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CORN FARMLAND MONITORING USING WIRELESS SENSOR NETWORK

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Abstract - ***In this paper, we have proposed the system for monitoring the growing status of the corn (maize) plant continuously and intimate the agriculturist using wireless sensor network (WSN). The upsurge increase in the technological and scientific innovation makes advancement in agricultural field. But in practice, cultivator faces too much effort in the farmland. This paper makes eases the work of the farmer in cultivated land through the usage of different kind of sensors. The two LDR sensors are interfaced with PIC16F877A microcontroller whereas its top array receives solar radiation for supply current and the bottom of the LDR array is for measuring leaf area index (LAI). The humidity sensor will compute the moisture level in the corn field, if the level decreases, then it automatically switches ON the DC motor. Another sensor is Water level sensor will anticipate the water level, if the water level aloft the level then it switches OFF the motor. All the particulars of farmland are sending to the farmer through GSM and revel in the LCD screen. The temperature sensor will find the intensity of heat present in the soil. PH sensor is used to find the soil alkalinity which is essential for plant nutrition. With this less cost and energy utilization, WSN is a hopeful method for harvesting the corn crop and also improves the quality of the corn crop and reduces the usage of pesticides, thereby increasing the overall profits for the farmers.***

Key Words: *Leaf Area Index (LAI), Wireless Sensor Network (WSN), GSM, Proteus8.*

1. INTRODUCTION

Today, Agriculture plays very important role in country development. To make feasible for the farmer, the automatic monitoring system for corn farmland using different sensors, PIC Microcontroller etc., and transmit the farm information through SMS to the farmer using Global Positioning System (GPS). Wireless Sensor Network plays important task in monitoring physical, environmental conditions used in the agricultural field, military surveillance, industrial, consumer application, etc., In the agriculture field, wireless sensor network is used to monitor Temperature, Humidity, Soil moisture, Wind, Pressure, PH and Redox. By monitoring the corn growth continuously will achieve better yield with less manpower.

If the canopy growth reaches its threshold value, then the information was displayed in the Liquid Crystal Display (LCD) and also send to the cultivator through mobile phone SMS for monitoring the canopy growth using LDR sensor with GSM [1].Using wireless sensor network (WSN), the Leaf Area Index (LAI) was monitored continuously for measuring plant growth in forest by LAInet method and the information are shared using cloud computing [2]. The automatic irrigation system wills save-all the unique stages of plant growth and the message about plant growth are transferred through Zigbee module to the agriculturist [3]. Using Digital Image Processing, the unique stages of plant growth are taken as input image. Based on the captured image with its weather condition, the nutrition material is given to the plant for its better yield [4]. The INTELLIGENT HUMIDITY sensor will automatically monitor the soil moisture level in the farmland with reduced power consumption by collecting only less data which in turn cause more data to be lost in the system and there is no need to monitor and save the bulky data required in agricultural fields [5]. The different types of crops such as Paddy, banana, turmeric fields the canopy growth was monitored by a temperature sensor,

humidity sensor, soil moisture sensor and the information about the farm are transmitted using a Zigbee module to the farmer and consume less power by using solar cells [6]. Using the Image Processing, the population of the corn plant count is measured automatically using a digital video camera on the vehicle moving in the distance of 1 to 2m/s. Based on this count, the fertilizers are given to the plant more approximately with avoiding insect attack [7].

In the proposed system, the Corn (Maize) plant is continuously monitored by Temperature sensor, Humidity sensor, Water level sensor, PH sensor and finally the LDR sensor automatically and updates the information about corn plant growth to the agriculturist periodically through mobile phone SMS using Global Positioning System (GPS) for improving the quality of the corn with better yield by avoiding spraying of chemical substance in the farmland which in turn reduces the insect attack in the corn.

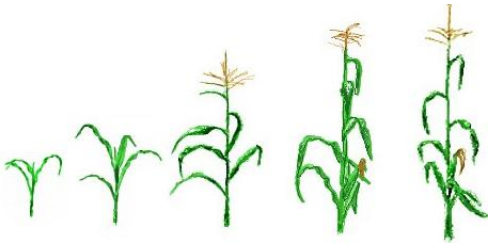

Fig -1: Stages of Corn Plant Growth

The power consumption is reduced by using Solar cell panel for running stepper motor automatically when the water level becomes low in the farmland and switch off the motor after watering the field with glowing LED. By using PIC16F877A microcontroller, the sensor will sense the temperature of the soil, soil moisture level, water level in the field, the amount of light which falls on the corn leaf for photosynthesis, the amount of acidity in the soil and display the messages on the LCD screen and also update the details to the farmer by connecting GSM using max232 in UART module. The system will make feasible for agriculturist in the modern environment.

