IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Review On Automatic Irrigation System Based On Solar Energy

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ABSTRACT

This paper discusses innovative technology in terms of various ways to irrigate agricultural land using solar power. Agriculture is the central heart for the nation and farmers. Nowadays Agriculture is decreasing day by day because of reduction of water and it consumes more electricity and loss of water in many fields like irrigation fields here because the overflow of water in irrigating land results in loss of water and also it will make plants decay. To control this cause we are using renewable energy by means of solar panels along with a pump and monitoring control system with four sensors. With the help of this system we are able to reduce, save and consumption of water will be in the limit without loss of water. This system performs automatically because an automatic monitoring system is provided.

Keywords— Automatic irrigation system, Microcontroller, Soil Moisture, Rain, Passive infrared and Temperature Sensors.

INTRODUCTION

Increasing demand of food requires the control in highly specialized greenhouse vegetable rapid improvement in food production technology. In a production and it is a simple, precise method for country like India, where the economy is mainly based on irrigation.

It also helps in time saving, removal of human agriculture and the climatic conditions are isotropic, still error in adjusting available soil moisture levels and to we are not able to make full use of agricultural resources. Maximize their net profits.

The main reason is the lack of rains & scarcity of land Irrigation is the artificial application of water to the soil reservoir water. The continuous extraction of water from usually for assisting in growing crops. In crop production earth is reducing the water level due to which lot of land is it is mainly used in dry areas and in periods of rainfall coming slowly in the zones of un-irrigated land.

Another shortfalls, but also to protect plants against frost. Very important reason of this is due to unplanned use of Types of Irrigation water due to which a significant amount of water goes to surface irrigation waste.

irrigation in modern drip irrigation systems, the most significant Drip Irrigation advantage is that water is supplied near the root zone of sprinkler irrigation. The plants drip by drip due to which a large quantity of water is saved.

At the present era, the farmers have been the conventional irrigation methods like overhead using irrigation techniques in India through manual control sprinklers, flood type feeding systems usually wet the in which farmers irrigate the land at the regular intervals. Lower leaves and stem of the plants.

The entire soil this process sometimes consumes more water or surface is saturated and often stays wet long after irrigation sometimes the water reaches late due to which crops is completed. Such condition promotes infections by leaf get dried.

Water deficiency can be detrimental to plants mold fungi. On the contrary the drip or trickle irrigation is before visible wilting occurs. Slowed growth rate, lighter a type of modern irrigation technique that slowly applies weight fruit follows slight water deficiency. This problem small amounts of water to part of plant root zone.

Water is can be perfectly rectified if we use automatic micro supplied frequently, often daily to maintain favourable soil controller based drip irrigation system in which the moisture condition and prevent moisture stress in the plant irrigation will take place only when there will be acute with proper use of water resources.

Drip irrigation saves requirement of water because only the plant.

PROBLEM STATEMENT

Automatic Irrigation System is used to irrigate the land without the help of manpower. It works by using soil moisture and temperature sensor (dht11). The Wireless Sensor Network is employed in the field for sensing the moisture and temperature of the soil.

The WSN is connected with the Node MCU for processing the sensed data from the sensor. The data manipulation is done by the centralized Server. Fig 2 Show the working system of the Automatic Irrigation System.

In the Automatic Irrigation System, The soil moisture tester and the temperature sensor are connected by connecting wires. The connection between the microcontroller and the sensor is done by connecting the ground of the microcontroller and the sensor, the power supply will be given to the Vcc pin of the Node MCU and the A0 pin of the microcontroller and the sensor are connected.

the moisture of the soil is below the threshold value, the sensor intimates the microcontroller to switch ON the valve. After reaching the threshold value, the sensor intimates the controller to switch OFF the pump.

The regulating of the water pump is by using relay. The routine activity of the irrigation is send to the user. The communication between the microcontroller and the user is done with the help of GSM module.

OBJECTIVES

- Option of controlling the water pump can be given to the farmer i.e. he can switch on/off the pump in order to start/stop the process of irrigation without being present at the farm.

- The farmer may choose to stop the growth of crops or the crops may get damaged due to adverse weather conditions. In such cases farmer may need to stop the system remotely.

- The idea of using for irrigation can be extended further to other activities in farming such as cattle management, fire detection and climate control. This would minimalize human intervention in farming activities

LITERATURE REVIEW

According to the survey conducted by the Bureau of Electrical Energy in India in 2011 there are around 18 million agricultural pump sets and around 0.5 million new connections per year is installed with average capacity 5HP.

