Wireless Sensor Monitoring Node Based on Automatic Tracking Solar Powered Panel for Paddy Field and Cattle Environment

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***Abstract*— Crop farming in India is labour intensive and obsolete. Farming is still dependent on techniques which were evolved hundreds of years ago and doesn't take care of conservation of resources. The newer scenario of decreasing water tables, drying up of rivers and tanks, unpredictable environment present an urgent need of proper utilization of water. We have the technology to bridge the gap between water usage and water wastage. Technology used in some developed countries is too expensive and complicated for a common farmer to understand. Our project is to give cheap, reliable, cost efficient and easy to use technology which would help in conservation of resources such as water and also in automating farms.**

***Index Terms*— Arduino uno, Solar Panel, Ultrasonic sensor, Water level sensor.**

I. INTRODUCTION

Agriculture is major source of income for the largest population in India and is major contributor to Indian economy. In past decade it is observed that there are not much crop development in agriculture sector. Food prices are continuously increasing because crop rate declined. There are number of factor which is responsible for this it may be due to water waste, low soil fertility, Fertilizer abuse, climate change or diseases etc. It is very essential to make effective intervention in agriculture and the solution is IOT in integration with wireless sensor network. Internet of things (IOT) is a method of connecting everything to the internet- it is connecting object or things (such as car, home, electronic devices, etc.) which are previously not connected with each other main purpose of IOT is ensuring delivery of right information to right people at right time. In agriculture irrigation is the important factor as the monsoon rain falls are unpredictable and uncertain.

II. PROCEDURE FOR PAPER SUBMISSION

A. Methodology

The hardware is interfaced with all the sensors in the board. The hardware components include the microcontroller, a water pump, relay,12 V battery, Wi-fi sensor and the soil moisture sensor is interfaced and power supply has provided. The system has been tested for watering a plant in a garden. In the field section, sensors are deployed in the field like soil moisture. The data collected from these sensors are sent to the Database via the android application. In control section, the system is turned on using the application, this is done using the on or off buttons in the application. Also, this system is turned on automatically when the moisture of the soil is low, the pump is turned on and depending on the moisture content. The application has a future feature of taking the time from the user and irrigates the field when the time comes.

B. Analysis

The agricultural growth is enhanced with the increase in the productivity and upgradation of the plantation systems. The application of Internet of Things (IoT) technology in agriculture could have the greatest impact for increase the productivity. The global population is increased every year. So, to feed this much population, the farming industry must use advanced technology like IoT for increased profit. Smart farming based on IoT technologies will enable growers and farmers to reduce waste and enhance

productivity ranging from the quantity of fertilizer utilized to the number of journeys the farm vehicles have made. In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, PIR Sensor) and automating the irrigation system. The farmers can monitor the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach.

III. MODELLING ANALYSIS

Arduino coding use Arduino IDE to write the code and upload the coding file to Arduino UNO at Proteus 8 Professional to simulate system operation. Solar energy utilize to power up the water pump while the solar charger controller is being used to control the charging and discharging of the battery. When the water level decreases below the targeted level, the water pump switched ON automatically until obtain the targeted level of water level. At the same time, LCD will display the motor condition and water level at paddy field.

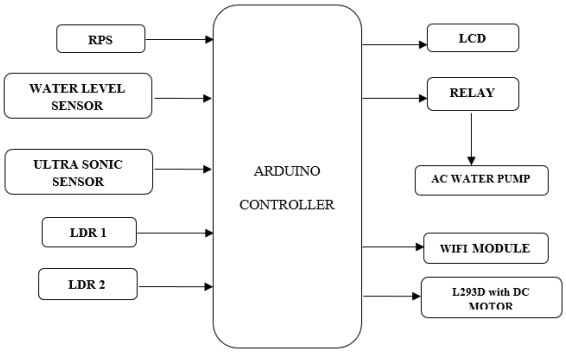


Figure 1: Block Diagram

A. Ultra Sonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

Ultrasonic level sensors are commonly used to measure distance or level, volume, and are used in flow monitoring. Other uses of an ultrasonic sensor include presence or absence detection, and object dimensioning.
Max Range: 400cm / 13 feet
Measuring Angle: <15°
Min Range: 2cm / 1 inch
Operating Voltage: 5V DC

Types of ultrasonic sensors

- Ultrasonic diffuse proximity sensors.
- Ultrasonic retro-reflective sensors.
- Ultrasonic through-beam sensors.

B. Water Level Sensor

It is an Operational Amplifier (Op-amp) consists of four channels. Its a low cost device having true differential inputs.For single supply applications LM 324 are superior to the other operational amplifiers.
LM-324 is capable of operating at the minimum voltage up to 3V and at the high voltage levels up to 32V.One of the major advantage of LM-324 is that common mode input range includes negative supply which eliminates the need of external biasing.
Negative power supply voltage is also included in output voltage range. It consists of four amplifiers per package. LM324 real life applications include conventional amplifier circuits, transducer amplifier, DC gain blocks etc.

