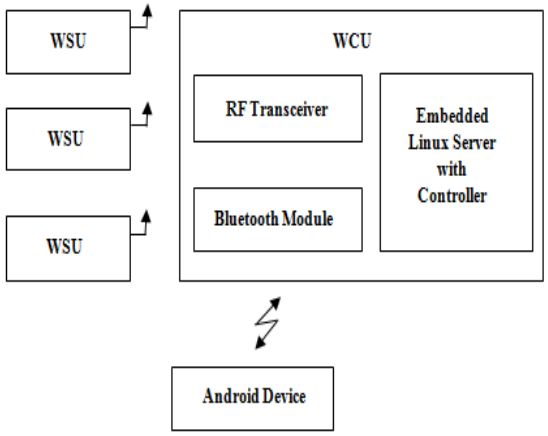

Figure.1 System Block Diagram

4.1 WSU-BLOCK DIAGRAM

Each unit is based on the microcontroller PIC 16F877A (Microchip Technologies) that controls the RF transceiver Zigbee Pro S2 (Digi International) and process information from the soil moisture sensor VH400 and the temperature sensor THERM200 (Vegetronix).

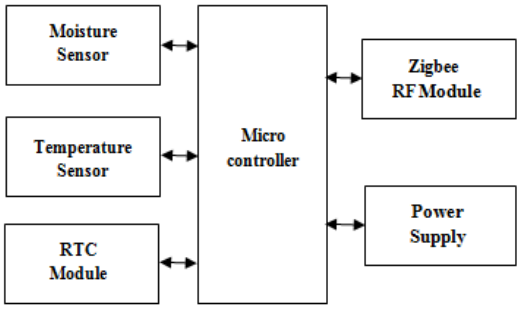

Figure.2 WSU Block Diagram

4.2 WSU-CPU

The wireless sensor unit uses PIC16F877A microcontroller, it is an 8-bit microcontroller with 40-pins and that operates in a range 5V at 8 MHz with internal oscillator. It has up to 25 digital input/output ports, 8, 10-bit analog-to-digital converters (ADC), two serial peripheral interface modules, two I2C, two UART, 3 8-bit timers, 8 KB of program memory, 368 bytes of SRAM, and 256 bytes of EEPROM. The microcontroller is well suited for this remote application, because of its low-power operating current, which are 175 µA at 2.5 V at 8 MHz and 0.5 µA for standby current in sleep mode.

4.3 WSU-SENSORS

The sensor array consists of two soil sensors, including moisture and temperature that are inserted in the root zone of the plants. The VH400 probe was selected to estimate the soil moisture because of low power consumption (< 7 mA) and low cost.

Figure.3 Soil Moisture Sensor

According to investigators, a measurement of 80 MHz, which is insensitive to water salinity, at the transmission line and the blood

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using techniques that measure the dielectric constant of the soil water content (VWC) is proportional to the output range between 0 and 3.0 V, the manufacturer provides a curve... The sensor was powered at 3.3 V and monitored by the microcontroller through an ADC port.

Figure.4 Soil Temperature Sensor

Soil Temperature is measured using THERM200 soil temperature sensor. A soil temperature probe with a temperature interval from THERM200 is 85øC. Y voltage outputs which have a narrow temperature OC, does not, therefore, from complex equations to calculate the temperature required resolution 0.125øC voltage's it is very accurate. The sensor is a simple 3-wire interface: lying on the ground, power, and output, running from
V 20 VDC, and a voltage of 3V outputs 0. This represents the 0 - 40øC and represents 3V 85ø. Buried by studies, or inserted into the pots. The blade is narrow; it can easily be inserted into potted plants.

4.4 WCU-BLOCK DIAGRAM

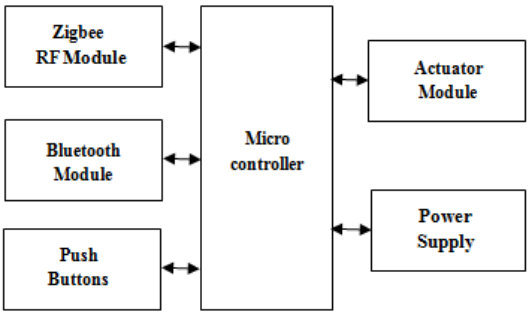

Figure 5. WCU Block Diagram

The soil moisture and temperature data from each WSU are received, identified, recorded, and analyzed in the WCU. The WCU consists of a single chip computer called as Raspberry Pi, an Zigbee module RF transceiver, a Bluetooth Module HC-05 and two electronic relays. The WCU can be located up to 1500-m line-of-sight from the WSUs placed in the field.

