

Microcontroller Based Power Generation from the Agricultural Field

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Abstract-- Agriculture is the main source of livelihood of people. It provides food as well as large employment. So, modernization of agriculture can boost up the crop yield and also helps in making agriculture simple, automatic and effective. Indian agriculture is dependent on the monsoons which is not a reliable source of water. Therefore there is a requirement of an automatic irrigation system which can provide water to the field according to their soil types. These requirements made us to come out with this project. This project initially test the moisture content of the soil, using analog soil moisture sensor whose output will be fed as an input to the microcontroller. The Microcontroller will play a major role by turning the motor ON or OFF based on the analog soil moisture sensor's output. When the motor is turned on by the microcontroller, it will pump the water from the ground. The pumped water is stored in the tank. The GSM module helps in sending a message to the farmer about the condition of the motor. The water when reaches the outlet of the tank, will rotate the turbine and thus the motion of turbine will help us in generating power based on the hydro electric power generation principle. Thus with the help of this project, many youngster can adopt agriculture with the latest technologies.

Keywords-- Analog Soil Moisture Sensor, PIC16F877A Microcontroller, GSM modem, Motor, Turbine, Power Generation.

I. INTRODUCTION

This project ensures that water is distributed to the field based on the moisture content of the soil. The Analog moisture sensor helps in checking the moisture content of the soil and its output will be fed as an input to the microcontroller. The PIC microcontroller will act according to the sensor's output. If the sensor's output match the required moisture value, then the motor will remain turned off and if the sensor's output does not match the required moisture value, the motor will be turned on. When the motor is turned on, it will pump the water into the tank. When the water flows, it will rotate the turbine placed at the outlet of the tank. Thus the motion of turbine can be utilized for power generation from the field, based on the hydro electric power generation principle. The generated power can be stored and used for home appliances. Thus the agricultural field can

be made fully automatic with the help of microcontroller.

Since we are depending on machines, every stage will be reported to the farmer of the field with the help of GSM modem and additionally farmer will be given multiple choices on his mobile phone. Thus the farmer can control the field at every stage by selecting the required option.

II. ARCHITECTURE DESIGN

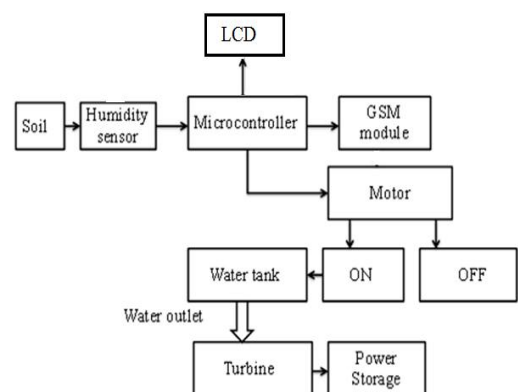


Fig.1 System Block Diagram

As shown in the fig.1, the PIC16F877A microcontroller will play a major role by controlling and communicating with GSM as well as all other interfacing modules.

III. DESIGN METHODOLOGY

In this project, overall steps that are taken to be carried out to successfully achieve the objectives are:

- i. Testing the Analog Moisture Sensor Module.
- ii. Choosing a Microcontroller.
- iii. Interfacing the Analog Moisture Sensor with the Microcontroller.
- iv. Testing of LCD (Liquid Crystal Display) with the Microcontroller.

- v. Testing of Relay for water motor control.
- vi. Testing of turbine.

IV. FLOW CHART

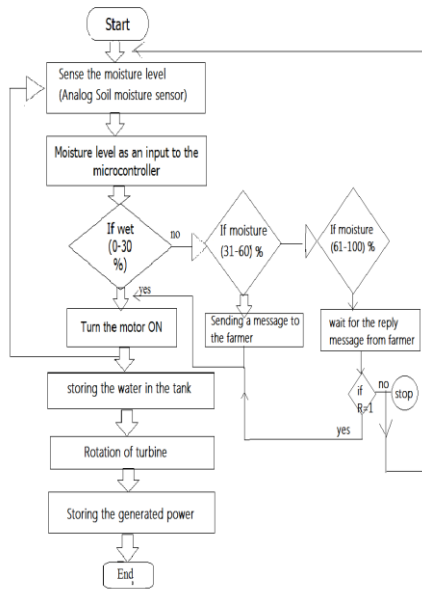


Fig 2. Flow chart

The above Fig 2. Flow chart describes the flow method of this project.

V. DESCRIPTION

A. Analog Soil Moisture Sensor

The analog soil moisture sensor can be used to test the moisture of the soil. The analog soil moisture sensor has copper plate netting coated over by plastic coating. The copper has high conducting capacity. Thus the copper plate will conduct the analog signal from the soil. The output analog signal represents the moisture level in the soil. This moisture level will be converted to percentage and will be displayed in the LCD screen with the help of PIC microcontroller.

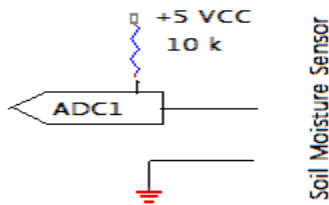


Fig 3 Analog Soil Moisture Sensor

B. PIC16F877A Microcontroller

PIC (Peripheral Interface Controller) is capable of encoding 5 instructions per second or 0.2 microseconds for an instruction. Thus PIC has high operating speed, instruction set simplicity, input and output port (I/O) expansions and an inbuilt ADC. Because of the inbuilt ADC, PIC reduces the complexity of the circuit as there is no need to design a separate ADC block.

