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Embedded Based Solar Power Auto Irrigation System

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ABSTRACT:The main objective of this project is to provide an auto irrigation system to sense the soil moisture level. And this level of sensing is done by a soil moisture sensor which detects the moisture level and also provides moisture level to various crops in a controlled manner. When the moisture of the soil is decreased below a certain level then the sensor sends the detected value to the microcontroller. According to the value that is sensed by the sensor, the water is supplied to the crops automatically to the desired level to maintain the moisture content in the soil. This project aims to reduce human intervention (farmers) and use solar energy which is one of the renewable sources for irrigation purposes. The overall system is controlled by the PIC microcontroller. The moisture of the soil is sensed and based on which the motor operation takes place. The working status of the electric motor is monitored using an LCD. This system is environment-friendly and cost-effective.

KEYWORDS:Embedded system, PIC microcontroller, moisture sensor, water pumping motor

I. INTRODUCTION

An irrigation system requires water in a large quantity based on the requirement. Most frequent watering of plants is needed and to be monitored regularly. In today's scenario, the technology can be utilized for monitoring purposes and automatic watering in irrigation. The automation can be achieved using an embedded controller very low cost. The entire system can be solar powered to make the system environment friendly because solar energy is a widely available energy source on the earth. Solar power is good in the view of the economy and also an environment-friendly form of energy. Nowadays this energy is used in street lighting and other domestic loads. In today's life due to advanced technologies, the cost of solar panels is decreased. One of the applications of solar energy is in the irrigation system. In India there is a major problem with energy, therefore solar energy is the best solution for the Indian farmer.

In this model, the solar energy is harvested through the solar panels and the electrical energy is obtained which is stored in the battery and used whenever necessary. The Functional block diagram is shown. The working of the system is based on the moisture content of the soil. To achieve this Moisture sensor is placed. Whenever the moisture content of the soil is less or it is completely dry, the sensor gives the signal to the embedded microcontroller, Controller gives the signal to the Relay which switches the motor ON. The LCD also is shown with the motor ON status on its display. The frequent sensing of soil moisture takes place and as soon as the soil gets wet and moisture is sensed by the sensor the signal is passed to the controller which turns off the relay which intern switches OFF the motor.

II. EXISTING METHOD

- A proper method is to be implemented for the irrigation system because of the lack of rain and scarcity of water in the soil. The agricultural field always needs and depends on the water level of the soil.
- But continuous extraction of water from soil reduces the moisture level of the soil to avoid this problem planned irrigation system should be followed.
- Improper use of water leads to the wastage of a significant amount of water.

III. PROPOSED METHOD

- The system uses a solar energy panel to energize the system and a soil wet detector to sense the water level for crops. Solar energy is employed solely as of the supply of power to regulate the system. Constant voltage from solar energy holds on to 12V Battery is employed to work the PIC microcontroller, microcontroller act as an impression circuit to regulate the method.
- It has twenty-eight pins IC every pin is connected for various operations; the soil wet detector is lordosis within the soil to sense the wetness worth.
- Soil wetness worth for various crops is chosen by LCD show, programming for crop choice and various wetness worth square measure programmed within the PIC microcontroller.
- The signal from the microcontroller to the 12V relay is operated on/off the motor pump.
- Water flows from the pump depends upon the signal from the PIC microcontroller. The PIC microcontroller controls the total system. Once the soil wet detector senses the low level of the soil wet then a symptom is distributed to the microcontroller then the controller check for the condition given within the program.
- The irrigation is machine-controlled with a Soil wet detector and therefore the relay unit. Once the soil wet is low then a symptom sends to the relay to modify ON the motor and once the soil is wet then the motor is in OFF condition. Relay offers the ON/OFF condition to the motor. The complete system is powered by solar array energy. Once the system uses alternative energy then the power will be preserved.

IV. CIRCUIT DESCRIPTION

- The circuit diagram consists of the components of core components of solar panel, rechargeable battery, relay, PIC microcontroller, water pumping motor, buzzer indication, LCD, moisture sensor, IC LM358.
- Electromechanical relay to be activated Water pumping motor. It's connected to a 12V supply then controlled by a PIC microcontroller device.
- Moisture sensor connected to LM358 IC and controlled by PIC microcontroller.
- Display the values by using LCD and buzzer used indication purpose.
- LCD has 8 connections. VCC connected to positive and GND connected to negative, D2, D3, D4, D5, D6, D7 are connected to RS, E, D4, D5, D6, D7.

