Smart Irrigation System in Agriculture

A MINI PROJECT REPORT

Submitted by

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Introduction

The agriculture plays the main role in the economy and development of the country. At present the farmers irrigate the fields manually at regular intervals .The manual method may consume more water that leads the damage of crops or lack of water due to which the crops will get dry in nature .The automatic irrigation system will overcome the above problems mentioned .The method drip by drip system may save the water in agricultural fields .This paper specifies a good idea about the automatic irrigation system .Many literature reviews stated about the automated irrigation mechanism which states the sensing of soil moisture and ON/OFF Control of motor in agriculture fields.

The ideas further specify in maintaining the crops during rainfall, landscapes and soil decay. Some wireless monitoring methods are also followed for finding the humidity and moisture content of the soil. In agriculture the controller system is also introduced comprising the regulated power supply system, intrusion detection system and pump switching system.

A pump mechanism is also introduced to deliver a water in the soil. By applying drip by drip irrigation large quantity of water is saved. Conventional irrigation method includes flood type feeding systems and flood type feeding systems. The working methodology includes power supply, sensing unit, pumping unit and control unit Water and power saving is the ultimate aspect in automatic irrigation. Our project shows a good attempt for automatic irrigation by applying the correct amount of water at correct time and minimization of human labour to turn OFF/ON the valves. This paper shows a simulation and prototype model for automatic irrigation systems.

Proposed System

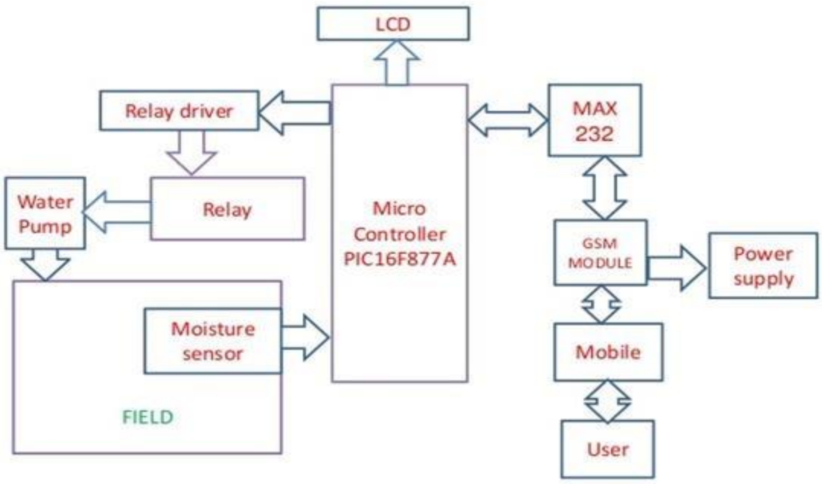

Figure 1: Proposed System Block Diagram.

This project is developed using a MPLAB Integrated Development Environment proteous 8 professional and Topwinv 6.0 universal programmer. Figure 1 shows the main processor applied in the proposed system is peripheral interface controller PIC16F877A. It is a 40 pin IC which is flexible in operation and cost of the IC is low. The purpose of using the particular PIC IC is it supports both hardware and timer interrupts and it is well suited for many application protocols such as I2C, Serial and Parallel. Further the features include 2 comparators, 256 bytes of EEPROM, and 10-bit A/D converter with 8 channels. With the help of GSM module, the message is sent to the electric board. The GSM module used in this model is SIM800 with a frequency of 850 MHZ. Relay switch is used to open and close the circuit electromechanically. An 16x2 LCD module is used to display the results. A transformer is used for stage coupling of circuits in signal processing and for decreasing or increasing the voltage alternating in power applications of electrical systems. To measure volumetric water content in soil, moisture measured sensors are used. The moisture sensor is also used for measuring dielectric constant, interactions with neutrons and electric resistance of the soil. A driver with pump is used in this system, driver supplies enough current for the pump. If the crop field is large, larger pumps and pressurized device is used. The water vapour present in air is measured by humidity sensor. Relative humidity and absolute humidity is also calculated. Humidity sensors measures the humidity value of the soil. The temperature of the soil is measured using relative sensors. Solenoid valve is used in the proposed system which is used for opening or closing an orifice in a valve body. Solenoid valve consists of plunger, coil and sleeve assembly. The main functional component in this proposed system is soil moisture sensor and water pump. The operation of the microcontroller is done by using IDE software. The level of moisture level in the soil is measured by soil moisture sensor and the temperature of the soil is measured by temperature sensor. The water to the plants is pumped by motor/water pump. The external power supply is can be given to either battery or AC-DC adapter. This new model can be operated with an external supply of 5 to 20 volts. If we apply less than 5V then the circuit is unstable, if we apply greater than 20 volts the voltage regulator may damage or overheat the board.

