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PV Solar Tracking with Drip Irrigation System

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ABSTRACT: Day by Day Farmer are facing many problem in farm.Water is main resource for Agriculture. Irrigation is one method to supply water but in some cases, there will be lot of water wastage. In the field of agriculture, use of proper method of irrigation is important and it is well known that PV Solar Tracking with Drip Irrigation is very economical and efficient. But for drip irrigation power is must without power we cananything. so we have proposed project titled PV Solar Tracking With Drip Irrigation system. In this proposed system, we are using Internet of things(IOT), Arduino , Flow sensor, demo model of drip irrigation set, And Pressure gauge. In addition, based on mobile app is automatically irrigated by ON/OFF of the motor. These sensed parameters and motor status will be displayed on user android application.

KEYWORDS: Solar Panel, Battery, Solar Inverter, Stepper Motor ,Internet of things(IOT), Arduino, Flow sensor, demo model drip irrigation set And Pressure gauge.

I. INTRODUCTION

Energy is clean and available in abundance. Solar technologies use the sun for provision of heat, light and electricity. These are for industrial and domestic applications. With the alarming rate of depletion of depletion of major conventional energy sources like petroleum, coal and natural gas, coupled with environmental caused by the process of harnessing these energy sources, it has become an urgent necessity to invest in renewable energy sources that can power the future sufficient. The energy potential of the solar sun is immense. Despite the unlimited resource however, harvesting it presents a challenge because of the limited efficiency of the array cells. Best efficiency of the majority of commercially available solar cells ranges between 10 and 20 percent. This shows that there is still room for improvement. This project seeks to identify a way of improving efficiency of solar panels. Solar tracking is used.

The tracking mechanism moves and positions the solar array such that it is positioned for maximum power output. Other ways include identifying the sources of losses and finding ways to mitigate them. When it comes to the development of any nation, energy is the main driving factor.

There is an enormous quantity of energy that gets extracted, distributed, converted and consumed every single day in the global society. Fossil fuels account for around 85 percent of energy that is produced. Fossil fuel resources are limited and using them is known to cause global warming because of emission of greenhouse gases.There is a growing need for energy from such sources as solar, wind, ocean tidal waves and geothermal for the provision of sustainable and power. 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 the manual control in which they irrigate the land at the regular interval.According to statistics, agriculture uses

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85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial and institutional improvements. Agricultural irrigation based on Internet technology is based on crop water requirement rules. By using Internet technology and sensor network technology we can control water wastage and to maximize the scientific technologies in irrigation methods. Hence it can greatly improve the utilization of water and can increase.

1.1 PROBLEM STATEMENT:

A solar tracker is used in various systems for the improvement of harnessing of solar radiation. The problem that is posed is the implementation of a system which is capable of enhancing production of power by 30-40%.Among the most promising current strategies to increase irrigation water use efficiency is the improvement of irrigation management by using photo voltaic solar tracking system by applying the write amount of water to the crop.60% of agriculture irrigation water is wasted due to conventional system. So remove this drawback we can implement photo voltaic solar tracking with drip irrigation system in which according to the incoming pressure of liquid decide open the no. of secondary valve those are connected to the distributed line

II. LITERATURE SURVEY

2.1 INTRODUCTION

Microcontroller-based Automatic Irrigation System with Moisture Sensors

Abhinav Rajpal Sumit Jain, Nistha Khareand Anil Kumar Shukla Amity Institute of Telecom Technology & Management, Amity University, U.P. Sector-125, Noida-201303

Indian agriculture is dependent on the monsoons which is not a reliable source of water. Therefore there is a need for an irrigation system in the country which can provide water to the farms according to their soil types.This paper represents the prototype design of microcontroller based automatic irrigation system which will allow irrigation to take place in zones where watering is required, while bypassing zones where adequate soil moisture is indicated.

Keywords: irrigation system, microcontroller, moisture sensors.

In a country like India, the agriculture plays the important role in the economy and development of the country. At the present era, the farmers have been using irrigation technique in India

2.2IEEE PAPER

R. Condit and D. W. Jones, “Simple DC motor fundamentals,” Texas Instruments.

Publication AN907, pp. 1 – 22, 2004. Fabrication of Dual-Axis Solar Tracking Controller Project

Nader Barsoum Curtin University, Sarawak, Malaysia E-mail: nnb3@hotmail.com Received January 28, 2011; revised March 21, 2011; accepted March 24, 2011

Abstract

The recent decades have seen the increase in demand for reliable and clean form of electricity derived from renewable energy sources. One such example is solar power. The challenge remains to maximize the capture of the rays from the sun for conversion into electricity. This paper presents fabrication and installation of a solar panel mount with a dual-axis solar tracking controller. This is done so that rays from the sun fall perpendicularly unto the solar panels to maximize the capture of the rays by pointing the solar panels towards the sun and following its path across the sky. Thus electricity and efficiency increased.