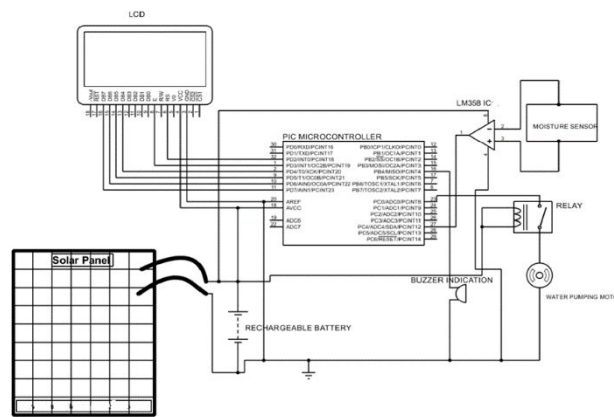


Figure 4.1: Circuit Diagram

I. PIC Microcontroller

PIC (Programmable Interface Controllers) microcontrollers are unit the world's smallest microcontrollers that may be programmed to hold out an enormous variety of tasks. These microcontrollers are unit found in several electronic devices like phones, laptop management systems, alarm systems, embedded systems, etc. numerous kinds of microcontrollers exist, even supposing the simplest are unit found within the djinni vary of programmable microcontrollers. These microcontrollers are unit programmed and simulated by circuit-wizard software system



II. Architecture

PIC microcontroller was developed in the year 1993 by chip technology. The term PIC stands for Programmable Interface Controllers. Initially, this was developed for supporting PDP computers to control their peripheral devices, and so, named as a peripheral interface device. These microcontrollers square measure in no time and easy to execute a program compared with completely different microcontrollers. PIC Microcontroller style depends on Harvard style. PIC microcontrollers square measure extremely regarded as a result of their simple programming, wide accessibility, simple interfacing with completely different peripherals, low cost, big user base, and serial programming capability (reprogramming with flash memory), etc.

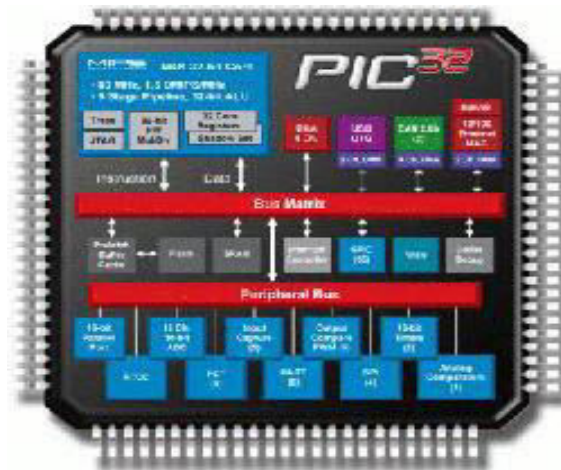


Figure 5.1: Architecture of PIC microcontroller

We know that the microcontroller is Associate in Nursing integrated chip that consists of C.P.U., RAM, ROM, timers, and counters, etc. Within the same approach, PIC microcontroller design consists of RAM, ROM, CPU, timers, counters and supports the protocols like SPI, CAN, and UART for interfacing with different peripherals. nowadays PIC microcontrollers square measure extensively used for industrial functions because of low power consumption, superior ability, and easy availableness of its supporting hardware and code tools like compilers, debuggers, and simulators.

