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Vol.12 / Issue 70 / February / 2022 *International Bimonthly (Print)* *ISSN: 0976 – 0997*

RESEARCH ARTICLE

Solar Powered Arduino Based Automatic Drip Irrigation System for Enhancing Agricultural Productivity

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Received: 01 Sep 2021 Revised: 20 Sep 2021 Accepted: 21 Oct 2021

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ABSTRACT

The paper proposes to use an automatic irrigation system based on Arduino boards, soil moisture sensors, float switches and solar panels. The automatic irrigation system senses the soil moisture content and automatically switches the solenoid valve. The top water level is monitored by a float switch detector. The power required by the entire system is generated by solar panels. It also automatically controls the water level in the water tank. This system is suitable for all climatic conditions. This project proposes the use of an automatic irrigation system based on an Arduino board, a soil moisture sensor, a float switch and a solar panel. This automatic irrigation system detects the moisture content of the soil and automatically switches solenoid valves, a float switch sensor monitors the overhead water level, and the power required for the entire system is generated by solar panels. It also automatically controls the water level in the water tank. Whenever a valve opens or closes, the Global System for Mobile Communications (GSM) module sends a message. The project fully supports farmers, provides water on demand, deploys renewable energy, minimizes manpower, saves space, reduces costs, and maintains user-friendliness.

Keywords: Solar panel, Automated drip Irrigation system, Arduino board, Soil moisture sensors, float switch.

INTRODUCTION

Irrigation is the process by which water flows through the soil to cultivate dry plants. There are many irrigation methods, and the most important function of irrigation is to provide water for plants. The water should be evenly distributed on the soil, which seems to be good for yield and growth. There are few irrigation methods. Surface irrigation: The surface irrigation method is one of the oldest methods and has been followed by developers for many years. Now it is also imitated by farmers. In this system, there is a small amount of water around the farmland to keep it moist and enter the soil. If it causes the cultivated land to be flooded, it is either a boundary well or fertilizer irrigation. This process is still valid. The water level is controlled by equipment that is usually inserted into the ground and applied, and rm is not necessarily defined. Unless it's unavoidable, don't use abbreviations in titles or titles. In most rice fields, the rice fields are sometimes poured to the ground by humans.

Drip Irrigation

Drip Irrigation is also called trickle irrigation. It is a system in which water flows out of the water to all bases. In these systems, water is pumped out of the root zone. This pattern increases the growth of all seeds and plants, and it is the most efficient method of irrigation. In this way the water can be divided into pipes, emitters, pipes and fittings. It is much better than watering it. Figure 1 shows the drainage process.

Sprinkler Irrigation

In this method, the irrigation canal is anchored to the paddy field at different points in the soil and can be circulated by spraying too much water. High -pressure nozzles and nozzle tubes are placed on a moving platform and connected to a source. The spray can be placed on a mobile platform and connected to the water through a hose. The voyage sweepers are a system with automatic moving wheels. When the pipe is injured by the drum carried by the irrigation water, the shower is pulled across the field. When the seeding returns to the roller, the system dies. This type of system is known as an irrigation hose and is used for dust removal, irrigation and sewage treatment.

Solar Energy

Solar energy is renewable. The sun needs energy. Sunlight has an output of large amounts of heat that can be converted into energy and is called solar energy. The light is converted into electricity, with the help of a solar plain or directly shown using voltaic acid (PV), or intense solar energy (PDC). The daytime PDC converts sunlight into electricity, namely through contact lenses or glasses and tracking to absorb large amounts of sunlight from the photoelectric [1-6].

Benefits of solar energy

a) Photovoltaic systems have less noise.
b) A small amount of solar energy to the solar panels placed on the roof reduces space.
c) Solar power is an easy connection service. This reduces interference.
d) PV generators are available in all sizes to suit the needs of some.