Keywords: Controller, Tracker, Sensor, Battery, Inverter, Timer, Switches, Program, Installation

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3. BLOCK DIAGRAM:

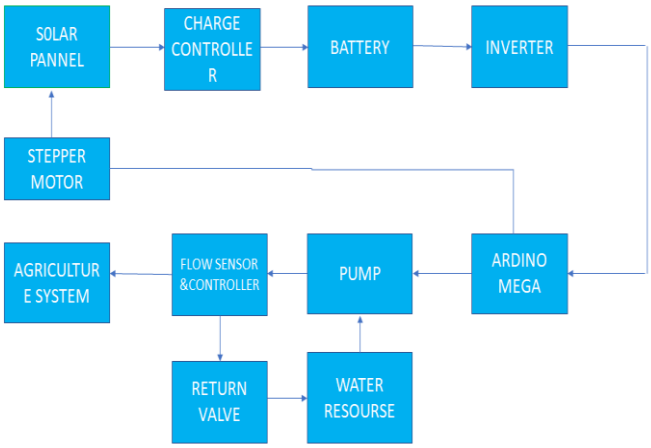

Figure 1.P.V Solar Tracking With Drip Irrigation System

3.1 Photovoltaic panel:-

A solar tracker is a device used for orienting a photovoltaic array solar panel or for concentrating solar reflector or lens toward the sun.Climatic conditions like clouds and fog significantly affect the amount of solar energy that is received by the array and therefore its performance.

The position of the sun in the sky is varied both with seasons and time of day as the sun moves across the sky.

Solar powered equipment work best when they are pointed at the sun. Therefore, a solar tracker increases how efficient such equipment are over any fixed position at the cost of additional complexity to the system.
There are different types of trackers.

Extraction of usable electricity from the sun becamepossible with the discovery of the photoelectric mechanism and subsequent development of the solar cell.
The solar cell is a semiconductor material which converts visible light into direct current. Through the use of solar arrays, a series of solar cells electrically connected,there is generation of a DC voltage that can be used on a load.

There is an increased use of solar arrays as their efficiencies become higher. They are especially popularin remote areas where there is no connection to the grid. Photovoltaic energy is that which is obtain.A photovoltaic cell, commonly known as a solar cell, is the technology used for conversion of solar directly into electrical power.

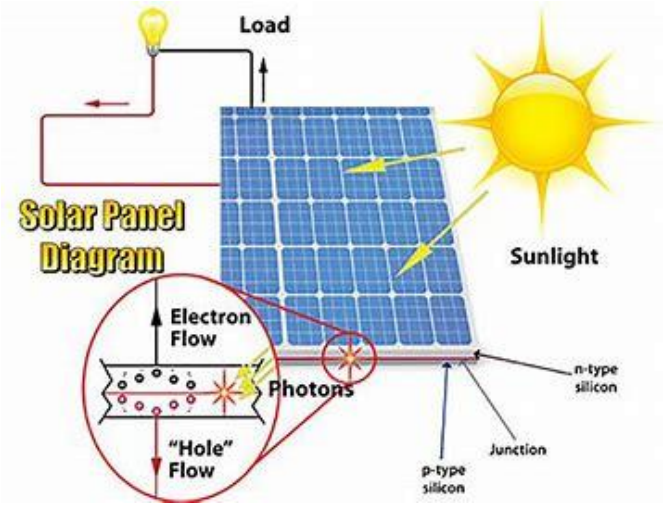

Figure 2 Solar structure

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The photovoltaic cell is a non-mechanical device made ofsilicon alloy.The photovoltaic cell is the basic building block of a photovoltaic system. The individual cells can vary from 0.5 inches to 4 inches across.One cell can however produce only 1 or watts that is not enough for most appliances. Performance of a photovoltaic array depends on sunlight
Most of the PV modules are between 10 and 20 percent efficient from the sun. A photovoltaic cell, commonly known as a so the PV Solar tracking

3.2The Earth: Rotation and Revolution:
The earth is a planet of the sun and revolves around it. Besides that, it also rotates around its own axis.There are thus two motions of the earth, rotation and revolution .The earth rotates on its axis from west to east.

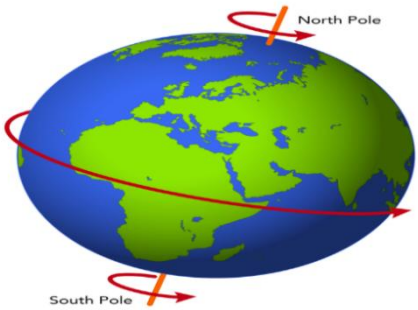

Figure 3Earth Rotation

The axis of the earth is an imaginary line that passes through the northern and southern poles of the earth. The earth completes its rotation in 24 hours. This motion is responsible for occurrence of day and night. The difference of 4 minutes is because of the fact that the earth' position keeps changing with reference to the movement of the earth round the sun is known as revolution. It also happens from west to east and takes a period of 365 days. The orbit of the earth is elliptical. Because of this the distance between the earth and the sun keeps changing.

3.3Charge Controller:
A charge controller, charge regulator or battery regulator limits the rate at which electriccurrent is added to or drawn from electric batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan and may pose a safety risk. It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life.

