International Journal of Scientific Research and Management Studies (IJSRMS)
ISSN: 2349-3771 Volume 3 Issue 5, pg: 203-209

SMART IRRIGATION SYSTEM USING GSM AND SOLAR PANEL

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ABSTRACT
Agriculture plays a key role in the life of farmers. So proper amount of water and power supply is required for efficient plant growth. So here we have automatic plant irrigation system which consists of solar modules, various sensors etc. Solar modules are devices that cleanly convert sunlight into electricity and offer a practical solution to the problem of power generation in remote areas. Solar power is used as only the source of power to control the overall system. Sensors are placed on the paddy field and these sensors continuously sense the water level and give the message to the farmer informing the water level. Without visiting the paddy fields, farmers can get the information about the water level. Based on the water level, a farmer can control the motor by sending a message from his cellular phone even from a remote place. However, if the water level reaches to the danger level; the motor will automatically start without confirmation of farmer to ensure the proper water level in the field.

KEYWORDS-*GSM, Rain sensor, Soil moisture sensor, Pump, Relay.*

I. INTRODUCTION

Agriculture is the backbone of Indian Economy. Because without agriculture life is impossible since it is the main source of food for us. The farmer has to toil himself to produce the crop which brings him little revenue, so he has to try some other options for his sustenance, also today the availability of labor for carrying out agricultural activities is less, therefore the automation in agricultural process is needed. Thus this paper has proposed a system so that even after devoting less time to the field, the farmer can carry out his agricultural activities efficiently from remote places. In this system all the devices work on their own with the help of inputs received from the sensors which are monitoring the agricultural land round the clock and farmer can monitor whether everything is going normal or some action is needed to be taken. The entire process is controlled and monitored by programmable controller. There are many regions which suffer from inadequate rainfall. For such regions automation plays a key role in the world economy therefore, engineers struggle to come out with combined automatic devices in order to help humans in its activities so that the system automatically processes itself without any human intervention. So we would like to develop an automatic irrigation system.
Basically, the project consists of electrical part and mechanical part. The electrical part consists of photovoltaic, which is used to generate electrical power and the power is stored in the rechargeable battery. The mechanical part consists of pump, which is used to pump out the water from the water source. The parameters in the project are soil humidity condition, water level condition, the position of the Sun. The solar system is used to generate the power and it provides the power to the entire system as the solar system is much cheaper than the electrical system. It is suitable to the rural area that is why the solar system is used as a power supplier to replace DC motor electricity source. It is a versatile source of renewable energy that can be used in any application. The system consists of

hardware and software and, finally, the integration of the two parts to provide the results. The hardware system consists of the sensors, and drivers. In hardware design, we need all the components that are necessary to accomplish the project, and these components are solar panel, DC water pump motor, sensors.

II. LITERATURE SURVEY

Y. P. Patil [1]: In this paper author proposed the automatic system based on ARM and for communication GSM technology is used. Automatic irrigation technique irrigated using wireless sensor network i.e. Zig-bee and internet technology. Soil moisture sensor, temperature sensors placed in root zone of plant. Soil moisture sensor sense water level and accordingly it turns OFF the motor when the water goes above the danger level and provide accurate supply to the fields. For measuring threshold values of temperature sensor and soil moisture sensor an algorithm is developed that was programmed into a microcontroller to control water quantity. To provide efficient power supply Photovoltaic cells are used. If the water level reaches at danger level, automatically motor will be turned off and it will provide notification to the farmer through GSM. Irrigation system provides adequate water supply in particular area which is real time. The system was based on ARM7TDMI core and GSM. GSM is an important part as communication between various systems occurs using GSM. GSM operate through SMS and is a link between ARM processor and centralized unit. The information send to user in the form of SMS and GSM modem is controlled with the help of standard set of AT (Attention) commands. These commands are used to control majority of the functions of GSM model. The idea was developed for improve irrigation system and reduced cost of irrigation water.

Karan Kansara [2]: In this author proposed an Irrigation Control System Using Android and GSM for Efficient Use of Water and Power. Automatic microcontroller based rain gun irrigation system in which the irrigation will take place only when there will be a need of water as a result it saves a large amount of water as it is avoiding wastage of water. Android is used for mobile devices that include an operating system. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. This application makes use of the GPRS feature of mobile phone as a solution for irrigation control system. These systems covered lower range of agriculture land and not economically affordable. The system supports water management decision, used for monitoring the whole system with GSM (RS-232) module. The system continuously monitors the water level and provide accurate amount of water required to the fields. The system continuously checks the temperature and humidity of soil in order to retain the nutrient composition of the soil so that. The system uses sensors for remote monitoring and controlling devices which are controlled via SMS using a GSM using android mobile.