Automatic Irrigation

Automatic irrigation system is very quiet and goes all the way from this system once installed in the culture soil. It can operate on its own and also does not require a permanent human. There are a lot of used losses here that seem really unwieldy. It is difficult to implement. There are three types of automatic categories. Here it is: The advantage of this system is that the operator can till and irrigate well. The microcontroller 8051 is programmed to receive a signal from the sensing material. An op amp, a moving comparator that connects sensors [7-8]. The humidity characteristic is transmitted by the microcontroller. The Fig.3 shows the Automatic Irrigation system

Irrigation system based on GSM

It is difficult for farmers to irrigate due to lack of manpower, expensive labour cost and water shortage. In order to minimize this problem, a new system using GSM technology was developed. In the GSM-based automatic irrigation system, we use the GSM module to identify the operation of the cultivated land through SMS [9-11]. Fig.5 shows the Irrigation system based on GSM

PROBLEM DESCRIPTION

The energy of the sun is absorbed by the solar system. Solar models use the light energy of the sun's rays (sunlight) to generate electricity through solar products. Solar panels are used in our thesis. Drip irrigation is one of the irrigation methods to control the flow of water, which is applied directly to the roots of many plants. Water dripping from the surface of the roots helps to reduce soil erosion, provides even water flow and reduces water contamination. Drip irrigation is a big part of our project. Hussein and Li Xue [6] investigated the drip irrigation system. In the current situation, drip irrigation systems are being used to improve water utilization. It sucks in groundwater. Manual operating system. It helps our farmers. This generation uses drip irrigation because the water level is very low. So farmers use drip irrigation systems. But farmers with low incomes are spending more water. So it will help small farmers and reduce water waste. C. Automation The technology that allows a device, process or system to operate an automated system is called automation.

The current irrigation system has some shortcomings, that is, soil erosion, water instability, water interference, and interference with the inspection of plants and water levels in the reservoir are required. To overcome these problems, the system is not used in conjunction with drip irrigation or irrigation. It is also an automatic generator to fill the water tank.

METHODOLOGY AND OPERATION OF PROPOSED METHOD

Sensor-Based Valve Operating System

Sensors are devices that detect changes in the environment and send information to the processor. Different types of sensors are commonly used in different applications. All these sensors are used to measure one of the physical properties such as temperature, resistance, capacitance and heat transfer. The different types of sensors are listed below.

Temperature Sensor

- Proximity Sensor
- IR Sensor (Infrared Sensor) Pressure Sensor
- Light Sensor
- Ultrasonic Sensor
- Smoke, Gas and Alcohol Sensor
- Touch Sensor
- Humidity Sensor
- Flow and Level Sensor

Soil moisture sensor

The soil humidity sensor is a type of humidity sensor. Soil moisture sensors are used to indirectly measure the moisture present in the soil by measuring the condition of the soil. The soil moisture sensor has two probes. Both are used to measure the amount of water in it. The two probes allow water to pass through the soil, and then obtain the resistance value depending on the type of soil to measure the water content. The earth has more water; the earth carries more electricity and reduces resistance, so the water level is higher. Dry soils are low in water content and electrical inequality. The sensor works according to this principle for ground moisture. C. Solenoid Valve Solenoid valve is often used to control the flow of fluid through electricity. The solenoid valve operates after power or exercise or is also known as a cut -off that allows fluid to flow. The actuator is an electromagnet. When the suitcase is powered, the magnetic field pulls the plunger toward the spring. Similarly, when the power goes out, the plunger will return to its original position under spring operation.

They are available in five types

- Pilot valve
- Direct valve
- 2-way valve
- 3-way valve
- 4-way valve

Arduino UNO

Arduino UNO board is an open-source microcontroller board based on Microchip ATmega328P microcontroller, developed by Arduino.cc. The board includes analog and digital input/output pins for connecting various boards and other circuits [12-13].

Automatic Tank Water Flow System

A Float switch is a type of water level meter, a machine that detects the water level in the tank. The button can be used to control with instrument, pump, alarm. In these systems, a float unit is used to measure the water level in the tank. When the water is below the indicated level, the body moves to the tank. As the tide reaches higher, the motor changes.

Advantages and Applications

Water waste is a major problem in field agriculture and horticulture. So this kind of automatic drip irrigation with solar energy system will help reduce water waste in agriculture and maintain the water needed for planting trees and crops [14-15].

i)Automatic drip irrigation system is used to automatically develop water supply. Roadside tree planting system.

ii) This automatic drip irrigation system will reduce the manpower required to supply water to the plants.

iii) This automatic drip irrigation system will reduce the total time required to water the garden or field.

