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Smart Irrigation Using RF Technology and Solar Metering System

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ABSTRACT

This paper is based on model of AVR atmega microcontroller based irrigation system. Considering solar energy as the source of power to regulate the overall system.In the field the sensors are placed so that these sensors are sense the water level contineously and it gives indication to the farmer informing the level of water. There is no need to visit the field, farmers can get the updated about the water level without wasting their time. According to the water level, a farmer can regulate the motor by sending a message from his cellular phone even from a remote place. As the water level reaches to the peak level; the motor will automatically run there is no need of farmer to assure the proper water level in the field.

Keywords: AVR AT Mega16, GSM, Irrigation system, ,RF model, Solar panel.

I. INTRODUCTION

In many developing countries such as India ,where Agriculture is the main source of National Economy but in reality what happened this countries are fails to make the proper use of agriculture resources because as they are totally depends upon the rain . The present scenario is that many developed countries using the different irrigation system to reduce the dependency of the rain and mostly some irrigation system which are actually regulated by the electrical power and manually ON/OFF scheduling controlled. Farmers generally observe the soil, crop and weather condition by visiting the sites and then control the electric motors as per requirement. Generally this manually controlled irrigation system cannot able to give the proper level of water in the sites. Their is lack of electricity and mismanagement in the controlling scheme manually sometimes the field get dry or sometimes flooded with the excessive water. These unplanned and not properly manually controlled irrigation system also reason of a significant amount of water waste. In the smart irrigation system the system is usually design to make sure that level of water is proper for the growing up the plants through all the seasons. Even as the farmer s are away from the field these smart irrigation system always ensure that the proper level of water in the sites. with the help of smart irrigation it also provides the water usage efficiency by regulating the soil moistures at optimum level with the new generation technology in water saving automation and irrigation is going to be more popular in the farms .

In previous year many of the irrigation system which are run by electricity with their highly efficient automated hardware are with fixed rated. These models are highly expensive because those were made of such an expensive devices. this is added in the disadvantage due to higher cost , some ordinary farmers cannot afford for their use; generally these models are mainly required in the farms only for the special purpose or for the experiment on demonstration purpose which is controlled or funded by government or any other private organization or enterprise.

In spite of the manual operated irrigation system, the variable rate smart and automated controlling approach improves the overall efficiency of the irrigation system reducing the cost and increases crop production .Hence, less cost, for the design of the smart irrigation system the various source of electricity and variable automated operation are the keys for ordinary farmers.

In this paper, we propose a solar power controlled smart irrigation system. Sensors collect the information about the water level of paddy fields and update the farmer as well as AVR at mega 16 microcontroller. The farmer can regulate or switch ON and OFF the motor based on the water level even from distant places using a cell phone Using DTMF Technology.

II. PROPOSED MODEL

A complete block diagram of proposed smart irrigation system is shown in Fig. 1. The system consist of solar panel battery range 12V 7805 IC, led indicator, AVR at mega 16 micro controller, L293D IC, LCD display, RF module , motor, DTMF technology.

III. HARDWARE ARCHITECTURE

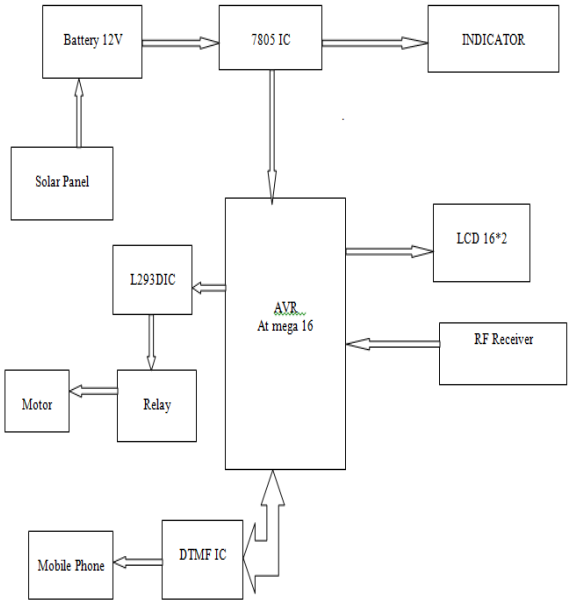


Figure 1

From the given block diagram it is shown that solar panel are placed which gives the solar energy from the sun in the dc form , this energy is then stored in battery . The battery which is used in this system is 12V. This 12V battery is charged and gives the supply of 12V to the system but we required 5V for the operation. All the voltage source are fails to give the fixed output voltage, it is necessary for some system to give the fixed constant and steady output voltage hence it is necessary to implement the voltage regulator hence we placed 7805IC. The 7805IC is voltage regulator IC. The 7805 IC contains 3 pin pin1 is input the function of this input pin is to give input voltage it should be in the range of 7V to 35V as we are applied unregulated voltage to this pin, pn 2 is connected with the ground this pin is equally neutral for input and output, pin 3 is give the output voltage it has some several application such as -