Automated irrigation system uses valves to turn motor ON and OFF and these valves are operating using microcontroller. These valves are automatically turned OFF and ON depending upon the need of supply. When there is a intense need of supply these valves will be ON and when water reaches at danger level these will be OFF. The system provides essential nutrients and enrich plant growth. Field is equipped with wireless communication sensors that avails better facilitated sensor communication and covers wider field area. The main aim of this paper is to provide automatic irrigation to the plants which helps in saving money and water. The entire system is controlled using 8051 micro controller which is programmed as giving the interrupt signal to the sprinkler. A wireless application of drip irrigation automation supported by soil moisture sensors. The author further added that if different kinds of sensors (that is, temperature, humidity, and etc.) are involved in such irrigation in future works, it can be said that an internet based remote control of irrigation automation will be possible. Conserves electricity by reducing the usage of grid power and conserves water by reducing water losses.

Prof. Rupali S. Sawant [3]: In this author proposed a microcontroller based automatic irrigation system. In this paper 8051 microcontroller series is used. The system consists of soil moisture sensor, temperature sensor, humidity sensor and solar panel. On the input side there are three. Soil moisture sensor will check the moisture of the soil as per the crop which is to be cultivated. When the moisture level of the soil goes above or below the set value, it will direct the microcontroller whether it should pump the water or not. Humidity sensor will check the temperature of the surrounding. If the

temperature goes above or below the set value which is needed for a crop to grow, the microcontroller will direct the shedding to shed the entire field thereby maintaining the temperature needed by the crop for its healthy growth. The water level sensor will check whether the water in the reservoir or tank is empty or not. Buzzers are connected at the output side to get rid of birds, animals, and mosquitoes etc. This solar panel charger has no moving parts that could wear out over time. In this SIM300 is used for transfer of data from weather station. Interfacing with PIC is done with RS-232 through D-TYPE 9 pin connector. SIS is the leading manufacturers of GSM modems for lower price.

GasoreGeoffrey[4]In this author proposed The control circuit is supplied by 5 volts, when the IR transmitter transmit light beam to the IR receiver, is evidence that there is no obstacle between them. This is an indication that water have not reached the predetermined level at which the IR sensor is placed, with this condition, the input pin of microcontroller is always high and the output pin of microcontroller is also high. Such output will activate the base of the transistor which connects the relay to the supplying voltage, whenever the relay is supplied; it closes its contact and connects the pump to supplying voltage, 24VDC. The pump fills the water in the tank whenever the above condition is fulfilled.

The red LED lights ON to indicate that the pump is pumping and on the LCD it is displayed "PUMP IS ON".

If the moisture content of the soil is low (at temperature below 15˚C) the temperature detector sends the signal to microcontroller to switch off the electro valve for stopping the irrigation process. The Green LED is off to indicate that the soil is wet and on the LCD it is displayed "VALVE IS OFF".

Nagarajapandian[5]: In this the author proposed automated irrigation mechanism which turns the pumping motor ON and OFF on detecting the dampness content of the earth. In the domain of farming, utilization of appropriate means of irrigation is significant. The benefit of employing these techniques is to decrease human interference. This automated irrigation project, the soil sensor senses the moisture content by giving input signal to an Arduino board which operates on ATmega328 micro-controller, is programmed to collect the input signal of changeable dampness circumstances of the earth via dampness detecting system.

Irrigation becomes easy, accurate and practical with the idea above shared and can be implemented in agricultural fields in future to promote agriculture to next level. The output from moisture sensor and level system plays major role in producing the output.

III. BLOCK DIAGRAM

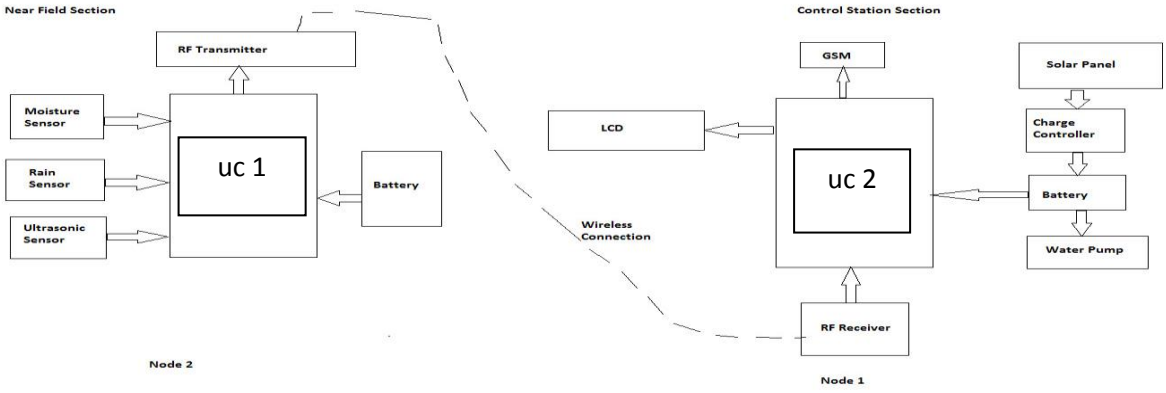

Figure-1: Block diagram of proposed project.