CONCLUSION AND FUTURE SCOPE

This negative voltage generator is made up of an Arduino board, solenoid valve, humidity sensor and solar panel. This negative voltage sensor understands the moisture content of the ground and turns on the solenoid valve immediately and the power supplied by the battery and the battery can be used by the sun. Erosion floats are used to control water levels. GSM standard mail delivery, each time the locker is turned on and OFF. With the whole generator is the reduction of erosion, the provision of water without water, no need to do, small space required, humid place in all places no electricity used. The old model is designed for automatic water jet. Using the same strategy, water leaks can be created easily. Check the water tank, just draw the water tank from the well or drinking water.

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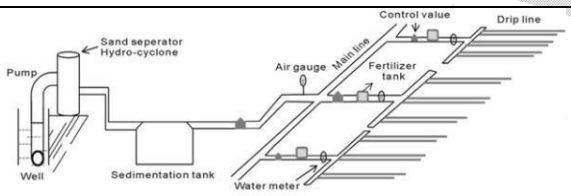

Fig.1 Drip Irrigation system

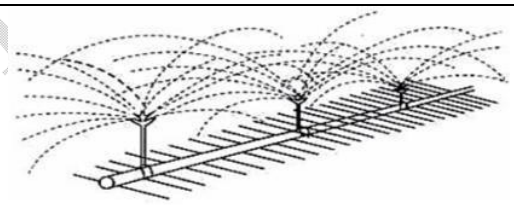

Fig.2 Sprinkler irrigation system

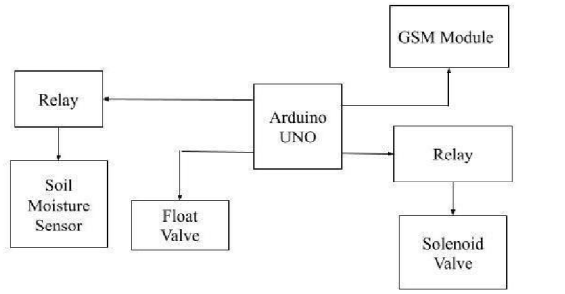

Fig.3: Automatic irrigation system

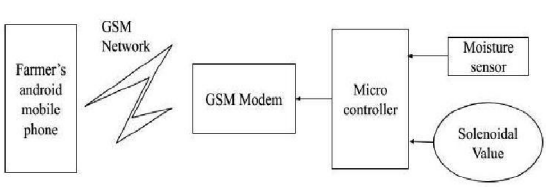

Fig.5: Irrigation system based on GSM

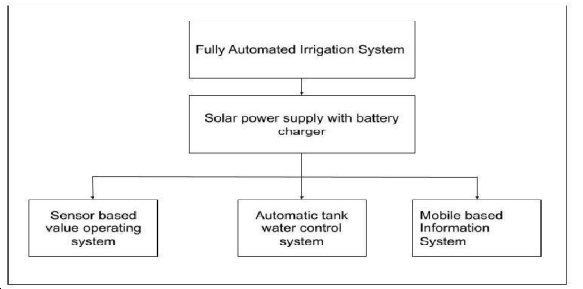

Fig.6: Proposed Auto drip system Method

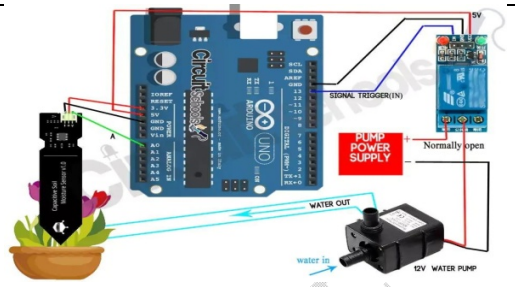

Fig.7: Arduino UNO Pinout diagram

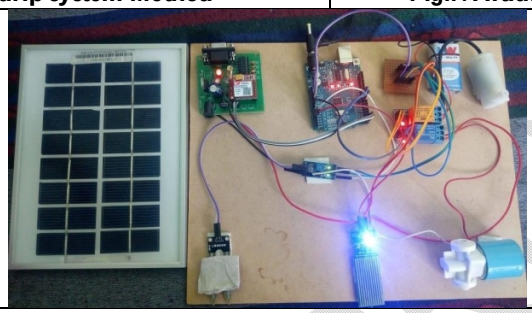

Fig.8: Hardware Circuit design