III. BLOCK DIAGRAM

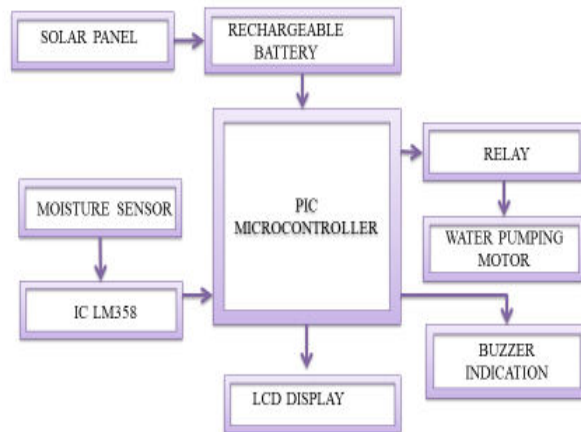


Figure 6.1:Block Diagram

V. EXPERIMENTAL SETUP



Figure 7.1:Hardware kit

VI. RESULTS



Figure 8.1: Soil in dry condition



Figure 8.2:Soil in normal condition

VII. LITERATURE SURVEY

[1] S. Harishankar, R. Sathish Kumar, SudharsanK.P, U. Vignesh and T.Viveknath, 2018, "Solar Powered Smart Irrigation System", Advance in Electronic and Electric Engineering. ISSN 2231-1297, Volume 4, Number 4, pp. 341-346, Research India Publications.

The entire system can be solar powered to make the system environment friendly because solar energy is a widely available energy source on the earth. Solar power is good in the view of the economy and also an environment-friendly



form of energy. Nowadays this energy is used in street lighting and other domestic loads. In today's life due to advanced technologies, the cost of solar panels is decreased. One of the applications of solar energy is in the irrigation system. In India there is a major problem with energy, therefore solar energy is the best solution for the Indian farmer.

[2] Kavita whole, Dimple Chaudhari, "Solar Powered Sensor Base Irrigation System" by International Research Journal of Engineering and Technology (IRJET), Volume 3, Issue 02 February 2019.

Solar power is that the conversion of energy from daylight into electricity, either directly victimization electrical phenomenon (PV), or indirectly victimization focused solar energy. Electrical phenomenon cells convert lightweight into an electrical current victimization the electrical phenomenon result. It's a crucial supply of renewable energy and its technologies are broadly speaking characterised as either passive star or active star reckoning on however they capture and distribute alternative energy or convert it into solar energy

[3] Sanjukumar, R.V.Krishnaiah, "Advance Technique for Soil Moisture Content Based Automatic Motor Pumping for Agriculture Land Purpose" by International Journal of VLSI and Embedded Systems, Volume 04, Article 09149; September 2018.

The LCD also is shown with the motor ON status on its display. The frequent sensing of soil moisture takes place and as soon as the soil gets wet and moisture is sensed by the sensor the signal is passed to the controller which turns off the relay which intern switches OFF the motor. The same status of the motor condition is communicated through Bluetooth and on the LCD

[4] "Design of small photovoltaic solar-powered pumping systems" by National Resources Conversion Service, United States Department of Agriculture, Technical Note no.28, October 2019.

The irrigation system is the one that requires water in a large quantity based on the requirement. Most frequent watering of plants is needed and to be monitored regularly. In today's scenario, the technology can be utilized for monitoring purposes and automatic watering in irrigation.

[5] Gutiérrez J, Villa-Medina J F, Nieto-Garibay A and Porta-Gándara M A ,Automated Irrigation System Using a Wireless Sensor Network and GPRS Module'.

To achieve this task, we tend to area unit creating use of a soil wetness detector and a GSM module. The soil wetness sensors are going to be placed within the sector, and that they are going to be connected to the microcontroller. The wetness detector is going to be incessantly sensing the wetness content of the soil and causing it to the microcontroller, wherever wetness content worth is going to be compared with a predefined level. Currently whenever the wetness level becomes but the predefined level, the microcontroller can send a command to activate the pump. Same time microcontroller can activate the GSM module, which can send a feedback message to the user, stating that the "Pump on".

VIII. CONCLUSION

By unendingly observation the standing of the soil, we will management the flow of water and thereby scale back wastage. Conservation of water and labour: Since the systems area unit automatic, they are doing not need continuous observation by labour. The planning is low power, low cost, small size, robust, and extremely versatile. This method avoids over-irrigation, below irrigation, soil erosion and reduces the wastage of water. By implementing this method, agricultural, husbandry lands, parks, gardens, golf courses is irrigated.

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