

AUTOMATIC RAIN WATER AND CROP SAVING SYSTEM USING EMBEDDED TECHNOLOGY

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Abstract— Now a days, during the rainy seasons the cultivated crops gets affected due to the heavy rain fall. The main theme of this project is that to prevent the crops from the heavy rain and save the rain water. The rain sensor and soil moisture sensor is used for the working of automatic roof. This system involves protects the crops by the auto roof which covers the whole field. The rain sensor is activated when there is a rain fall. The soil moisture sensor will sense the water level in the field. If the water level is beyond the normal level it will gives intimation to the controller. So when both the sensor is 'ON', it will gives intimation to the controller, GSM and it will indicate to the DC motor and it will automatically open the roof. In this project, the roof is open automatically when both the sensor is 'ON'. . If there is any problem with opening the roof automatically, manually set by remote access. This system also use emerging applications of GSM. It is used to report the conditions in the field through SMS to the mobile phone. The power is supplied to this project is using renewable energy sources as solar power.

Index Terms— DC motor, GSM, PIC microcontroller, Remote access, Rain sensor, Soil moisture sensor Solar panel

I.INTRODUCTION

The system is based on GSM, remote access, Rain sensor, Temperature sensor and soil moisture sensor. This system uses renewable energy sources as solar power that is generated from solar panel. Then generated solar power is stored in DC battery. During cloudy season, the power supply is recovered from DC battery. Here the system will be a sensor based one where the pump will start only when there is

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the need of water to the land. The auto roof is mainly depends on the rain sensor, soil moisture sensor and temperature sensor. Here, GSM [1], [2] technology and remote access having major role for automatically closing roof. The GSM and remote access are acting as a control system for our project. The condition of auto roof is usually intimated by GSM. The GSM technology, effectively allows control from a remote area to the desired location in the agricultural field. If there is any problem in sensors then roof is manually set by using remote access. Based on rainy season and sunny season it will controls the auto roof. The decision making capability carried out by PIC 16F877A. Then the rain water in the roof is collected by the Water tank. When water scarcity in agricultural field, the collected water is pumped out using DC motor 2. In this way the wastage rain water is saved. The collected rain water also used for other purposes.

II. SYSTEM ARCHITECTURE

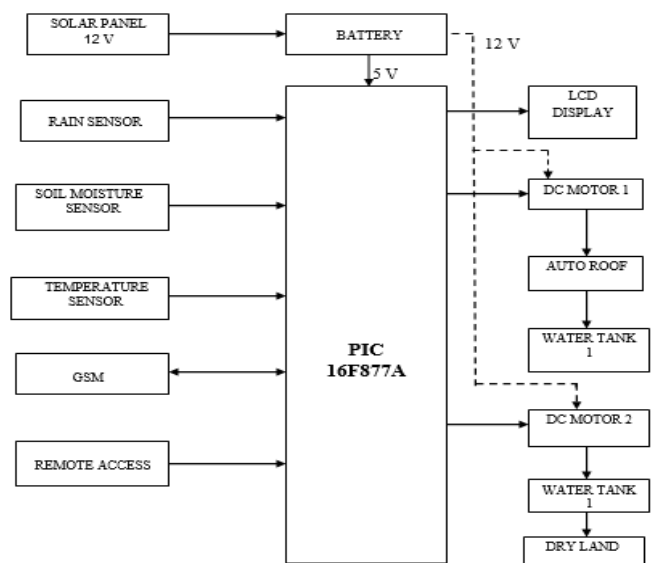


Fig. 1 System block diagram

III. HARDWARE DESCRIPTION

1. Microcontroller Unit:

The prime use of a micro controller is to control the operation of a machine using a fixed program that is stored in ROM and that does not change over the life time of the system. The architecture and instruction set of the micro controller are optimized to handle data in bit and byte size. The areas of applications of micro controllers include control process, manufacturing process, medicine, instrumentation etc.

2. PIC:

PIC stands for peripheral interface controller as coined by microchip technology Inc., USA. PIC is a very popular microcontroller worldwide. Microchip is the first manufacturer of 8 pin RISC MCU.

Features

- High-performance RISC CPU
- Operating speed: DC - 20 MHz clock input
- Up to 8K x 14 words of Flash Program Memory
- Up to 368 x 8 bytes of Data Memory (RAM)
- Up to 256 x 8 bytes of EEPROM data memory
- Interrupt capability (up to 14 internal/external)
- Direct, indirect, and relative addressing modes
- Power-on Reset (POR)
- Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Watchdog Timer (WDT) with its own on-chip RC Oscillator for reliable operation
- Power saving SLEEP mode
- Selectable oscillator options
- Low-power, high-speed CMOS EPROM/EEPROM technology
- Fully static design
- Processor read/write access to program memory
- Wide operating voltage range: 2.5V to 5.5V
- Low-power consumption

3. Solar panel:

The solar panels are made of solar cells. A solar cell, or photovoltaic cell, is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect. It is a form of photoelectric cell, defined as a device whose electrical characteristics, such as current, voltage, or resistance, vary when exposed to light. Solar cells are the building blocks of photovoltaic modules, otherwise known as solar panels. The operation of a photovoltaic (PV) cell requires three basic attributes:

- The absorption of light, generating either electron-hole pairs.
- The separation of charge carriers of opposite types.
- The separate extraction of those carriers to an external circuit.

4. 12 V Battery:

A 12 V Battery is used to store the charge or store the power from solar panel. This power supply is used to control the whole system unit such as microcontroller, DC motor etc.

5. Rain Sensor:

A rain sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall. The second is a device used to protect the interior of an automobile from rain and to support the automatic mode of windscreen wipers.