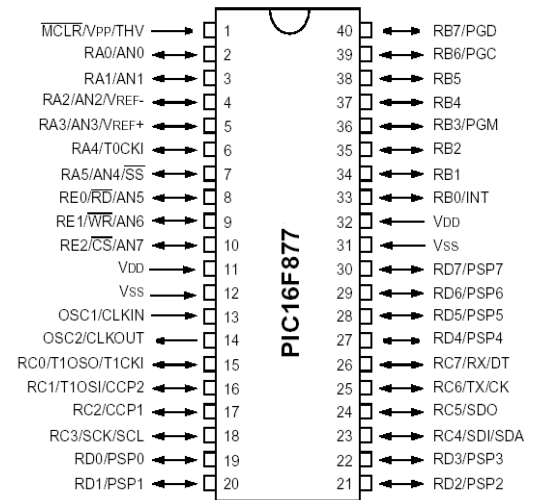


Fig 4 Pin Diagram of PIC 16F877A

C. GSM Module

GSM (Global System for Mobile Communication) is capable of operating at various set of frequencies. It is very compact in size. GSM interface module has an inbuilt SIM (Subscriber Identity Module) card holder. So it can be interfaced to the Microcontroller and thus it makes communication much easier between the farmer and field.

D. Motor

Motor device used to pump the ground water. The pumped water will be stored in the tank and then it can be supplied to the field whenever required.

E. Turbine

Turbine is a fan like structure which will be placed in the outlet of the tank. The turbine will be rotated by the water when it flows out from the tank. The motion of the turbine will be utilized for the power generation.



Fig 5 types of water turbine

F. Power Generation and Storage

The generated power will be stored in the battery and can be utilized for home appliances.

G. Relay Switch

Relay is an electronic device, typically incorporating an electromagnet, which is activated by a current or signal in one circuit to open or close another circuit. Relay is capable of interconnecting two or more devices in a single network. In this project, Relay is used for connecting the water motor and the microcontroller.

H. LCD

LCD is the Liquid Crystal Display used to display the values. In this project we use 16 x 2 LCD displaying the value in the screen. It has 16 pins. It supports 16 characters per rows and total number of rows is 2. This LCD will be interfaced to the microcontroller and so the LCD will be display the output of the microcontroller i.e. the moisture level in terms of percentage.

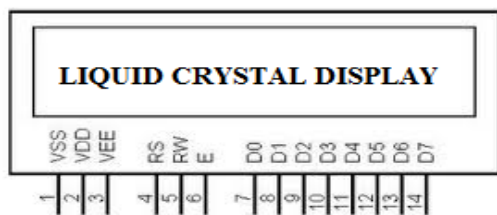


Fig 6 Pin diagram of LCD

VI. ADVANTAGES OF THE PROJECT

- i. Agriculture will be made simple and automatic
- ii. Continuous monitoring of the field by the farmer
- iii. Generated power can be utilized for home application
- iv. Protection of crops from excess flow of water

VII. RESULT

The proposed project will follow the procedure: The analog soil moisture sensor will measure the moisture level from the soil. The measured moisture level will be fed as an input to the microcontroller. If (moisture>0 && moisture<=30) then the moisture level will be displayed as “Low” in the LCD unit and the motor will be turned on automatically. And if the (moisture>30 && moisture<=60) then the moisture level will be displayed as “Normal” in the LCD unit and it will be reported to the farmer of the field using GSM modem and he will be given option to either

turn on or off the motor. If the (moisture>60) then the moisture level will be displayed as “High” in the LCD unit and it will be reported to the farmer of the field using GSM modem and he will be given option to either turn on or off the motor.

When the motor is in turned on, it will pump the water into the tank. When the water flows out from the tank it will rotate the turbine. The motion of the turbine is utilized for power generation. The generated power will be stored in the battery and can be used for future applications.

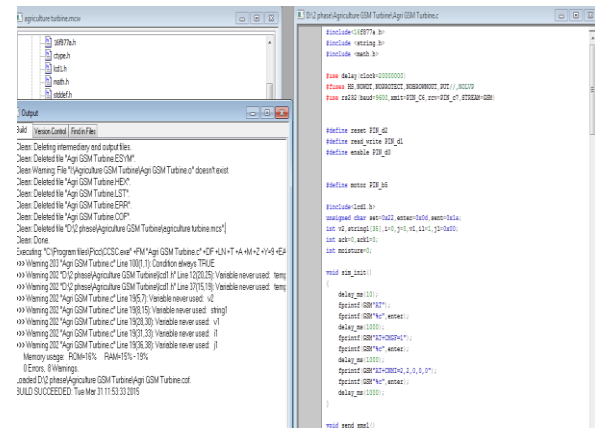


Fig 7 Snapshot of the verified coding

VIII. CONCLUSION

The system designed will make Agriculture fully automatic and very simple and effective. This system will maintain an optimum water distribution in the field. So, it provides better crop protection. The system is controlled with the help of a PIC microcontroller. The farmer will be given the message at every stage of the process. Thus this design will be farmer friendly and it also helps the farmer to take decisions even when he is far apart from the field. The power generation part will help the farmer much better. The generated power can be utilized for the home applications. This technique can help the farmer’s in the rural areas.

IX. REFERENCES

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