1. it is current regulator IC
2. it is also regulated dual supply
3. it is fixed output regulator
4. it is adjustable output regulator

Components used in Hardware

1. LM7805 Pinout Diagram

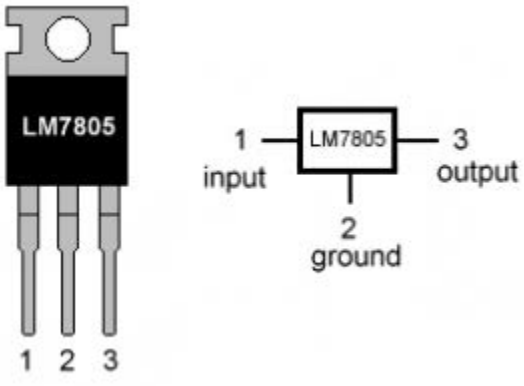


Figure 2. LM7805 Pinout Diagram

The main operation of the 7805IC is whatever the input is given to the supply side or input side it will give only 5V. This IC will give the indication by LED blinking whether the motor is ON or OFF.As if motor is ON is on the LED will glow or if the motor is off LED will not glow.

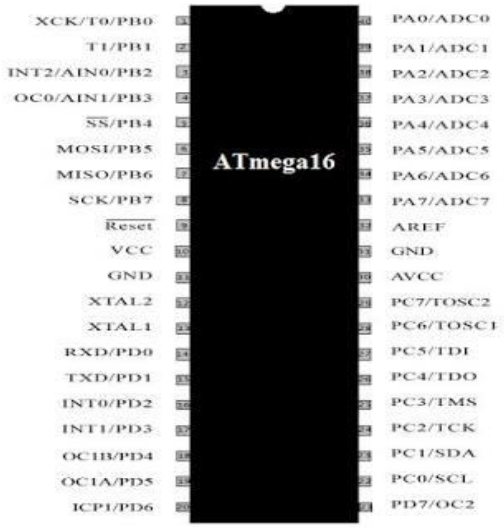


Figure 3. AVR atmega 16 microcontroller

AVR atmega 16 is main device of all the system as it is also the brain of the whole device to run this whole system we required AVR atmega 16 microcontroller, we can use many other microcontroller but with many advantages such as there is no need of crysteline function in AVR we prefer AVR atmega 16.AVR atmega 16 have several features such as 131 powerful instruction most in single clock cycle execution , it has fully static operation it has 32*8 general purpose working registers, it has 4 PWM channels , it has programmable serial USART, it has Master/Slave SPI serial interface, it has on chip analog comparator.

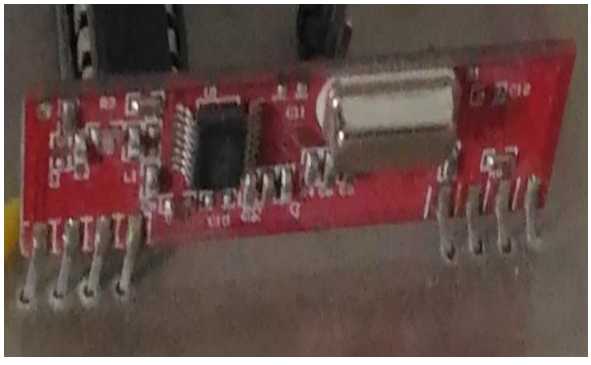


Figure 4. RF technolgoy

The wireless system contain two constrains. it is necessary to operate at specific distance and it has to transfer some information at specified data rate. The RF technology is very tiny in size and having a wide range operating range upto 3V to 12V. it have some several features such RF receiver having frequency range of 433MHz, it has receiver typical frequency 105Dbm , it supplies upto 3.5 mA current, it consumes low power , The RF receiver operate in 5V. Similarly the RF transmitter frequency range upto 433.92 MHz. It is also having small voltage supply range upto 3V to 6V , it gives output power upto 4V to 12V. It has some several application such as

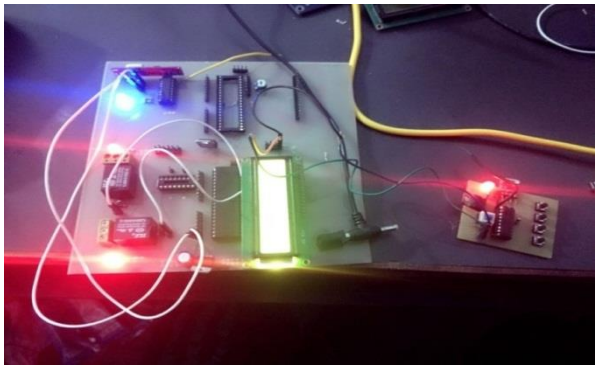
1. it is used in Remote control system
2. it is also applicable in car alarm system
3. it is applicable in sensor reporting
4. it is widely used in automation system

RF receiver is a radio frequency receiver it is an electronic device which is used in this system which is connected to AVR atmega 16 micro controller. It is necessary to communicate between the two devices hence RF receiver is playing a vital role in the irrigation system .The RF technology incorporates transmitter and receiver.