2. SYSTEM ARCHITECTURE

The Architectural model is developed to monitor the corn growth in the farm. The PIC16F877A Microcontroller is a low cost RISC processor with multiple features. When the 5v power supply is given to the PIC16F877A microcontroller, the sensors which are attached to the controller start sensing the corn farmland. The Temperature sensor will perceives the soil temperature in the corn field. If the temperature is high, then intimate to the cultivator through mobile phone SMS via GSM. The humidity sensor will sense the soil moisture level and automatically turn ON the DC motor when the water level in the farm is low. The DC motor will run on battery supply from the solar cell panel and LED will also glow when the DC motor runs. The water level sensor will sense the water level in the farm aloft or not, if it exceeds then automatically switch OFF the DC motor.

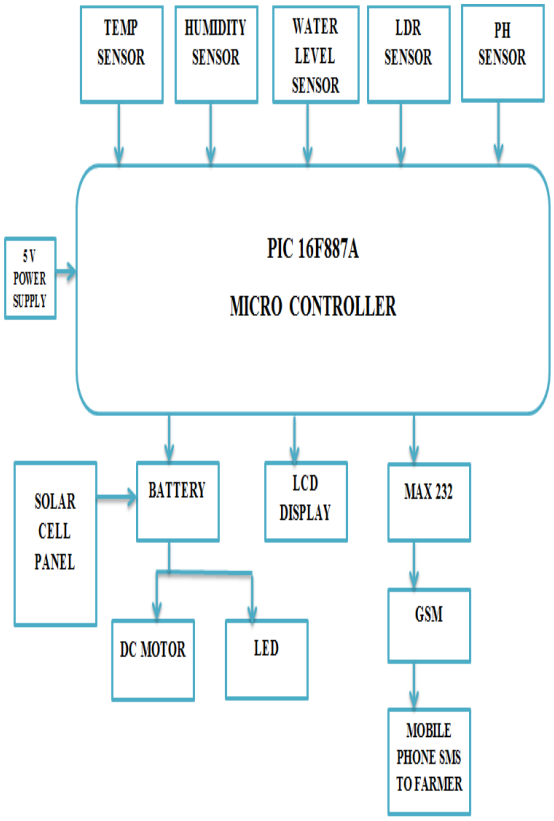

Fig -2: Block Diagram for Monitoring Corn Growth

The solar cell arrangement is designed based on the amount of power required to run the DC motor. LDR sensor will perceive the amount of light received by the leaves which is responsible for leaf growth in the Leaf Area Index (LAI) measurement. The PH sensor will identify the alkalinity of the soil caused by the chemical substance applied in the farmland. The LCD display will shows the messages about corn grown in cultivated land. The max232 is used to connect the GSM to the PIC16F877A in UART module. The mobile phone SIM should be registered for sending messages to the cultivator. By using the messages displayed on the

cultivator's phone, the corn field situation will periodically know. If any upsurge changes occur, it will inform the cultivator.

3. COMPONENTS REQUIRED

3.1 Microcontroller:

The PIC (Peripheral Interface Controller) microcontroller is based on Harvard architecture with RISC processor developed by Microchip technology. The PIC16F877A is a one of the most powerful controller which has 40 pin with itself. The high performance PIC16F877A executes the instruction in very high speed within less cost.

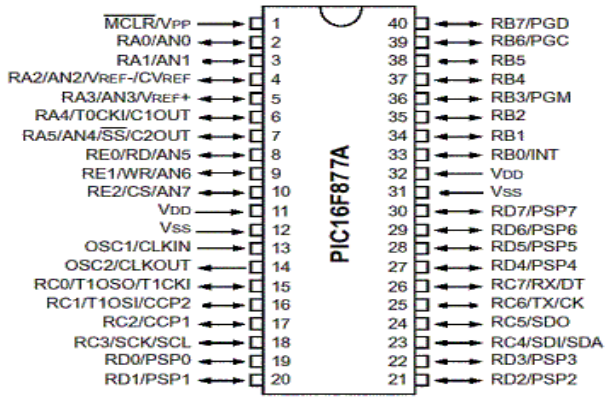

Fig -3: PIC16F877A Microcontroller Pin Diagram

It is reliable and easy to interface with its peripherals. The power required for operating PIC16F877A microcontroller is 5v power supply.