Prototype Model Output

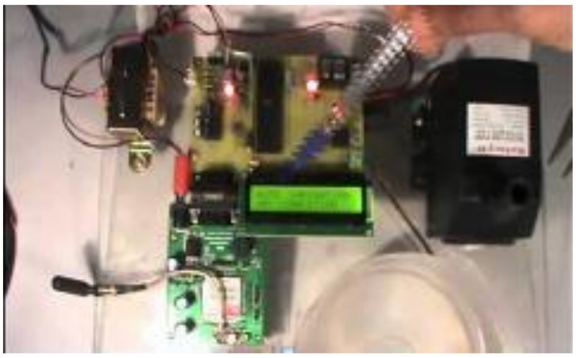

Figure 2. Snap shot of Proposed Model.

Figure 2 shows the snap shot of proposed model with mobile based automatic irrigation system using a self-made, humidity sensor, soil moisture sensor, GSM module and microcontroller. The system sets the irrigation time based on the moisture reading from the sensors and irrigates the field automatically, when unattended. The soil moisture level is further measured by capacitive sensor which is inserted in various places in crop fields.[7] An automatic meter reading with inbuilt microcontroller is placed in various fields is used to monitor the data at regular intervals. At consumer side PIC microcontroller is employed and in pole station ARM microcontroller is employed. Periodic data is sent continuously by PIC Microcontroller and the data is processed by ARM microcontroller. If the recently sent data is different from previously received data, then it is denoted that the moisture level is somewhat changed and therefore a message is received to the mobile using GSM module. If the data exceeds the threshold values, then the motor gets on and water is delivered to the particular field. If the obtained values are below threshold values, then the motor gets off and the crops are saved from the damage of over water.

Proposed System Flow Chart

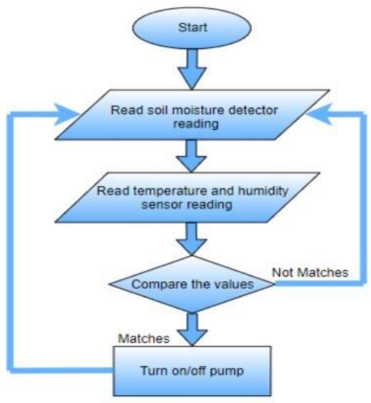

Figure 3. Proposed Model Flow Chart.

The proposed model flowchart states that with the help of moisture soil sensor, temperature and humidity sensor the values of temperature, humidity and moisture soil values are monitored periodically. If the obtained value is deviated from actual value, then the motor gets on and the message is sent to the farmers immediately.

Description of the Proposed System

The detailed description of the proposed system is given below.

Step 1: “CONDITION” The Message from user mobile to gsm module.

Step 2: The analysis data from humidity sensor and soil moisture sensor from GSM Module to user mobile.

Step 3: “AREA 1” message form user to GSM Area 1 ONN Area 2 OFF.

Step 4: else (if wants AREA 2 ONN) “AREA 2” Message from user to GSM Area 1 ONN Area 2 OFF.

Step 5: “RUN TIME 15 MIN” message from user to gsm.

Step 6: “MOTOR RUN TIME 15 MIN” Message from GSM to user (motor running time).

Step 7: “MOTOR OFF” Message from user to GSM (motor off).

Result

Proteus Model of the Proposed System:

