

AUTOMATIC WATERING SYSTEM WITH EFFICIENT SUN TRACKING SOLAR PLATE

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ABSTRACT

Agriculture, with its allied sector, is one of the largest sources of livelihood of people. Around 70% of the rural population is dependent on this sector, It was going through many problems such as energy management and water management. Since more than 20% of Indian farmers face drought, we should invent technologies for the wellbeing of farmers. The use of Renewable resources has been the most significant task in front of this sector. There are many prototypes available in the market, but focusing on the agricultural sector, their cost should be minimum and should have fewer components. In this we are presenting a novel system for the agriculture sector, which has single Axis Sun Tracking Solar Plate with an automatic watering system. This prototype is useful for the agriculture sector as it will save water and help the agriculture sector with renewable energy.

I. INTRODUCTION

India is a country of farmers with a colossal amount of income, depending on the agricultural sector. For many years' farmers have been using traditional ways off watering. Also, villages face the problem of power cut even in days of farming. This is a big concern as the population of the world is increasing at a fast rate, which indeed causes tremendous pressure resource utilization. Studies have shown that even technology in-country is developing its natural resources such as water are decreasing at high speed, as the agriculture sector facing many crises which leads to suicides of farmers. Since many sources of renewable energy are stationary and not portable, it decreases the domain width of renewable resources. Also, the problem of water resources decreasing leads to decrement in farmer's income, which indeed affects the country's economy. In this time of crisis, solar energy has developed to be a helping hand for

farmers. Since India is near the equator and unlike many nations, we have sunny days the whole year. As solar energy is a prime source of energy which not only provide energy alternative but also helps to reduce pollution as some energy generation resources lead to pollution. On the other hand, availability of water resources is random in India. Some states, such as Punjab, have precious water resources, whereas states like Rajasthan, Maharashtra face water crisis continuously. Solar plate tracking approaches have been of two types. Depending upon its degree of freedom. The Single-axis tracking system tracks the movement of the sun in on degree of freedom that is east to west. Whereas dual-axis solar plate has two degrees of rotation, i.e., movement of solar plate horizontal as well as vertical. In recent researches, dual-axis solar plate tracking has been focused compared to the singleaxis tracking system because of accuracy and more efficient output. Solar tracking systems are broadly classified into two types closed-loop tracking system and open-loop tracking system. In an open loop tracking system, control algorithms and mathematical derivations are used to obtain results. These kinds of mathematical expressions can be derived using concepts of elevation angle, azimuthal angle. The movement of the sun determines these angles,

whereas, in closed-loop tracking systems, various sensor-based systems are developed. In closed-loop systems active sensors such as charge loop sensor and Light-dependent resistor are used to depict the maximum position of the sun, by using a generated feedback error signal system is controlled to et the maximum efficiency output. Available moisture sensor and automatic watering prototype are complex. Besides that, for any significant change, any prototypes have to reset and change the mode of operation. To overcome the problem of complex architecture

and complex working, we have come up with cheaper technology and consist of a simple circuit which can be easily fabricated on a chip and can be used in the field. Considering the dualaxis sun-tracking solar system. Since many researchers have claimed that both open-loop tracking a well as close loop tracking systems have significant applications in the use of renewable energy, we have implicated both types of tracking systems and tried to overcome the best possible prototype. In many prototypes, manual action is required to control the tracking. Since the workforce can be used for other work, we have implemented our prototype, which won't have any workforce involved. That means it saves the amount of effort and time. Prototypes available I the market are of the high cost. Farmers can't afford thee prototypes or a person related to the agricultural sector. In this project, we have come up with technology with the least cost and excellent efficiency. Working on both prototypes and comparing their efficiency gave us the best suitable prototype to use in the agricultural sector. Here in our project, we have implemented both openloop tracking and close loop tracking mechanism with the help of Arduino, various other technologies such as programmable logic controller (PLC)[1], the microcontroller can also be used. An automatic watering prototype can be printed on a printed circuit board, which makes it less complex, which can perform the required function. As the type of soil and type of crop is the same in particular land, this prototype has a high effect on improving water conditions. Also, this prototype can be used in regular households as this can save water and manage water problems. These two technologies can be used to make a village self-sufficient. This can eventually help to decrease problems in the agricultural sector[1]. As from studies, it is seen that a higher amount of revenue is generated from the agricultural sector. Such prototype can easily be used in this sector so that it can lead to an increment in the economy. As this prototype is cheap, this self-sufficient village can be obtained at very less cost.

