

SOLAR POWERED SMART IRRIGATION SYSTEM USING IOT

Pradeep.K.K

Assistant Professor, Department of ECE
Velalar College of engineering and Technology
Erode, India
pradeep6414@gmail.com

Danushri.K.S

Department of ECE
Velalar College of engineering and Technology
Erode, India
danushri3112@gmail.com

Imran.J

Department of ECE
Velalar College of engineering and Technology
Erode, India
jrimran786@gmail.com

Arunadevi.K

Department of ECE
Velalar College of engineering and Technology
Erode, India
arunadevik2000@gmail.com

Kavin Kumar.S

Department of ECE
Velalar College of engineering and Technology
Erode, India
kavinselvaraj484@gmail.com

I. INTRODUCTION

IoT is changing the agriculture domain and empowering farmers to fight with the huge difficulties they face. Agriculture must overcome expanding water deficiencies, restricted availability of lands, while meeting the expanding consumption needs of a world population.. Agriculture is the backbone of Indian Economy. In today's world, as we see rapid growth in global population, agriculture becomes more important to meet the needs of the human race. However, agriculture requires irrigation and with every year we have more water consumption than rainfall, it becomes critical for growers to find ways to conserve water while still achieving the highest yield. But in the present era, the farmers have been using irrigation technique through manual control in which they irrigate the land at the regular interval.. Internet of Things (IoT) is a type of network technology, which senses the information from different sensors and makes anything to join the Internet to exchange information. The proposed system has been designed to overcome the water flow into the agricultural lands. Temperature, moisture, growth of plant and humidity readings are continuously monitored by using temperature, moisture, humidity and NPK sensor and send these values to the assigned IP address. Once the soil moisture values are exceeded the particular limit then the relay, which is connected to the microcontroller controls the application is a simple menu driven application, with 4 options. This includes motor status, moisture, temperature, humidity and NPK values. The motor status indicates the current status of the pump.

Abstract-- The inspiration for this project came from the countries where the economy is based on agriculture and the climatic conditions prime to shortage of rains & scarcity of water. Even if the farmland has a water-pump, manual involvement by farmers is required to turn the pump on/off when needed. The project is intended to cultivate an automatic irrigation system which controls the pump motor ON/OFF on sensing the moisture content of the soil. In the field of agriculture, use of appropriate techniques of irrigation is essential. The advantage of using this technique is to reduce human intervention and still certify proper irrigation. It provides mild shock to the nearing animals. Growth monitor sensor senses abnormal growth in plantations.

This paper proposes a model of variable rate automatic microcontroller based irrigation system. 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 the danger level; the motor will automatically start without the farmer to ensure the proper water level in the site.

Keywords: Microcontroller, Irrigation, Soil Moisture, Automated Irrigation, Growth monitor, Mild shock

II. LITERATURE SURVEY

S Harishankar, R Sathish Kumar, KP Sudharsan, U Vignesh, T Viveknath proposed the system **“Solar Smart Irrigation System”**[3] consists of solar powered water pump along with an automatic water flow control using a moisture sensor. It is the proposed solution for the present energy crisis for the Indian farmers. This system conserves electricity by reducing the usage of grid power and conserves water by reducing water losses. Cost effective solar power can be the answer for all our energy needs. Solar powered smart irrigation systems are the answer to the Indian farmer. This system consists of a solar powered water pump along with an automatic water flow control using a moisture sensor. It is the proposed solution for the present energy crisis for the Indian farmers. This system conserves electricity by reducing the usage of grid power and conserves water by reducing water losses.

Menendez Monica, B Yeshika, GS Abhishek, HA Sanjay, Sankar Dasiga proposed **“IoT based smart irrigation”** India has a population of more than a billion and its requirement for water increases each year as the demand for food increases hence management[7] of water resources to sustain this massive population is of high importance. The agricultural sector, an important sector of our economy accounts for a good percentage of our nation's GDP and of the exports. With advancement in technology we can establish a system that automates the irrigation process such that there is efficient usage of water and create an ease of work load for the farmers. Internet of Things, in this work we have designed an IoT based automated irrigation system for the Indian scenario. Our system is able to deliver optimal water to the plants based on moisture, light and temperature levels which are obtained through sensors. The farmer will be able to monitor the parameters through the mobile app which is integrated with cloud storage.