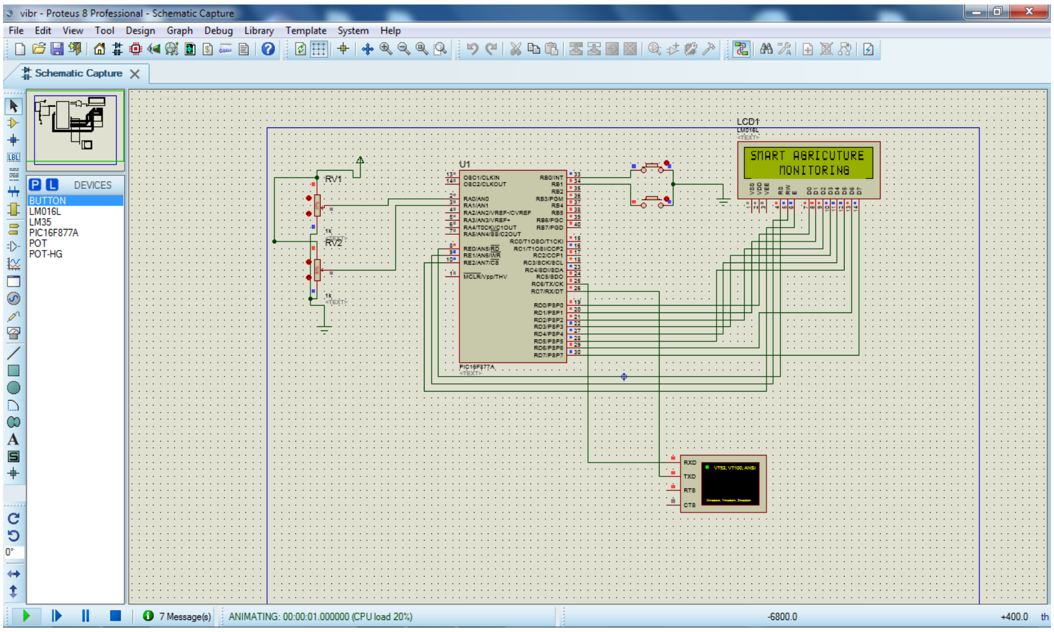

Figure 4. Title Display of the proposed system.

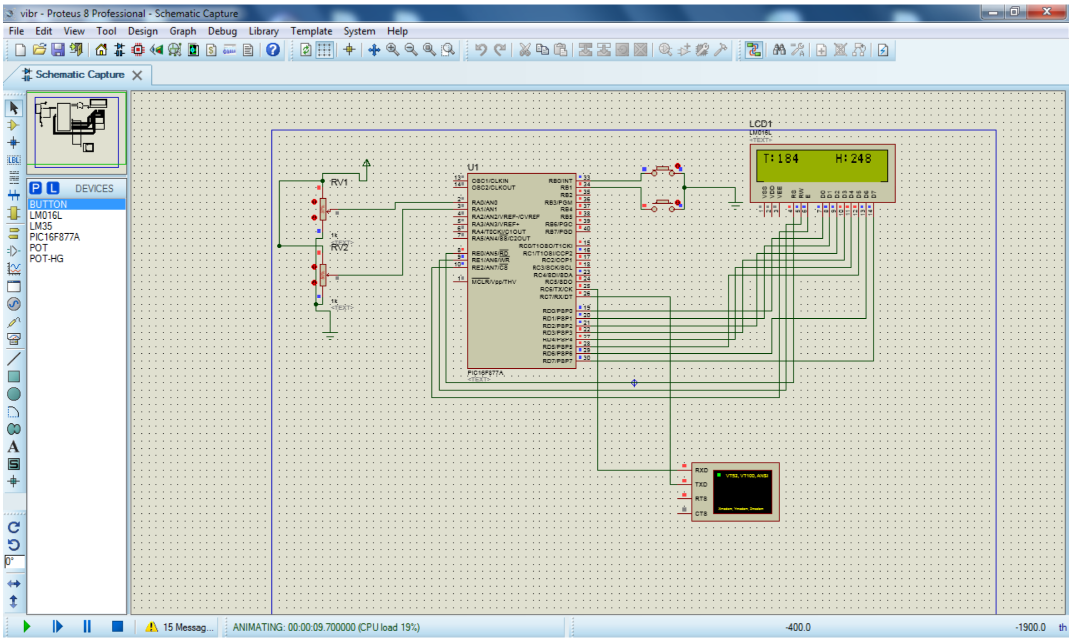

Figure 5. Simulation Results of Temperature and Humidity value.