II. POWER SUPPLY

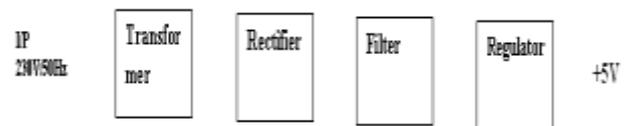


Figure: Power Supply

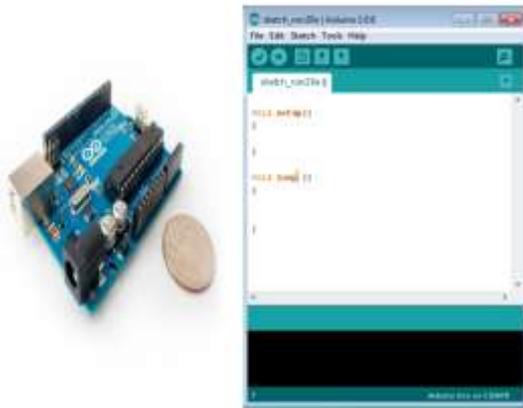
III. HARDWARE

3.1 Arduino

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are –

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.



Board Description:

In this chapter, we will learn about the different components on the Arduino board. We will study the Arduino UNO board because it is the most popular board in the Arduino board family. In addition, it is the best board to get started with electronics and coding. Some boards look a bit different from the one given below, but most Arduinos have majority of these components in common.



3.2 Liquid Cristal Display

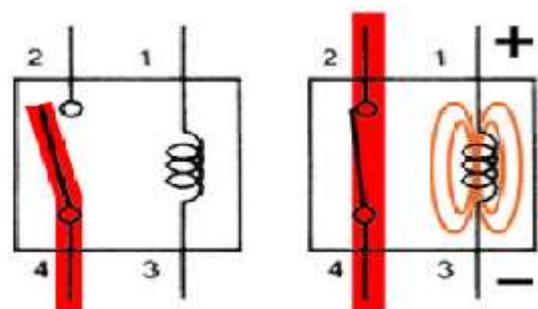
A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

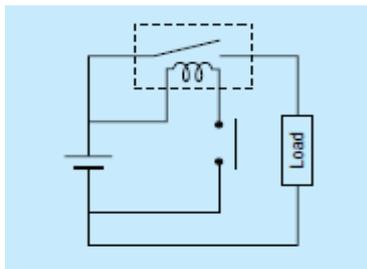
A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an controller is an LCD display. Some of the most common LCDs connected to the contollers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around LCD NT-C1611 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 5X7 dots plus cursor of the display. They have a standard ASCII set of characters and mathematical symbols. For an 8-bit data bus, the display requires a +5V supply plus 10 I/O lines (RS RW D7 D6 D5 D4 D3 D2 D1 D0). For a 4-bit data bus it only requires the supply lines plus 6 extra lines(RS RW D7 D6 D5 D4). When the LCD display is not enabled, data lines are tri-state and they do not interfere with the operation of the microcontroller.

3.3 Relays

A relay is an electrically operated switch. These are remote control electrical switches that are controlled by another switch, such as a horn switch or a computer as in a power train control module, devices in industries, home based applications. Relays allow a small current pin, 4-pin, 5-pin, and 6-pin, single switch or dual switches. Relays are used throughout the automobile. Relays which come in assorted sizes, ratings, and applications, are used as remote control switches. A typical vehicle can have 20 relays or more.





3.4 L293D

L293D is basically a high current dual motor driver/controller Integrated Circuit (IC). It is able to drive load having current up to 1A at the voltage ranging from 4.5V to 36V. Motor driver usually act as current amplifier because they receive a low current signal as an input and provides high current signal at the output.

Motors usually operates on this higher current. L-293D has to builtin H-Bridge driver circuits and is able to control two DC motors at a time in both clockwise and counter clockwise direction. It has two enable pins and they should be kept high in order to control the motor. By changing the polarity of applied signal motor can be rotated in either clockwise or counter clockwise direction. If L 293D enable pin is high, its corresponding driver will provide the desired out. If the enable pin is low, there will be no output. L-293D has different features including internal ESD protection, large voltage supply range, large output current per channel, high noise immunity input etc. L 293D plays a vital role in electronics era and has several different applications e.g relay drivers, DC motor drivers, stepping motor drivers etc. The further detail about L 293D motor driver/controller will be given later in this tutorial.

L293D Motor Driver



3.5 DC Motors

The brushed DC motor is one of the earliest motor designs. Today, it is the motor of choice in the majority of variable speed and torque control applications.

Advantages

- Easy to understand design
- Easy to control speed
- Easy to control torque
- Simple, cheap drive design

3.6 Solar Panel:

The term **solar panel** is used colloquially for a photo-voltaic (PV) module.