Total annual consumption in agriculture sector is 131.96 billion KWh (19% of total electricity consumption).As cited in paper [1] solar powered smart irrigation technique is the future for the farmers and a solution for energy crisis. So for the proposed solar powered system we are using techniques analyzed in paper [2] and [4] and modified. Sine PWM technique has been used for inverter operation for minimum harmonics as given in paper [3] which further increases the efficiency of the system.The rating of the system was calculated corresponding to the pump specifications referring to paper [5].

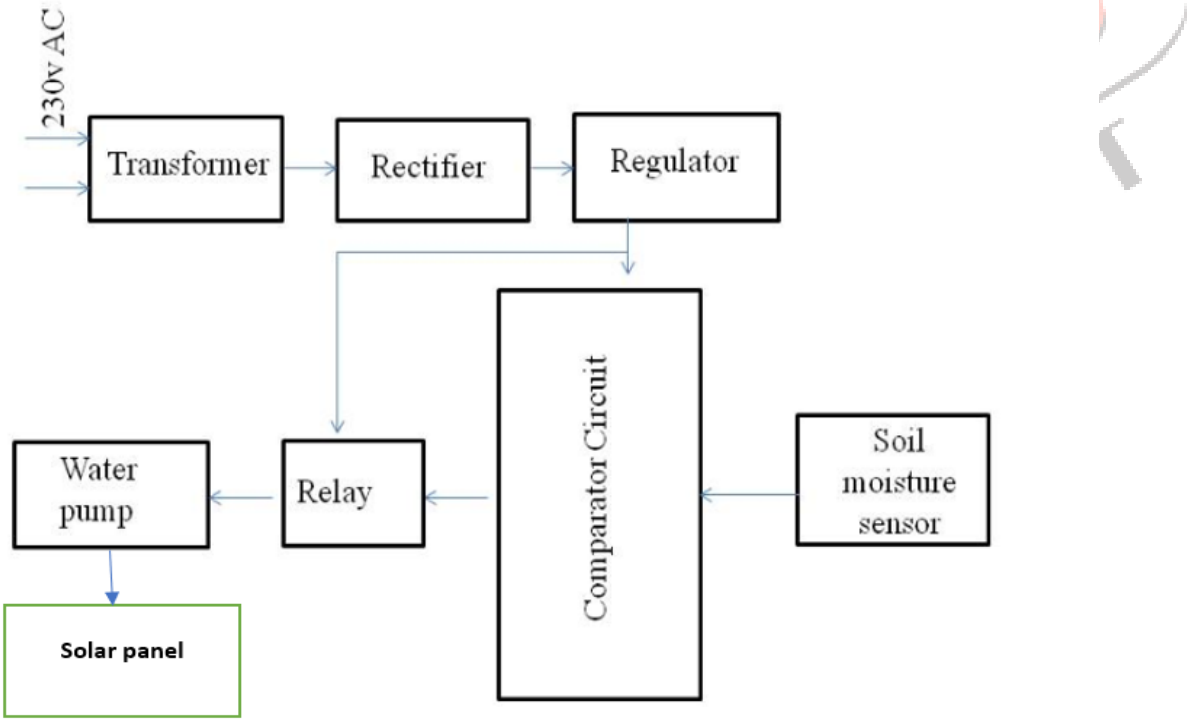
METHODOLOGY

The innovative process of a solar-powered smart irrigation system involves a step-by-step procedure by first Selecting the irrigating land in a small village with a total population of Five hundred people approximately. a village in Ponneri where irrigation of paddy as well as seasonal crops plays a major role in economic growth. Here we have used two parameters: soil moisture and temperature sensors. as well

as two detectors: rain and passive infrared sensors. With the help of a distinct monitoring system, Arduino By utilizing solar energy as a major source and implementing it in villages, it will help farmers, and it will run automatically in all cases

1. To irrigate a specific region, we should first determine the land area available for irrigation. Additionally, in terms of the solar panel, it should be able to produce enough electricity to run the water pump and the control system. selected the field near Ponneri, which is located in Thiruvallur District, Tamil Nadu.
2. In this project, paddy is a crop because in India, rice is used as a major carbohydrate, it consumes more water to grow, and it can play a vital role against malnutrition. It is the primary source of energy for over half of the world's population, and it is the dominant crop in the country.
3. Primarily A solar panel is fixed near the field, and it is used as a major source for receiving heat energy from the sun and converting it into solar energy using the photovoltaic effect.
4. The solar panel is connected to a battery, where the excess amount of energy from the solar panel is stored in the form of a battery. Because in rainy weather solar panels are not able to supply a sufficient amount of energy to other components during that time, batteries will supply sufficient energy to other components.