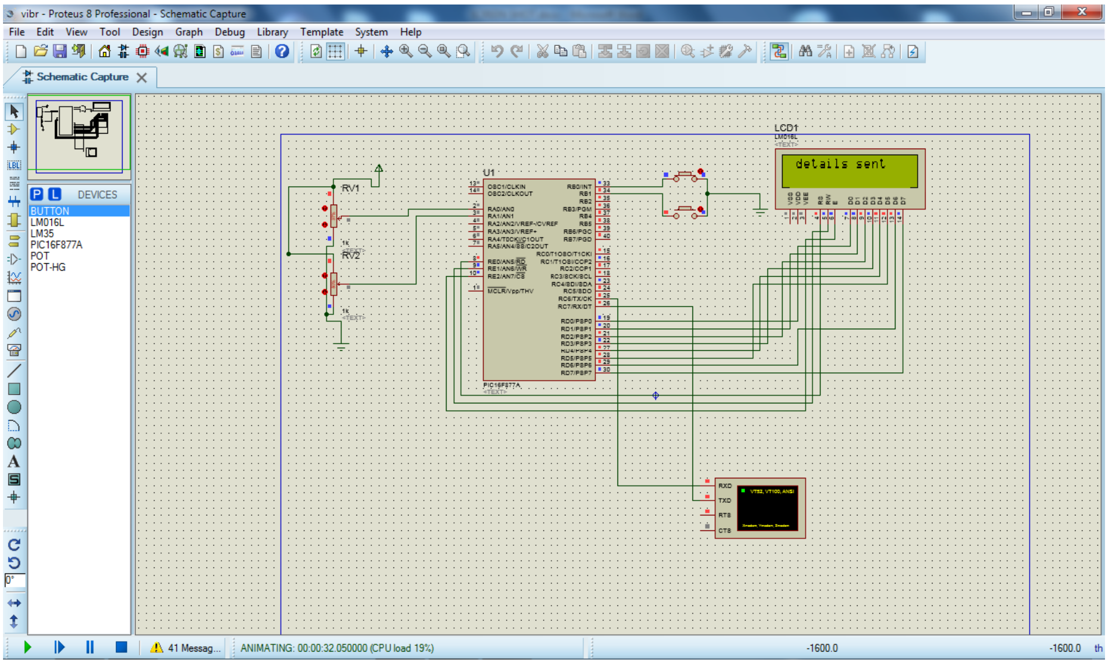

Figure 6. Data from GSM module to user mobile.

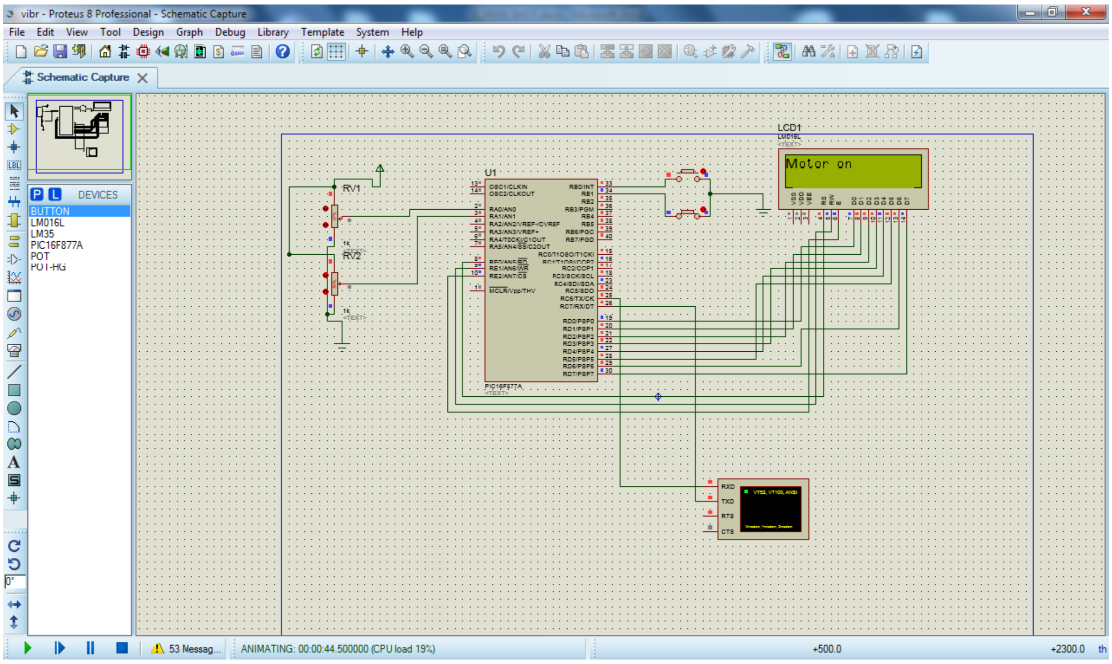

Figure 7. Motor in ON condition status.

Figure 4 shows that the working model for smart agriculture monitoring system using proteus simulation is ready. Figure 5 shows that the obtained current status of the temperature and humidity value of the soil. Figure 6 shows that the current value of the above is sent from the GSM module to the users mobile. Figure 7 shows that if the threshold values of soil moisture, temperature and humidity exceeds then the motor turns ON condition.