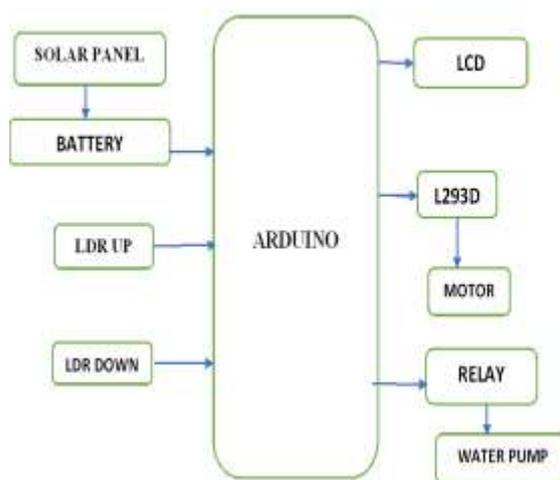
A PV module is an assembly of photo-voltaic cells mounted in a frame work for installation. Photo-voltaic cells use sunlight as a source of energy and generate direct current electricity. A collection of PV modules is called a PV Panel, and a system of Panels is an Array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

The most common application of solar energy collection outside agriculture is solar water heating systems.^[1]

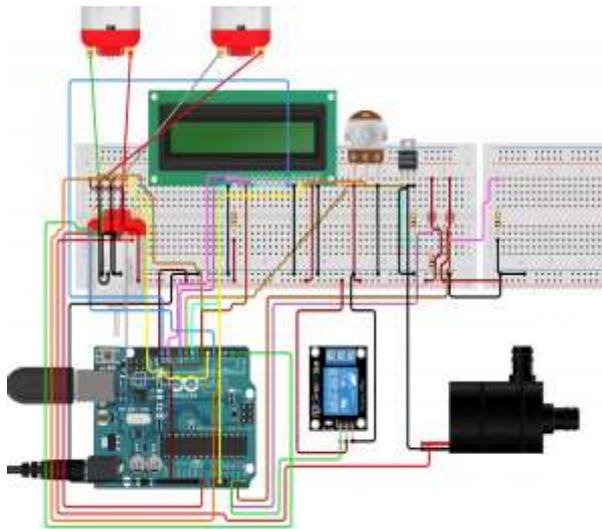


IV. RESULT:

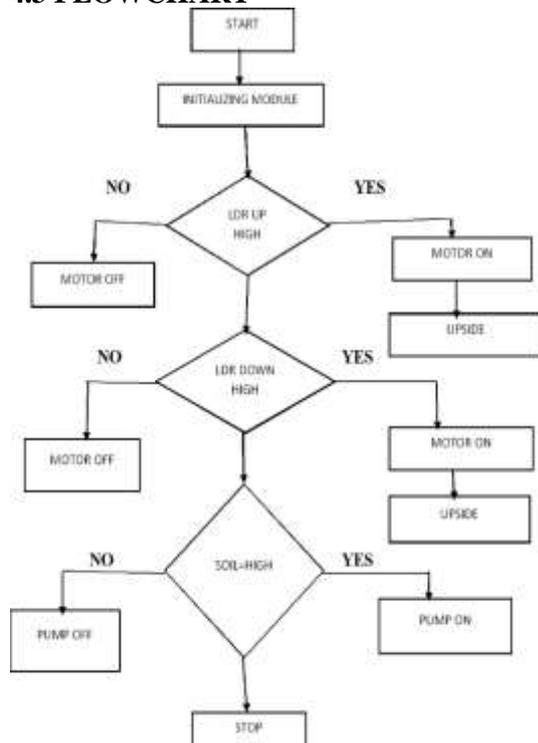
4.1 BLOCK DIAGRAM



4.2 SCHEMATIC DIAGRAM



4.3 FLOWCHART



WORKING

When ldr up is high then motor on in upside otherwise motor off. When ldr down is high then motor on otherwise motor off also when soil is equal to high then it is pump on otherwise is pump off.

V. CONCLUSION

Dual-axis solar tracker designed with two strategies, and with the help of a watering system, it was made much more useful for the agricultural sector. From this paper it can be seen that solar energy can be very beneficial if used in right way. We have compared efficiencies of the kind of solar plates and concluded that the efficiency of an open-loop control system is better than the fixed solar plate by 164%. And efficiency of closed loop system is better by 138% compared to fixed solar plate. And with a watering system, prototype this can make self-sustainable and indeed help to increase the economy of the agricultural sector. This work can help agriculture sector to fight various problems, as electricity is major problem in villages this can lead to solve that problem. Fig. 6. Comparison of average efficiencies.

VI. REFERENCES

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