Solar Based Intelligent Automatic Plant Watering System

Pranita G. Titare[1], Rani A. Wagh[2], Vaibhav M. Umate[3,]
Department of electrical engg, DES'S COET, SGBAU university,
Email: pranitatitare@gmail.com[1] , raniwagh00@gmail.com[2]

Abstract-This paper explain the solar based intelligent automatic plant watering system. The proposed system mainly composed of solar power generation. Solar panel which extract the maximum energy from sunlight irradiation by maximum power point tracker which rotate and energies stepper motor and whole circuit. By using solar tracker the maximum power get track. This application is useful in Irrigation in farm, Irrigation in garden and park, very efficient for rice field and Lawn.. These solar source system is an very efficient for irrigation system.

1. INTRODUCTION:-

Renewable energy sources give the clean, abundant energy which gathered from self renewing sources like sun, wind, water, and plants. For Solar tracking and irrigation controller, we need to measure different parameters i.e. surrounding temperature, Water Level and Soil moisture. For Solar tracking and irrigation controller, we need to measure different parameters i.e. Water Level and Soil watering level. The irrigation system is defined as a system that distributes water to targeted area. Basically, the project consists of electrical part and mechanical part. The electrical part consists of photovoltaic, which is meant to generate power and the power is stored in the rechargeable battery.

The mechanical part consists of pump, to pump out the water from the water source. And in this fast fade world human being required everything to be automated. And hence to makes life of human being simpler and easier we made solar based automatic plant watering system. This project is mainly based on the technology of microcontroller ATmage328 for the smart application. Water is one of the smart application for successful garden. When the owner of farm or garden will goes out of location the also the water can be provided to the pant as required. The project also consist of moisture sensor. In which the threshold value will be fixed with the help of microcontroller AT mega328 programming. When the moisture will be decreases then the water will be feed in the farm automatically which is the main motto of project
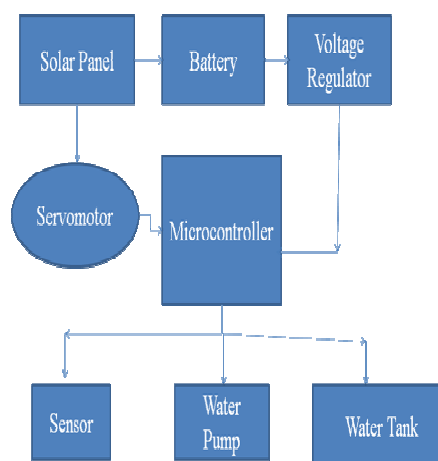
2. BLOCK DIAGRAM:-

Fig.2: Block Diagram of solar based automatic plant watering system

Main components include in the solar based automatic plant irrigation system can be explained as follows.

2.1 Solar Panel:-

Solar panel is a device that converts solar energy directly into electrical energy. Solar panel is made up off photo-voltaic cells which are made by semiconductor. Solar Panel. As we were facing problem for regularly discharge of 12v battery used at filed. Solar energy is the non renewable energy. . Solar panel is mainly made from semiconductor materials. Si used as the major component of solar panels, which is maximum 24.5% efficient.

2.1.1 Applications:-

There are many practical applications for the use of solar panels or photovoltaic's. It can first be used in agriculture as a power source for irrigation.

2.2 Solar Tracker:-

International Journal of Research in Advent Technology, Vol.4, No.4, April 2016
E-ISSN: 2321-9637
Available online at www.ijrat.org

Newly added feature for our project is - Solar tracking system is the most appropriate technology to enhance the efficiency of the solar cells by tracking the sun. As the optimum point changes with the natural conditions so it is very important to track the maximum power point (MPP) for a successful PV system. As the optimum point changes with the natural conditions so it is very important to track the maximum power point (MPP) for a successful PV system. . In most PV systems a control algorithm, namely maximum power point tracking algorithm is utilized to have the full advantage of the PV systems.

2.3 Battery:-

As the solar energy is cannot be obtained every time so the rechargeable battery can be used as the backup system for the project which will be stored the 12v dc supply from the solar panel. The battery will be charge continuously up to 12v from the solar panel. And it will be discharge when it will be required for irrigation purpose. The Deep Cycle batteries used are designed to be discharged and then re-charged hundreds or thousands of times.

The battery should have sufficient amp hour capacity to supply needed power during the longest expected period "no sun" or extremely cloudy conditions.

2.4 Voltage Regulator:-

The voltage regulator IC 7805 having mainly three terminal i.e. Input, output and common. The voltage regulator IC having high power dissipation capability. Voltage regulator IC gives constant DC voltage at output. The voltage regulator IC takes the 12v supply from input and provides the 5v supply to the output side. As the voltage regulator of IC having the name such as IC 7805 i.e. it provides the 5v supply to the output side.
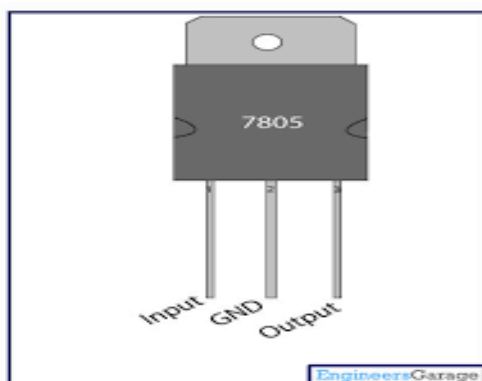

Fig2.4: Voltage Regulator

2.4.1 Commercial use:-

Voltage regulators or stabilizers are used to compensate for voltage fluctuations in mains power.