GSM Module and Mobile Output

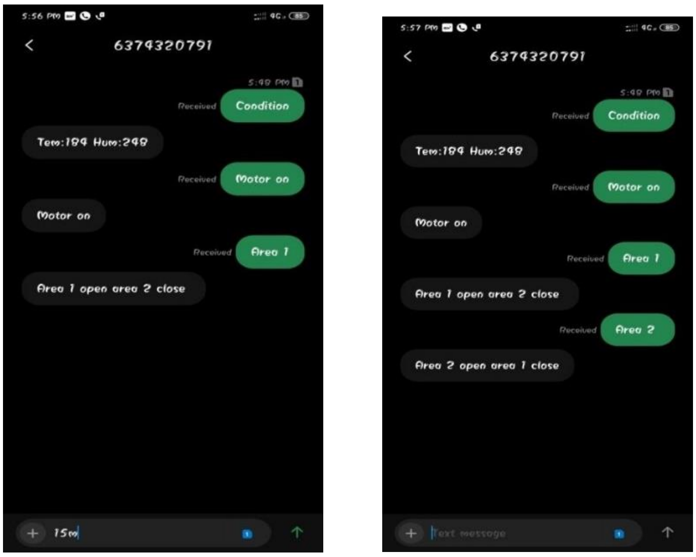

Figure 8. Water flow area.

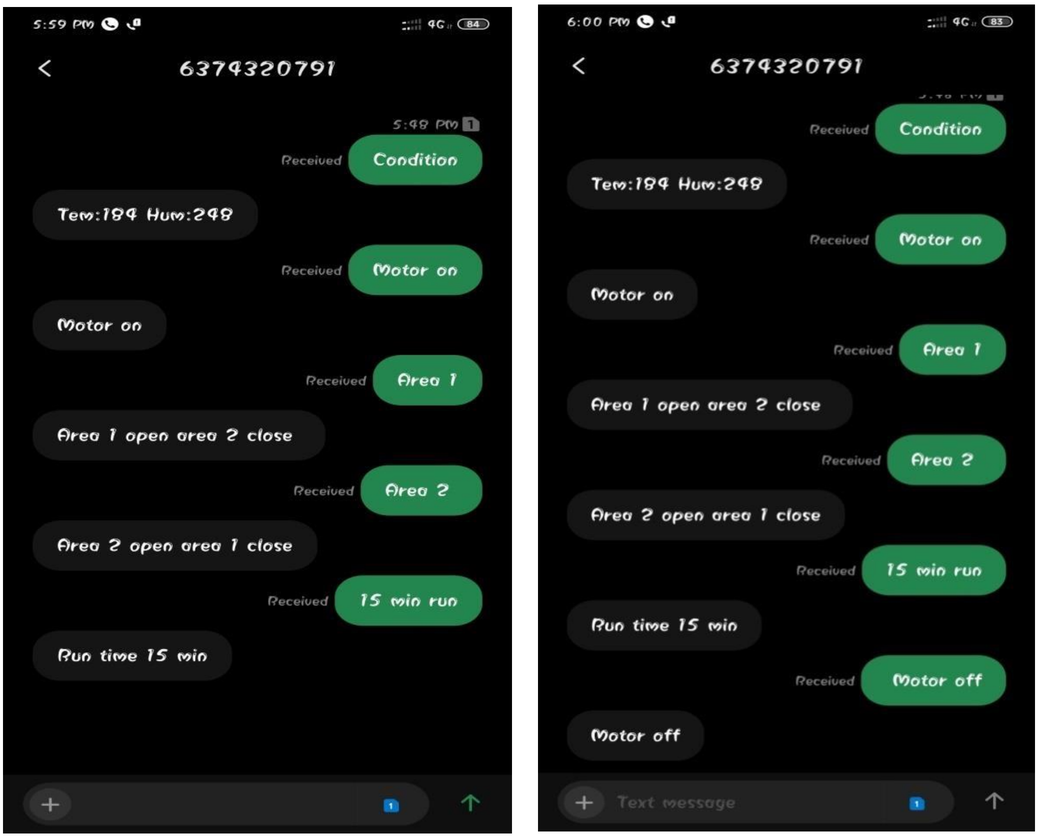

Figure 9. Run time of motor.

Figure 8 shows the motor on/off condition from GSM module to users mobile. If more than one agriculture fields are there, if the water is flowing in the first field, after enough water is supplied the value of the motor gets off and automatically the value of the motor gets on in the second field and vice versa. Figure 9 shows the run time of the motor in field 1 and field 2 and if the motor gets off then the message is sent to the farmers mobile also.

Conclusion

The Automated Irrigation System based on microcontroller controls and monitors all the drip irrigation system activities efficiently. The proposed System is a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production and it is a precise simple method of irrigation. The proposed system helps in automatic adjusting of moisture levels; time saving that leads to good profit for farmers. The values of temperature and humidity is captured by sensors send it to cloud server which is centralized and gets processed. Moreover, the information about their farm is managed by farmers and also can interact with drip irrigation from their mobile devices. The advantages of this proposed system are through nozzle the distribution of water is done and only the water is supplied to the necessary area.

Thank You!