3.2 Temperature Sensor:

The Temperature sensor LM35 is used to find the temperature of the corn field. For corn plant the temperature should be little high.

Fig -4: Temperature Sensor LM35

Normally corn crop are planted in summer season in our country. The LM35 is low cost and locally accessible sensor. But for low power consuming, the THERM200 is also another choice for measuring temperature of soil in corn field. The temperature will hold the ranges between 24^0 to 35^0. The LM35 will measure the temperature in the corn farmland.

3.3 Humidity Sensor:

The humidity sensor will find the water content in the soil responsible for the soil moisture. In the corn farmland, the humidity of the soil should be maintained by using SY- HS-220 sensor. Based on the humidity of the soil, it will turn ON or OFF the DC motor. It will help the cultivator for producing the good quality corn.

3.4 Water Level Sensor:

The water level sensor will find the water content level in the corn farmland. If the water level is low or high by using the DC motor the water is supplied to the field using solar power supply.

3.5 LDR Sensor:

The Light Dependent Resistor (LDR) will determine the amount of light perceives in the canopy leaf. The LDR will sense only during the light falls on it and not on dark. The LDR will calculate the leaf growth if any changes occur it will message to the farmer.

3.6 PH Sensor:

The PH sensor is very useful in the corn field to find the alkalinity in the natural or chemical materials present in the soil. The PH of the soil is responsible for its nutrition content. By knowing the PH of the soil, the minerals are sprayed in the corn field without affecting the corn quality.

3.7 DC Motor:

The DC motor is used to watering the corn farm. The DC motor converts electrical energy into the mechanical energy.

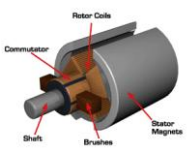

Fig -5: DC Motor

Here, the DC motor operates based on the commands from the humidity sensor and water level sensor in the corn farmland. The speed of the DC motor is maintained by voltage applied to it. The Relay will act as a switch for operating DC motor in ON or OFF condition for supplying the water to the corn field. The Relay has the coil, when the current is flowing in the coil; it creates the magnetic field and attracts the lever, which in turn causes the switch ON or OFF state.

3.8 LCD Display:

The Liquid Crystal Display (LCD) is used to display the messages of the corn farmland which has been interfaced with the PIC16F877A microcontroller.

Fig -6: LCD Display

3.9 GSM:

GSM (Global System for Mobile communication) is the 2nd Generation mobile phone. GSM SIM will send the information about the farmland situation to the farmer through max232 module. It is advanced technology than GPRS, RF module, Zigbee etc. Using RS232 cable, the GSM module has communicated with the controller as serial communication. The voltage level varies from -15v to +15v for showing output signal.

4. SOFTWARE DESCRIPTION

4.1 PROTEUS:

PROTEUS is Processor for Text Easy to Use simulation tool for embedded microcontroller. The main features are being fully functional and procedural programming function. It has clear and comprehensible syntax. PROTEUS is easy to use, efficient, complete, and readable. C/C++ language is mostly used in the PROTEUS software. The advantages of PROTEUS is powerful string manipulation, comprehensibility of Proteus scripts, availability of arrays, AVL trees etc. In this paper PROTEOUS 8 version is used.

4.2 MPLAB IDE:

MPLAB IDE is the integrated development environment. The MPLAB IDE software runs the program on the windows operating system. It is used for developing the application for microchip microcontrollers and digital signal controllers. MPLAB provides a single integrated 'environment' is used to develop the code for embedded microcontroller. So it is called as an The features of MPLAB are comprehensive editor, project manager and design desktop. It is used for application development of embedded designs using Microchip PIC MCUs and ds PIC DSCs. The HI-TECH C compiler is used to build the embedded c coding in the MPLAB software.

