Original Research Paper

Agricultural Science

SOLAR POWERED ARDUINO UNO BASED AUTO IRRIGATION SYSTEM

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ABSTRACT In the field of agriculture, the use of proper method of irrigation is important because the main reason is the lack of rains & scarcity of land reservoir water. The continued extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un- irrigated land. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes waste. For this purpose; we use this automatic plant irrigation system. This type of system is often used for general plant care, as part of caring for small and large gardens. Normally the plants need to be watered twice daily, based on moisture content. The project is designed to develop an automatic irrigation system which switches the pump motor ON/OFF on sensing the moisture content of the soil. In the field of agriculture, the use of proper method of irrigation is important. The advantage of using this method is to reduce human intervention.

KEYWORDS : Embedded system, Solar Panel, Voltage Regulator, Soil moisture sensor and irrigation

I. INTRODUCTION

Irrigation has essentially been used since humans first began cultivating plants. Any sort of cultivated plant requires water in order to grow and thrive. In many instances, rainfall is not sufficient to achieve this goal. In other instances, an area may experience short or prolonged periods of drought. Irrigation works to get around these problems. Irrigation systems are also used for cooling livestock, dust suppression, disposal of sewage, and in mining. Irrigation is often studied together with drainage, which is the removal of surface and sub-surface water from a given area. Irrigation has been a central feature of agriculture for over 5,000 years and is the product of many cultures. Historically, it was the basis for economies and societies across the globe, from Asia to the Southwestern United States.

In the mid 20th century, the advent of diesel and electrical motors led to a system that could pump ground water out major aquifers faster than drainage basins could refill them. This can lead to permanent loss of aquifer capacity, decreased water quality, ground subsidence, and other problems. Apart from all these there has been an evolution in the methods to perform irrigation with the help of technology, which leads to increase efficiency and accuracy. World moving towards automation, in agriculture filed too moving toward an auto irrigation system. A lot of research happened previously for auto irrigation[]. In this paper the solar energy is used for the primary source to control the water pumping system. The prototype model evaluates the proposed model.

II. ARDUINO SOFTWARE IDE

The Arduino IDE is a cross platform, application written in java which is derived from IDE make for processing programming language and writing the projects. It is designed to introduce programming to artists and other newcomer unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching and automatic indentation, it is also capable of compiling and uploading programs to board with a single click. There is typically no need to edit or run programs on command line It connects to the Arduino hardware to upload programs and communicate with them. Software written using Arduino are called 'sketches'. Arduino IDE comes with a C/C++ library called "wiring", which make command input or output operations easier.

BASIC METHOD OF UPLOADING:
- Connect your Arduino using the USB cable. ...
- Choose Tools → Board → Arduino Uno to find your board in the Arduino menu.
- Choose the correct serial port for your board. ...
- Click the Upload button.

III. PROTEUS DESIGN SUITE

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation (EDA). The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. It was developed in Yorkshire, England by Lab center Electronics Ltd and is available in English, French, Spanish and Chinese languages. It was initially released in 1988.

A. Product Modules:
The Proteus Design Suite is a Windows application for schematic capturing, simulation, and PCB layout design. It can be purchased in many configurations, depending on the size of designs being produced and the requirements for microcontroller simulation. All PCB Design products include an auto router and basic mixed mode SPICE simulation capabilities.

B. Microcontroller Simulation:
The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. This enables its use in a broad spectrum of project prototyping in areas such as motor control, temperature control and user interface design. It also finds use in the general hobbyist community, and, since no hardware is required, is convenient to use as a training or teaching tool. Support is available for co-simulation of:
- Microchip Technologies PIC10, PIC12, PIC16, PIC18, PIC24, ds PIC33 Microcontrollers.
- Atmel AVR (an Arduino), 8051 and ARM Cortex-M3 Microcontrollers
- NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 Microcontrollers.
- Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 Microcontrollers.
- Parallax Basic Stamp, Freescale HC11, 8086 Microcontrollers.