There are five basic types of commercially used water level indicators:

- Capacitive
- Ultrasonic
- Frequency
- Guided wave GWR
- Pressure transducers.

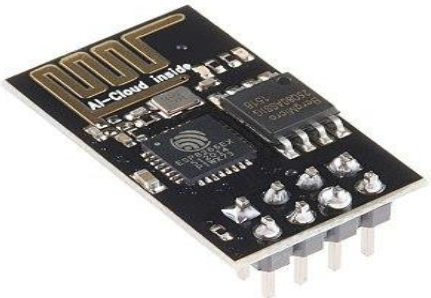
C. LDRs

A light-dependent resistor (LDR) whose resistance is inversely proportional to the intensity of light is often used as a sensor in electronic projects that involve the use of light. This LDR-based DC motor speed control project uses an LDR to control the speed of a DC motor.

D. Arduino

Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.These are just some of the many varieties of Arduino that you can build your electronics projects with. There have been thousands of Arduino-based projects that have been made since its introduction, from simple to complex projects like *music instruments, car robots, remote controls, and even security systems.*

E. Wi-Fi Module (ESP8266)



The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability, produced by Espressif Systems in Shanghai, China. ESP8266. ESP8266-IC. It enables microcontrollers to connect to 2.4 GHz Wi-Fi, using IEEE 802.11 bgn. It can be used with ESP-AT firmware to provide Wi-Fi connectivity to external host MCUs, or it can be used as a self-sufficient MCU by running an RTOS-based SDK.

IV. RESULTS AND DISCUSSION

Here, after the practical implementation we see that when the power supply is given to LDR1, LDR2 and Water level sensor the LCD display supply positions. If LDR1=1 and LDR2=0 the DC motor rotate clockwise direction along with time. If LDR1=0 and LDR2=1 the DC motor rotate anti-clockwise direction. If LDR1=LDR2=0 or LDR1=LDR2=1 the DC motor is in stable condition or OFF state. If water level=1 then the motor is in OFF position and send the notification to the authority (farmer) with the help of Wi-fi module.

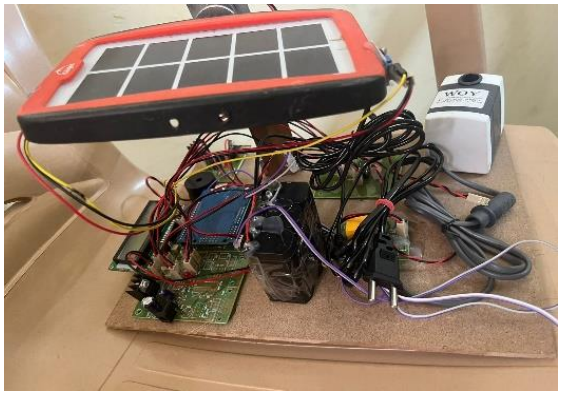


Figure 2: Project Kit

Figure 3: Display of results

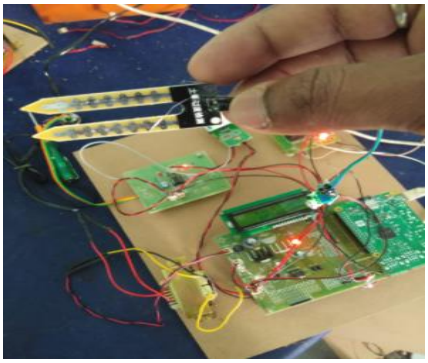


Figure 4: Soil Moisture Sensor

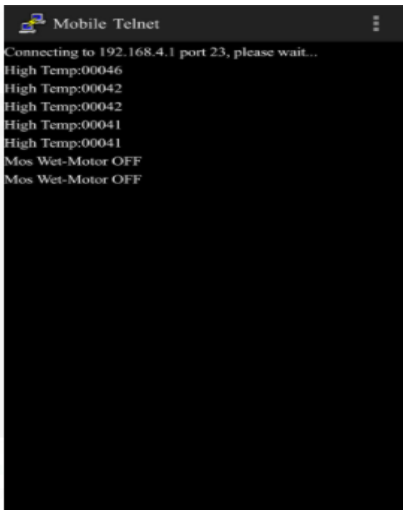


Figure 5: Output Result

CONCLUSION

Internet of Things will help to enhance smart farming. Using IoT we can predict the soil moisture level and humidity. Irrigation system can be monitored and controlled by IoT technology. The crop damage using predators is reduced. IoT works in different domains of farming to improve time efficiency, water management, crop monitoring, soil management, control of insecticides and pesticides. It also minimizes human efforts, simplifies techniques of farming and helps to gain smart farming. Along with these features smart farming can help to grow the market for farmer with single touch and minimum efforts.

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