Ahmed Hassan, Hafiz Muhammad Abdullah, Umar Farooq, Adil Shahzad, Rao Muhammad Asif, Faisal Haider, Ateeq Ur Rehman proposed the **“Irrigation control using Matlab software”** control system[4] by GA genetic algorithm that optimizes the output energy of the PV system by adjusting the spatial angles of the solar panel in both vertical and horizontal axes. In this method, without the need for additional hardware, the optimal panel position angles are calculated by using the Matlab software to capture the most sun and maximize output energy. The main advantage is that the system operates discretely during operation and losses are reduced, as well as in the clouds, solar radiation is received and the output energy rises. The important results of this study can be that the system is optimized, the output power of the photovoltaic system in a fixed array mode increases by 15.85%.

Yasin Kabalci, Ersan Kabalci, Ridvan Canbaz, Ayberk Calpbinici implements the **“GSM based Irrigation”** solar plant and irrigation system with several control [2] features designed and implemented in this study. The technical aspects of the study include sizing of a solar plant, feasibility analyses, system planning and implementation, remote monitoring, and remote control issues. The sizing and feasibility analyses are performed by using highly reliable software. The remote monitoring system is implemented with several sensing and communication boards designed by authors, and server-client software. The remote control operation is performed owing to implemented 8-channel relaying devices that are reached over networks. Each part of the entire system is implemented and is optimized to provide an observable and controllable solar irrigation system in a county yard. The presented study is aimed to express the potential capabilities of a solar plant in irrigation, and integration capabilities to numerous communication systems such as 3G, GSM, and Wi-Fi to implement remote monitoring and remote control infrastructures.

S Vidya Sagar, G Ragav Kumar, Lino XT Xavier, S Sivakumar, Ramesh Babu Durai proposed a Smart Irrigation System **“Modern irrigation”** by detecting the dampness content[6] as it turns the engine ON/OFF automatically. In agribusiness, the utilization of right and reasonable technique for water system to the product is essential by checking the amount of water appropriate to affirm the water substance of it. The benefit of utilizing this innovation is to lessen human intercession and still guarantee a legitimate water system, utilizing sun powered boards to save and change over vitality, to defeat the flooding and to make a keen water system. In this innovation the level of water and dampness is absolutely controlled with no power cut off. This will help the poor agriculturist to decrease the weight of manual exchanging ON/OFF. It will likewise lessen undesirable water assets and power utilization.

III. METHODOLOGY

1. Soil moisture sensor

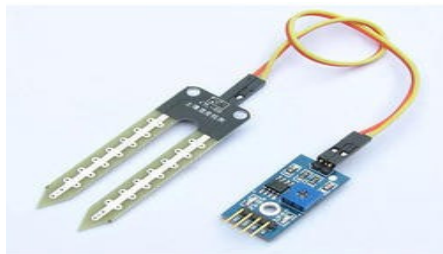
Liquid/moisture sensors and precision centigrade temperature sensors detect or sense the presence of any amount of liquid or moisture between two wire leads of the equipped leads and provide active High output as required by the system. The exposed wire which is in contact is porous; therefore it allows transmission of water vapors from the field into the sensor. These exposed areas are engineered very thinly. Hence the liquid/moisture sensor responds very rapidly to any changes in applied moisture or liquid, both when being dried (on process start-up) and

Block Diagram Description**1. Solar panel**

Photovoltaic solar absorbs sunlight as a source of energy to generate electricity. Battery is charged by solar energy The PV (photovoltaic) cells basically depend on the size of the water pump. A panel values in watts of power it can generate. This system should be worked with a PV array of capacity, and measured under some typical test conditions. A sufficient number of modules in series and parallel could be used to acquire the necessary photovoltaic power array power o/p. The PV modules o/p power which is used in the PV array under typical test conditions must be a min of 74 watts peak.

**Fig 2.Solar panel****2. Soil moisture sensor**

The soil moisture sensor (YL-69) consists of two probes which are used to measure the volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value.