From the block diagram we can see the modules are used in this proposed project, the solar panel is the major part of this project, it provides supply to system using photovoltaic cells. The four moisture sensors used to check the moisture content in field and microcontroller works according to the sensors result. An ultrasonic trans receiver is used to control the overflow of water in the field, water pump is used to provide proper watering to the field according to the feedback of all sensors. All these

readings of sensors send to node 1 by transmitter at node 2 the LCD displays all readings and a GSM module is use to communicate the authorised person or can say the farmer.

IV. PROTEUS VIEW

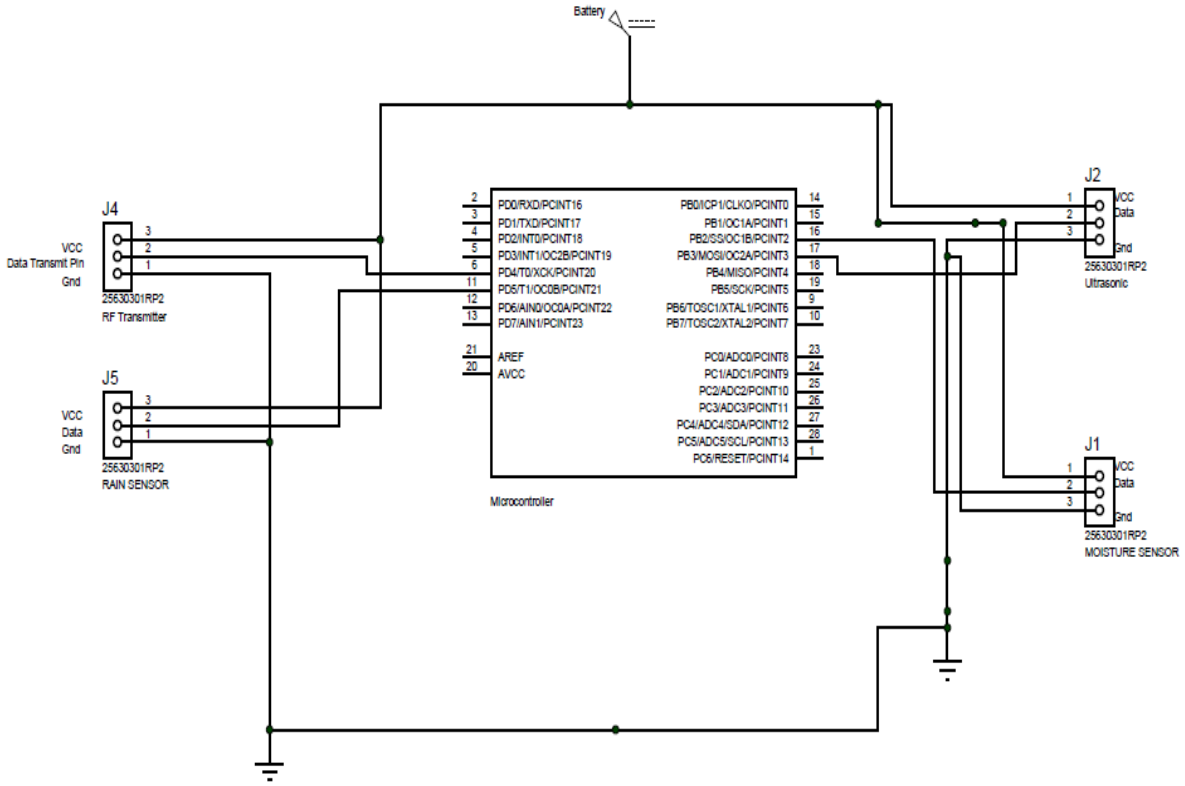

Figure-2:Transmitter proteus view

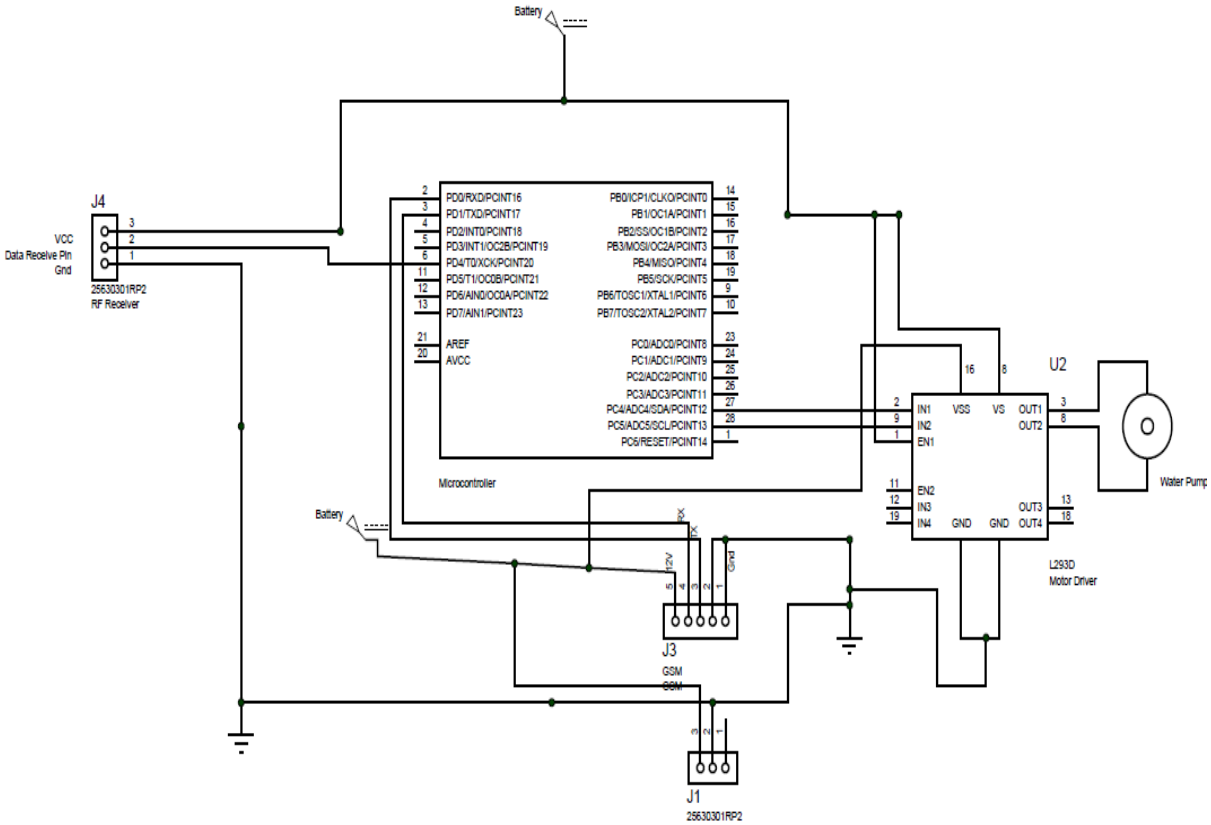

Figure-3:Receiver proteus view

V. COMPONENTS DETAILS

A) **Water level sensor-** water level sensor is used to measure water level. An drawback of many liquid level sensors is the effect of electrolytic reaction between the liquid and the sensors. Metal electrodes are prone to corrosion and consequent loss of effectiveness (reduced conductivity), with the result that they have to be replaced at frequent. One solution to this problem is to ensure that there is an AC, rather than DC potential between the sensor electrodes.

B) **Soil Moisture Sensor:** It is a measure of temperature at different levels of the Earth's atmosphere. It is governed by many factors, including incoming solar radiation, humidity and altitude. This variable should be defined as a continuous signal (normally as a sine wave which simulated the day and night temperature changes).

C**) Relay-** It acts as an electrically operated switch. Many relays use an electromagnet for operating a switching mechanism mechanically, but the other operating principles are also preferred. They are used extensively in telephone exchanges and early computers to perform logical operations.

D) **Solar panel-** The solar cells are also called photovoltaic (PV) cells, which as the name implies (photo meaning "light" and voltaic meaning "electricity"), convert sunlight directly into electricity. A module is a group of cells connected electrically and packaged into a frame (more commonly known as a solar panel), which can then be grouped into larger solar arrays. Photovoltaic cells are made of special materials called semiconductors such as silicon, which is used most commonly. Basically, when light strikes the cell, a certain portion of it is absorbed within the semiconductor material. This means that the energy of the absorbed light is transferred to the semiconductor.

VI. CONCLUSION

The proposed project is very useful for maximum plant growth in our fields because we can automatically provide water when our crop need it, we also prevent the wastage of water by setting the level of water with the help of ultrasonic trans receiver. As the solar energy is used the system is eco-friendly because the solar energy is a green energy source. The farmers can get maximum plant

growth in optimised time, they can control the irrigation system by their mobile phones with the help of GSM technology.

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