5. SOFTWARE DESCRIPTION

The software design of automated irrigation system consists of Android application software, Firmware for Wireless Sensor Unit, Linux system software for Wireless Controller Unit and PHP based program for web application design. Software design uses Eclipse IDE for Android software, MPLAB IDE for PIC microcontroller programming and GCC compiler for Raspberry Pi based system programming

5.1 WCU- IRRIGATION FLOW CHART

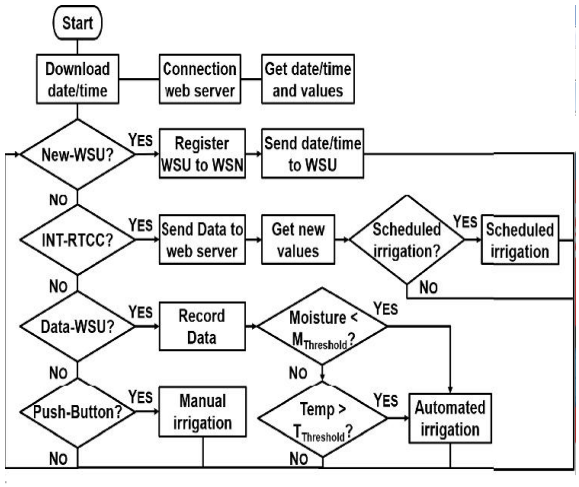

Figure.6 Irrigation Flow Chart

5.2 ANDROID APPLICATION SOFTWARE

The Android Application Software for the proposed system has been done through Eclipse IDE and the App was created for user interaction through android device. The android software works based on the Bluetooth interface, the user can access field data and monitor the field data.

To run the android application on a device, the user must install the android apk file in their device. Then startup the application, while starting the device asks user to enable Bluetooth setup. The user needs to press connect button to search the available Bluetooth devices, the application software lists the available device lists. The user needs to select HC-05 device and pair the device by entering the password 1234 for first time. Then the software continuously requests the field data from the wireless controller unit.

The user can set the set points for field data and send the data to the wireless control unit. The wireless control unit stores the data in EEPROM memory. The user change the irrigation type, manual irrigation initiated by the buttons provided in the

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application and sets the time interval for scheduled irrigation. The user can view and download the history of irrigation over the period.

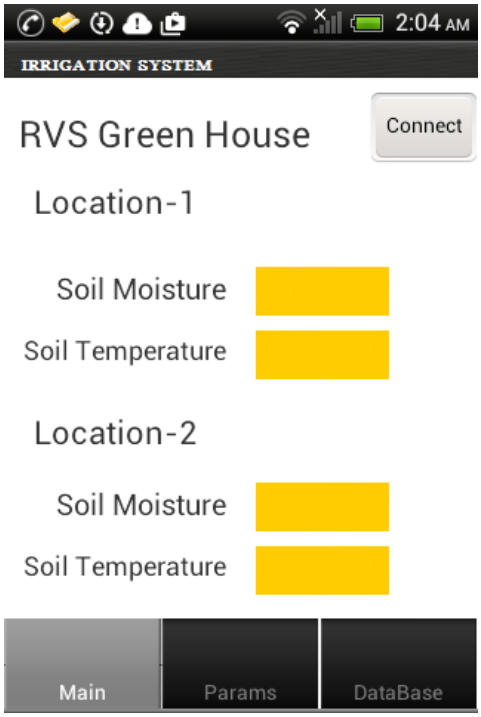

Figure.7 Main Page Screen Shot

6. CONCLUSION

The aim of this proposal is to develop a low cost automated irrigation system with a portable human machine interface on a android device. This design will minimize the cost as well as reduce the complexity and required minimum space compared computer based system.

7. FUTURE ENHANCEMENT

The growth of the crop is depends on the nutrients called as Macro nutrient and Micro nutrient. The measurement of these nutrients in the soil can be added to the Wireless Sensor Unit and send to the web server. Through this rationalization of the plant nutrition management can be implemented to improve the efficiency of the plant growth

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