C. PCB Design:
The PCB Layout module automatically gives connectivity information in the form of a netlist from the schematic capture module. It applies this information, together with the user specified design rules and various design automation tools, to assist with error free board design.

D. 3D Verification:
The 3D Viewer module allows the board under development to be viewed in 3D together with a semi-transparent height plane that represents the boards enclosure. STEP output can then be used to transfer to mechanical CAD software such as Solid works or Autodesk for accurate mounting and positioning of the board.

IV. CIRCUIT DIAGRAM
A. POWER CIRCUIT
The circuit diagram of the power circuit of our project is shown in Fig. 1

Fig. 1 Power Circuit
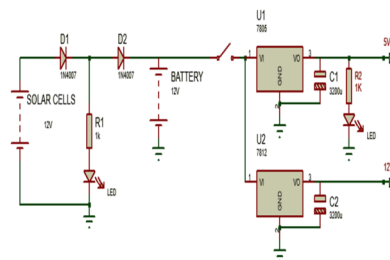
B. CONTROL CIRCUIT

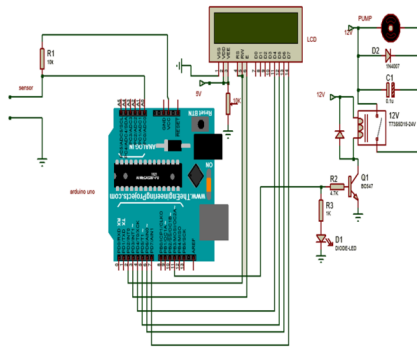The control circuit of our project is shown in Fig. 2

Fig.2 Control circuit

V. WORKING

In this project we make use of solar panels as source, we obtain 12V from the solar panel and it supplied to recharge a battery through diode for reverse blocking of supply. It charges 12V battery and it is given to 7805 & 7812 voltage regulators the output of the voltage regulators is 12V and 5V which is used for powering the Arduino, LCD and motor pump, that is shown in Fig. 2.12.

Arduino powers the Soil moisture sensor that will be inserted in soil and it gives a signal to relay to make the pump ON/OFF. Soil moisture sensor gives output based on the conduction between the electrodes of it. If it has conducted between them, it gives the signal to make pump off through Arduino. If it has no conductivity it doesn't give any signal so the pump will be on condition.

VI. RESULTS AND DISCUSSION

As we have got the result of our project, If the value is less than 512 then the motor will be in ON condition. If values greater than 512 then motor will go to OFF as we designed in source code. The overall Kit result will be displayed in Fig. 3. The prototype test system results show that the proposed model performs the task in an effective manner, and reduces the human effect and also reduces the cost of the electricity. Compare with the other proposed techniques, this technique can be used in any remote locations where the electricity not available.

Fig 3. Prototype model of the test system

VII. APPLICATIONS

The major applications are listed below:
- By implementing proposed system, there are various benefits to both governments as well as farmers. For the government solution to the energy crisis and water shortage is proposed.
- The main application of the proposed system is for irrigation of agricultural fields.
- Even we can apply this system in agricultural research stations, the greenhouses where high precision soil moisture control is required.
- Use of solar energy in the proposed system allows us to use this system in remote areas where electricity is not available.

VIII. CONCLUSION AND FUTURE SCOPE

In this paper, a solar powered sensor base automated irrigation model is proposed. We designed this model considering low cost, reliability, alternate source of electric power and automatic control. As the proposed model is automatically controlled, it will help the farmers to properly irrigate their fields. The model always ensures the sufficient level of water in the soil. Thus, this system avoids over irrigation, under irrigation, top soil erosion and reduce the wastage of water. Solar power provides sufficient amount of power to drive the system. To overcome the necessity of electricity and ease the irrigation system for our farmers, the propose model can be a suitable alternative.At present this Auto Irrigation System is efficient for small fields like gardens or parks only and it can be implemented in the larger field for smart and efficient use.

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