6. Soil Moisture Sensor:

The Soil Moisture Sensor is used to measure the volumetric water content of soil. Soil-moisture devices measure the energy level at which water is being held by soil. The Soil Moisture Sensor to:

- Measure the loss of moisture over time due to evaporation and plant uptake.
- Evaluate optimum soil moisture contents for various species of plants.
- Monitor soil moisture content to control irrigation in greenhouses.

7. Temperature Sensor:

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. Temperature is sensed and then this signal is sent to PIC. In that PIC a particular set point is given and if it is below or above it takes action likewise. The LM35 device does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4^\circ\text{C}$ at room temperature and $\pm 3/4^\circ\text{C}$ over a full -55°C to 150°C temperature range.

8. GSM:

GSM can control appliances even from long range of distances. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. The baud rate can be configurable from 9600-115200 bps through AT (Attention) commands. This GSM/GPRS TTL Modem has internal TCP/IP stack to enable user to connect with internet through GPRS feature. It is suitable for SMS as well as DATA transfer application in mobile phone to mobile phone interface. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. The GSM modems are used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. A GSM modem exposes an interface that allows applications such as SMS to send and receive messages over the modem.

interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an “extended AT command set” for sending/receiving SMS messages.

9. DC Motor:

Here the DC motor1 used to provide making auto roof based on the field moisture, temperature and rain sensor. The DC motor 2 used to supply the water in the field. Whenever the field is dry condition, at that time DC motor 2 pump out the water from water tank1.

10. LCD display:

The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. The Serial LCD Firmware, which allows serial control of the display. The firmware enables microcontrollers to visually output user instructions or readings onto an LCD module. All LCD commands are transmitted serially via a single microcontroller pin. The firmware can also be connected to the serial port of a computer. The LCD display is used to display the field characteristics like as temperature and whether soil is wet or sunny.

11. Remote access:

The Remote access is also used major role in our project. If there is any problem in sensors (Rain sensor, Soil moisture sensor and Temperature sensor) the roof is manually set by Remote access. The RF transmitter and RF receiver is used in the remote access module.

IV. HARDWARE AND SOFTWARE USED

i. Hardware used:

1. Solar panel
2. 12 V Battery
3. GSM
4. Remote access
5. Rain sensor
6. Soil moisture sensor
7. Temperature sensor
8. DC motor
9. LCD display

ii. Software used:

1. Proteus
2. PIC C compiler

V. RESULT

The system has been designed and simulated by using proteus software. When the rain sensor detects rain and soil moisture detects moisture content, which will be displayed in LCD display. The process of auto roof is intimated by GSM which will be sent through SMS to mobile user. The soil moisture sensor, temperature sensor and rain sensor detects the value that sent to PIC microcontroller. Based on the values

the automatic roof is performed. If any problems in sensors, the roof is manually set by remote access. The whole simulation system is displayed in following figure.

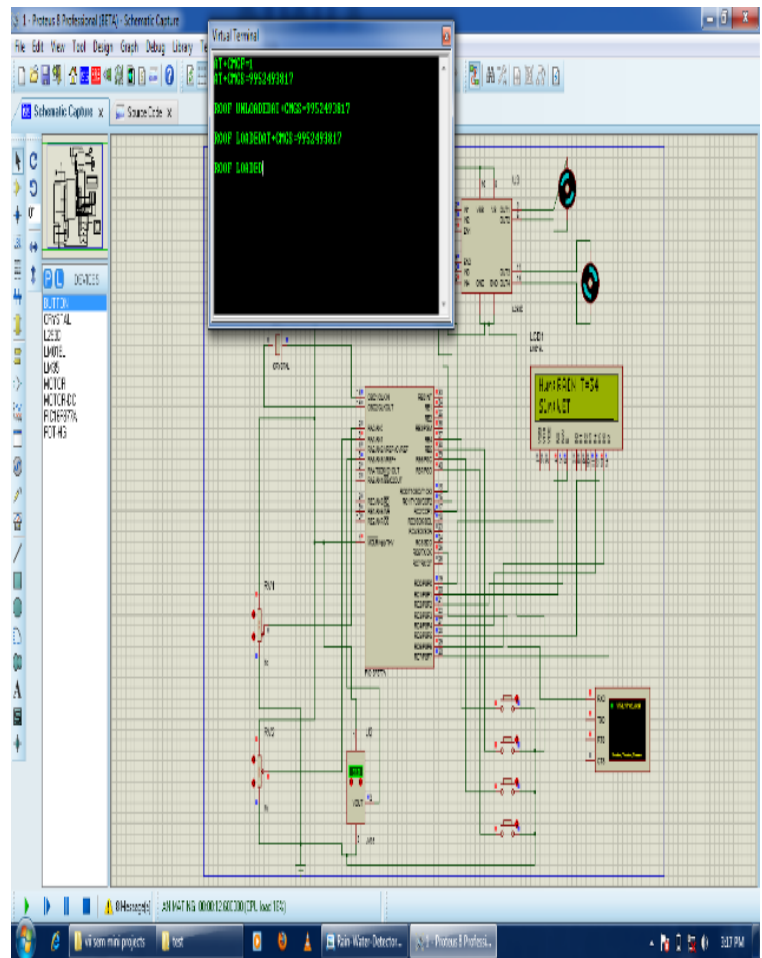


Fig.2 Simulation result

VI. CONCLUSION

The automatic rain water and crop saving system protects crops from excess amount of rain water and also saves water from wastage. By using these system saves the electricity, maximizes the productivity during both rainy season and sunny season. Here the human power were eliminated by providing auto roof.

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