BLOCK DAIGRAM



HARDWARE REQUIRMENT

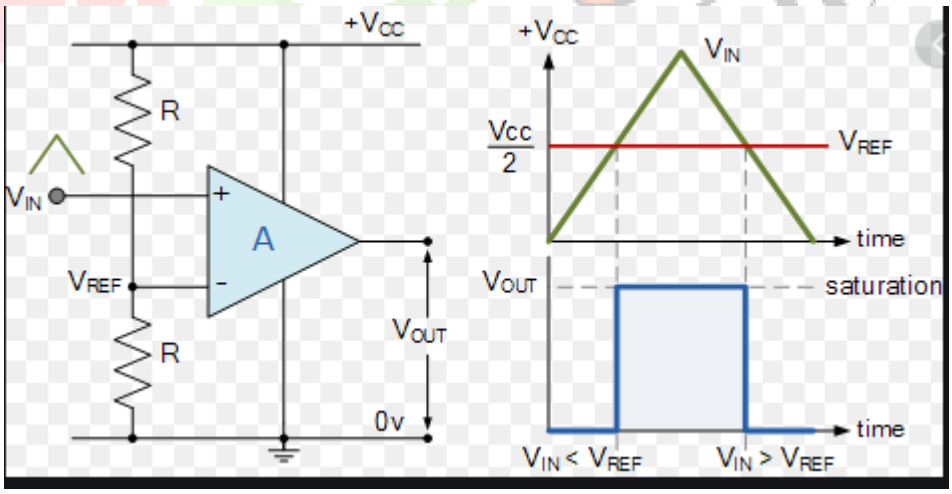
- Transformer
- Rectifier
- Regulator
- Comparator
- Soil moisture sensor
- Relay
- Water pump
- Resister
- Capacitors
- LED
- SOLAR PANEL WITH CHARGER

SOFTWARE REQUIRMENTS

- Eagle

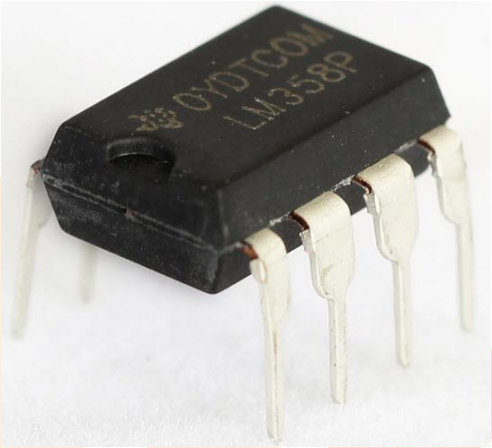
COMPARATOR

A **comparator** circuit compares two voltages and outputs either a 1 (the voltage at the plus side) or a 0 (the voltage at the negative side) to indicate which is larger. **Comparators** are often used, for example, to check whether an input has reached some predetermined value.



What is LM358 IC?

The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, and independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages. The LM358 IC is available in a chip sized package and applications of this op amp include conventional op-amp circuits, DC gain blocks and transducer amplifiers. LM358 IC is a good, standard operational amplifier and it is suitable for your needs. It can handle 3-32V DC supply & source up to 20mA per channel. This op-amp is apt, if you want to operate two separate op-amps for a single power supply. It's available in an 8-pin DIP package



The pin diagram of LM358 IC comprises of 8 pins, Where

- Pin-1 and pin-8 are o/p of the comparator
- Pin-2 and pin-6 are inverting I/ps
- Pin-3 and pin-5 are non-inverting i/ps
- Pin-4 is GND terminal
- Pin-8 is VCC+

Features of LM358 IC

The features of the LM358 IC are

- It consists of two op-amps internally and frequency compensated for unity gain
- The large voltage gain is 100 dB
- Wide bandwidth is 1MHz
- Range of wide power supplies includes single and dual power supplies
- Range of Single power supply is from 3V to 32V
- Range of dual power supplies is from + or -1.5V to + or -16V
- The supply current drain is very low, i.e., 500 µA
- 2mV low i/p offset voltage

- Common mode i/p voltage range comprises ground
- The power supply voltage and differential i/p voltages are similar
- o/p voltage swing is large.