**Fig 3:Soil moisture sensor****3. Water pump**

The water pump is used to artificially supply water for a particular task . It can be electronically controlled by interfacing it to a microcontroller . It can be triggered ON/OFF by sending signals as required. The process of artificially supplying water is known as pumping.

**Fig 4:Water pump****4. Relay**

Relays are switches that open and close circuits electro mechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. Once the controller receives this signal, it generates an output that drives a relay for operating the water pump.

**Fig 5:Relay****NPK sensor**

Detection of nitrogen, phosphorus, and potassium (NPK) nutrients of soil using optical transducer The optical transducer is implemented as a detection sensor which consists of three LEDs as light source and a photodiode as a light detector. The wavelength of LEDs is chosen to fit the absorption band of each nutrient.

**Fig 6:NPK Sensor****6.Temperature sensor**

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature.The LM35 device is rated to operate over a -55°C to 150°C temperature range,

while the LM35C device is rated for a -40°C to 110°C range (-10° with improved accuracy).

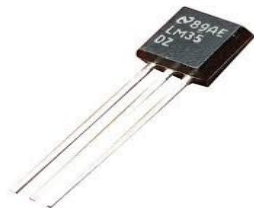


Fig 7:LM35 Sensor

Flow Chart

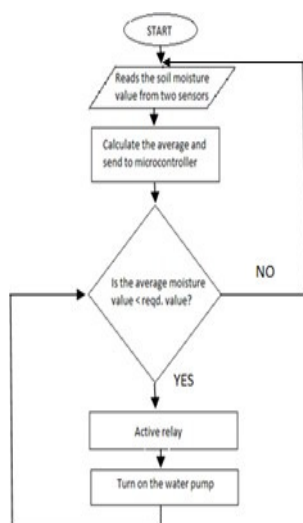


Fig 8:Flow chart

V.RESULTS

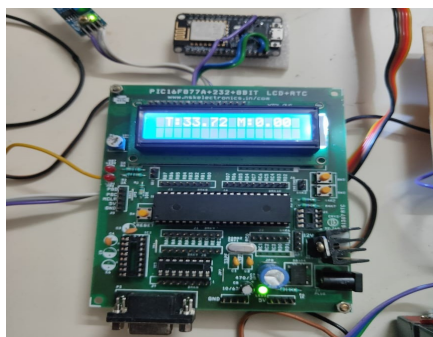


Fig 9:Output for Temperature and moisture

The temperature and moisture are measured with sensors and displayed on LCD



Fig 10:Output for nutrients content

The nutrients like Nitrogen, phosphorus and potassium are calculated with NPK sensor and output is displayed on LCD.

In addition to these, mild shock is produced to nearing animals. Output records can also be maintained and can be viewed via internet in portal called “**Thinkspeak viewer**” with help of Node MCU.

VI. CONCLUSION

In present days especially farmers are facing major problems in watering their agriculture fields. It's because they have no proper idea about when the power is available so that they can pump water. Even after then they need to wait until the field is properly watered, which makes them stop other activities.

In this paper, an automated irrigation model is proposed and successfully implemented using different circuits as demonstrated in different figures. We designed and implemented 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 paddy field avoiding the under-irrigation and over-irrigation. Solar power provides a sufficient amount of power to drive the system. To overcome the necessity of electricity.

VII.FUTURE SCOPE

The solar powered automatic irrigation system is going to be very useful in the future. It has various advantages over the other conventional type irrigation systems. To demonstrate the functionality and performance of the controller system, the prototype was implemented and tested. In future the advances in nanotechnology, improvements in smart grid and power electronics have a major role in implementing solar energy policies. Our government, Research and laboratories, various

solar organizations are working hard to make this solar pump set as agriculture and user friendly. Let us have a hope so that in one fine day all farm lands in India are provided with solar pump sets with SMS alert. help to minimize over water and crop production cost. The solar powered automatic irrigation system is going to be very useful in the future. It has various advantages over the other conventional type irrigation systems. The components required for this type irrigation system are moisture sensors, relays, solenoid valves, and sub-immersible type pumps and GSM functionality can be used. Integration of sensor grid to determine important parameters like PH, CEC, SAR, organic constituents of the soil. Implementation of ML algorithm to predict health status of crops.

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