The working of RF technology is very simple as when there is water is spread over the farm RF receiver transmits the data to the receiver at AVR atmega 16 micro controller. Where the microcontroller will receive the message from the RF receiver and the motor will stop. RF communicate with microcontroller.

Figure 5. Hardware LCD display.

Various componenmts used in hardware main circuit



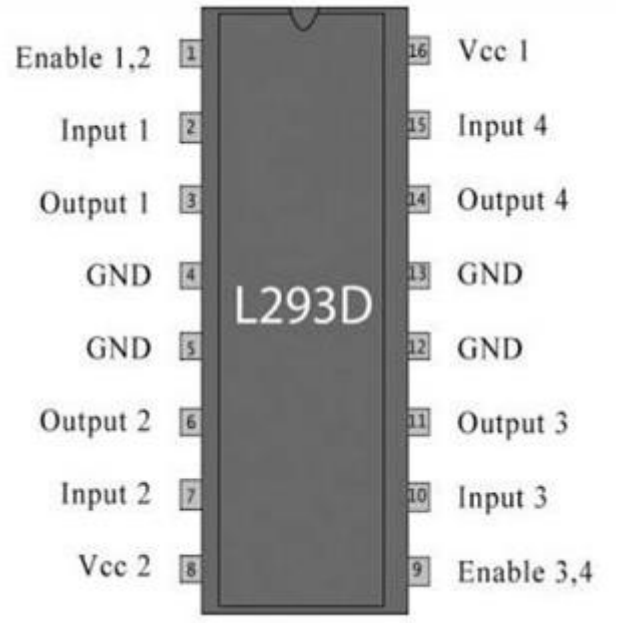


Figure 6. L293D IC

L293d IC is motor driver IC it is connected between the AVR at mega 16 and motor the output of the IC is connected to the motor and input of the IC is connected with AVR at mega 16 microcontroller as shown above in block diagram as this IC is capable of handling the two dc motor simultaneously, this IC is used to control the low current rated motor , L293d IC consist of 16 pin in which 4 are ground pins, 4 are connected with inputs , similarly 4 are connected with the output two are enable pins and two are voltage pins.

The L293D IC is work with heavy current hence there is possibility of flowing high current and hence there is chance to IC gets heated hence we required a heat sink decrease the heating therefore we required 4 ground pins there is huge metallic area between grounds to release the heat. As there is only 5V supply is connected with micro controller hence there is low voltage is applied and hence the current is also low. As the microcontroller required a small amount of current to operate but the motor required high current and voltage, thus the current cannot be supplied to the motor from the AVR at mega 16 hence we placed L293D IC this is the first need of motor driver IC.

DTMF is dual tone multi frequency in this system we are using DTMF technology. In the farm we are placing sensors in every yard the field is too large usually several hundreds of hectors hence we are placing some sensors to cover all the area. with help of DTMF technology the sensors will sense the water level whether it is dry or wet and it will give the message to the farmer to give the information about the condition with help of DTMF technology. After receiving the signal AVR atmega 16 microcontroller will send a message from cell phone, the farmer will regulate the motor by sending the code to the microcontroller.

The cell phone consist of optocoupler which is connected with keypad of the cell phone. the AVR atmega 16 microcontroller take the message from the farmer as he wants to start the motor or not, if the farmer wants to start the motor he will send the

message to the 0 microcontroller, and the motor will start. DTMF having several advantages as the farmer can control the motor from anywhere, there is reduction in wastage of electricity if the farmer forget to switch of the motor and it has very low cost.

IV. WORKING OF PROPSED CIRCUIT

In India there are many villages in which the problem of load shading is normal and thus farmers are facing many problems. The power is not available at every time. In this paper there are two modes such as automatic and DTMF modes. In automatic mode we first check water is available in tank or not then check the moisture level in soil. There are two sensors are used S1 and S2 there are upto 16 sensors can be implimented. If moisture is available the motor is off if there is no moisture is available then motor is on and countinously check the moisture.

In DTMF mode first check the water level in tank, then check the moisture level in soil it will check the on and off signal from farmer by using Call or DTMF IC. If signal is on then motor will on or start. Then check the moisture level continity upto moisture is greater than set moisture, if moisture is greater than set moisture then off the motor automatically.

V. CONCLUSION

In this paper smart irrigation model is successfully proposed and implemented using different circuits it is demonstrated with different figures, for consideration of the reliability, low cost, efficiency and wastage of electricity and as option for electric power we implemented the smart irrigation system. A in this paper we proposed model which is automatically control which is helpful to the farmers to irrigate the farm properly. This model will gives the proper indication whether the sufficient amount of water is provided or not it will also reduce the wastage of water. Farmer can operate the motor or regulate the motor by cell phone from anywhere. We are using the non conventional energy source hence there is no wastage of electricity, farmers do not depends upon the electric supply.

VI. REFERENCES

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