Advantages of LM358 IC

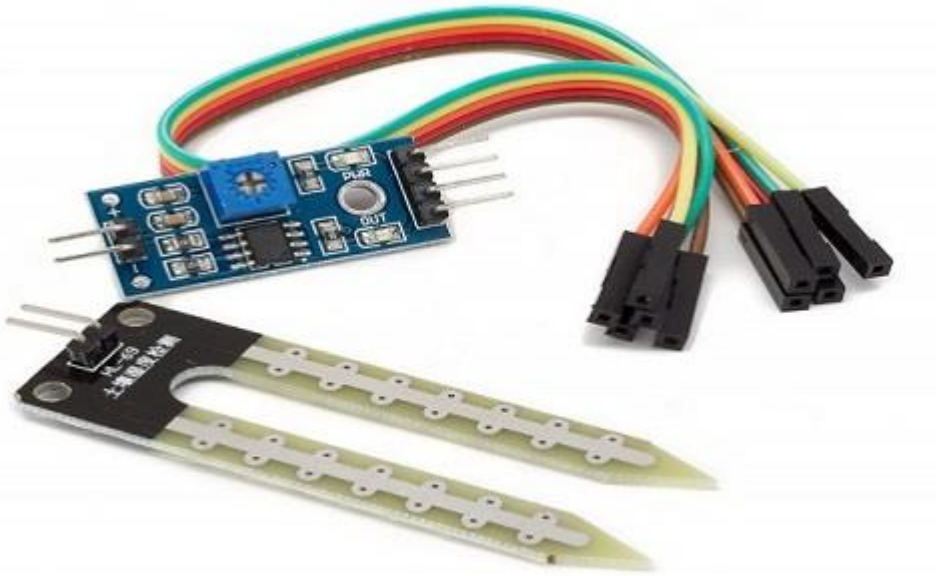
- Two operational amplifiers are compensated internally
- Two internally compensated op amps
- Removes the necessity of dual supplies
- Permits direct sensing close to GND & VOUT
- Well-suited with all methods of logic
- Power drains appropriate for the operation of the battery

Soil Moisture Sensor

The moisture of the soil plays an essential role in the irrigation field as well as in gardens for plants. As nutrients in the soil provide the food to the plants for their growth. Supplying water to the plants is also essential to change the temperature of the plants. The temperature of the plant can be changed with water using the method like transpiration. And plant root systems are also developed better when rising within moist soil. Extreme soil moisture levels can guide to anaerobic situations that can encourage the plant's growth as well as soil pathogens. This article discusses an overview of the soil moisture sensor, working and it's applications.

What is a Soil Moisture Sensor?

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. As the straight gravimetric dimension of soil moisture needs eliminating, drying, as well as sample weighting. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content



Specifications

The specification of this sensor includes the following.

- The required voltage for working is 5V
- The required current for working is <20mA
- Type of interface is analog
- The required working temperature of this sensor is 10°C~30°C

Soil Moisture Sensor Applications

The applications of moisture sensor include the following.

- Agriculture
- Landscape irrigation
- Research
- Simple sensors for gardeners

Water Pump

In this project water pump is used to give water supply to the soil when there is decrease in moisture level of soil. Here we used Easy Way Submersible Water Pump - High Power Cooler Magnetic Water Pump (19 hp) .

SOLAR PANEL

Solar panel as shown in figure it is a device which is used to absorb sun rays and convert them into electricity (or) heat. Solar radiation is light also known as electromagnetic radiation that is emitted by the sun. Solar panel capture this radiation and turn it into Solar energy.

FUTURE SCOPE

In future

(i) we are going to develop this project for seasonal crops.

(ii) Additionally we are going to add an Automatic fertilizer sprinkler to this project.

Where it will detect itself the fertilizer content in plant if need it needed it will automatically sprinkled to all kind of the plants

CONCLUSION

The government and the farmers stand to gain from the proposed system's implementation in several ways. An energy crisis solution is suggested by the government. utilizing the automatic irrigation system maximizes water use by minimizing wastage and requiring less farmer interaction. With a few minor changes to the system circuit, the extra energy generated by solar panels may also be fed into the grid, providing a source of income for the farmer and helping to solve India's energy issue at the same time. The suggested approach for irrigating fields is simple to use and environmentally favorable. When used for boreholes, which pump continuously throughout the day, the method has proven to be effective. Solar panels provide clean solutions without the more maintenance Since the system is self-starting, little maintenance and care are needed. This setup shows that it is possible and practical to use solar PV to supply the electricity needed for the pumping necessary for automatic irrigation. Although a significant capital expenditure is needed to construct this system, the total benefits are great, and in the long run, this system is cost-effective.using different sensors we are making this project a cost effective.By implementing this project we can save time,money and water in the irrigating field using eco friendly solar energy as main source and with automatic irrigation system.

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