There are two type of charge controller:
1. MPPT{MAXIMUM POWER POINT TRACKING}
2. PWM{PULSE WIDTH MODULATION}

3.4MPPT(Maximum Power Point Tracking):
Maximum power point tracking (MPPT) or sometimes just power point tracking (PPT)[is a technique used commonly with wind turbines and photovoltaic (PV) solar systems to maximize power extraction under all conditions.
Although it primarily applies to solar power, the principle applies generally to sources with variable power: for example, optical power transmission and thermos photovoltaicPV solar systems exist in many different configurations with regard to their relationship to inverter systems, external grids, battery banks, or other electrical loads.Regardless of the ultimate destination of the solar power, though, the central problem addressed by MPPT is that the efficiency of power transfer from the solar cell depends on both the amount of sunlight falling on the solar panels and the electrical characteristics of the load. As the amount of sunlight varies, the load characteristic that gives the highest power transfer efficient

3.5 Battery
A battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, mobile phones, and electric cars.
When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.
The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load.

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3.6Inverter

Inverter, is a power electronic device or circuitry that changes direct current to alternating current.The input voltage, output voltage and frequency, and overall power handling depend on the design of the specific device or circuitry. The inverter does not produce any power; the power is provided by the DC source.A power inverter can be entirely electronic or may be a combination of mechanical effects and electronic circuitry.

3.7 ATMEGA 328

The ATmega328P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328P achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

It has 28 pins. There are 14 digital I/O pins from which 6 can be used as PWM outputs and 6 analog input pins. The I/O pins account for 20 of the pins. The 20 pins can act as input to thecircuit or as output. Whether they are input or output is set in the software. Two of the pins are for the crystal oscillator and are supposed to provide a clock pulse for the AT mega chip. The clock pulse is needed for synchronization so that communication occurs in synchrony between the Atmega chip and a device connected to it. Two of the pins, Vcc and GND are for powering the chip. The microcontroller requires between 1.8-5.5V of power to operate the pin-out for the microcontroller.

3.4 INTRODUCTION OF HARDWARES

Arduino :

Arduino is an open source physical computing platform based on simple input/output board and a development environment that implements the Processing language (www.processing.org). Arduino can be used to develop standalone interactive objects or can be connected to software on your computer. The boards can be assembled by hand or purchased preassembled; the open source IDE (Integrated Development Environment) can be downloaded for free from www.arduino.cc.

Introduction to Arduino Boards:

Arduino is an architecture that combines Atmel microcontroller family with standard hardware into a board with inbuilt bootloader for plug and play embedded programming. Arduino Software comes with an IDE that helps writing, debugging and burning program into Arduino. The IDE also comes with a Serial Communication window through which can easily get the serial data from the board.

Figure 4Arduino

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Each of the 14 digital pins can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

In addition, some pins have specialized functions: Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog.

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Write () function. SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library. LED: 13. There is a built-in LED driven by digital pin 13. TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is itpossible to change the upper end of their range using the AREF pin and the analogReference () function. There are a couple of other pins on the board, AREF Reference voltage for the analog inputs. Used with analog Reference Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Pin Diagram:

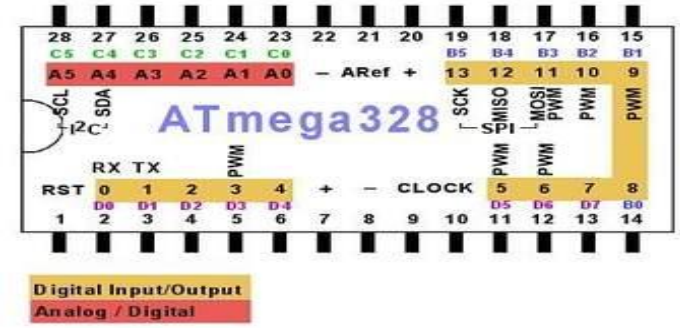

Figure 5 Pin Diagram AT Mega 328

IV. OTHER SPECIFICATIONS

4.1ADVANTAGES

1) Minimize fungul problem of crop
2) Suitable for any type of lands
3) Target the root of crop so large growth of crop
4) Uniformity of water application
5) Crop yield enhancement
6) No air pollution as well as water pollution
7) No foregin oil requried

4.2APPLICATIONS

1) Smart agricultural system
2) Roadside landscaping.
3) Lawns
4) Vegetable gardens
5) Surface drip irrigation
6) Vertical gardens
7) Multi used sports facilities

V. CONCLUSION

1) Drip water system widely used in agriculture field & it's required innovationPremier irrigation equipment's is are of the established companies having a good reputation and lot of good will to words the product the company and the agency have a good future

2) A solar panel that tracks the sun was designed and implemented. The required program was written that specified the variousactions required for the project to work. As a result, tracking was achieved. The system designed was a single axis tracker.

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VI. FUTURE SCOPE

In Future, double axis solar tracking are used and day as well as night working are possible. Intelligent IOT based Automated Irrigation system can be extended not just for irrigating the field with water but also for deciding on spraying appropriate chemicals for proper growth of crop. The same work can be extended by looking into water level in tank before irrigating the field. Lastly the data security and integrity of agricultural data can be secured while transmitting for analysis towards prediction and sending the control signal for actuation.

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