5. RESULT AND DISCUSSION

The Proteous output for corn plant farmland monitoring system is shown below. Fig -7 schematic will display monitoring status in the LCD screen.

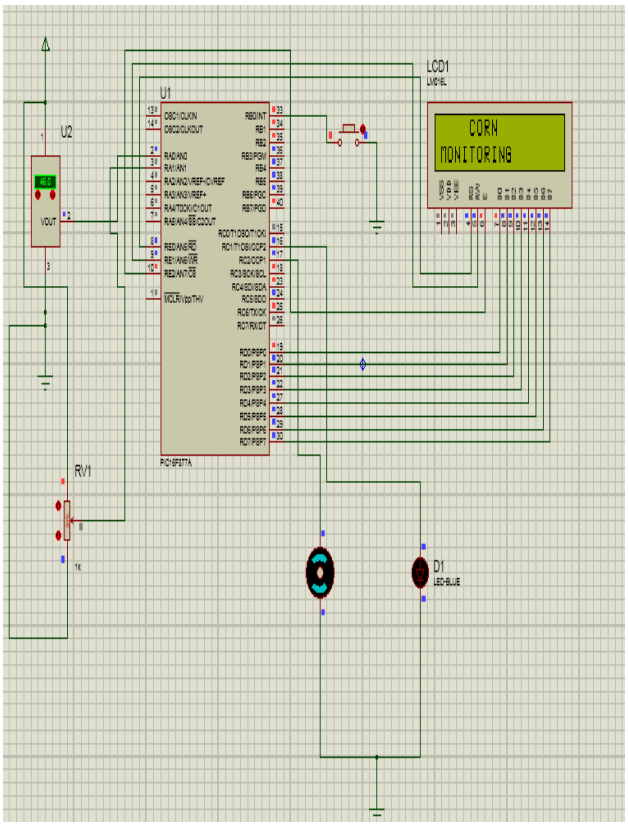

Fig -7: Schematic output screen1

The water level in the farmland is detected by water level sensor and humidity sensor. If the water level is low, the DC motor is starts running with the help of solar power supply.

The Fig -8 will show the schematic output for running DC motor during less water level in the farmland.

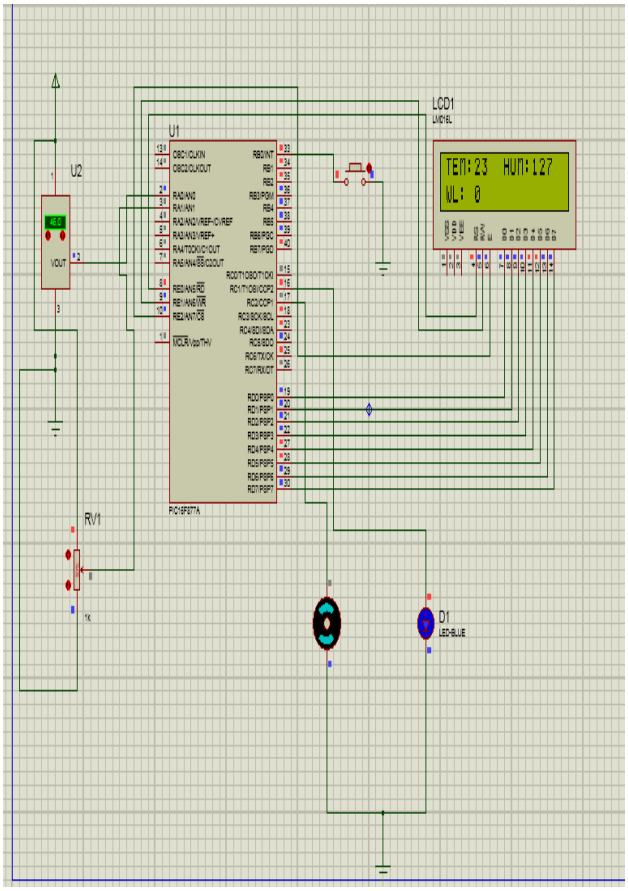

Fig -8: Schematic output screen2

6. CONCLUSION

The project had resulted as efficient monitoring system for the corn farmland and informs the details about the current situation of the farm to the cultivator by using different sensors. By using solar power source, the power consumption cost required for driving the processor and DC motor is reduced.

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BIOGRAPHIES

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