Large regulators may be permanently installed on distribution lines. Small portable regulators may be plugged in between sensitive equipment and a wall outlet. Automatic voltage regulators are used on generator sets on ships, in emergency power supplies, on oil rigs, etc. to stabilize fluctuations in power demand.

2.5 Microcontroller:-

The **ATmega328** is a single chip microcontroller created by Atmel and belongs to the mega AVR series. The AT mega 328 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing

powerful instructions in a single clock cycle. AT mega 328 is an 8 bit microcontroller with 32k bytes in the system .
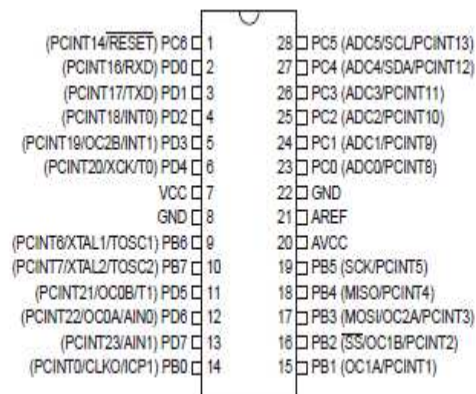

Fig2.5:Pin Diagram of microcontroller AT mega 328]

2.6 Servomotor:-

A servo is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a solar panel for changing the position of solar plates from east to west. Servomotors are not a different class of motor, on the basis of fundamental operating principle, but use servo mechanism to achieve closed loop control with a generic open loop motor. In other words, a servomotor is just a regular motor typically to controlled angular position during operation. A servomotor is a specific type of motor and rotary encoder combination that forms a servomechanism.

Stepper motors are not considered as servomotors, although they too are used to construct larger servomechanisms. Stepper motors have inherent angular positioning, owing to their construction, and this is generally used in an open-loop manner, without an encoder. Servomotors are used for both high-end and low-end applications, although the mid-range is generally handled by stepper motors. Most

International Journal of Research in Advent Technology, Vol.4, No.4, April 2016
E-ISSN: 2321-9637
Available online at www.ijrat.org

servomotors, at least under this name, are precision industrial components.

2.7 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. There are many varieties of water pumps used. This project employs the use of a small water pump which is connected to a H-Bridge.v .The pumping of water is a basic and practical technique, far more practical than scooping it up with one's hands or lifting it in a hand-held bucket. This is true whether the water is drawn from a fresh source, moved to a needed location, purified, or used for watering, washing, or sewage treatment, or for evacuating water from an undesirable location.

Fig2.7: Submersible Water pump

2.8 Sensor:-

Sensors are used in everyday objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1 °C, the sensitivity is 1 cm/°C (it is basically the slope Dy/Dx assuming a linear characteristic).

3 CIRCUIT DESCRIPTION:-

The circuit diagram can be given as shown in above fig. The circuit diagram have main component solar panel, servomotor, battery, water tank and microcontroller atmage328.

In this project firstly the solar panel of 12W will takes the solar energy from sun and that solar energy can be stored in the battery in the form of electrical energy. That 12v energy can be given to servomotor and printed circuit board. But the servomotor required only the 5v supply hence there can be used one voltage regulator IC of 7805 which can be step down that voltage from the 12v to 5v and the servomotor can be used for the angular motion of any motor of any motor or device
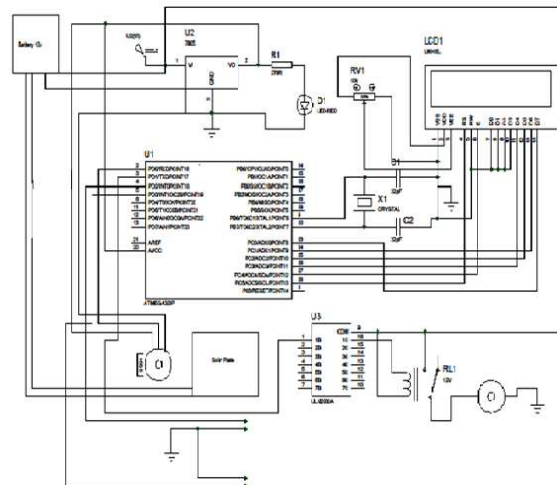

Fig3:circuit diagram of solar based automatic plant watering system

And hence the solar panel can be act as solar tracker when the sun will goes from east to west then also the solar panel can be moved from east to west with the help of servomotor. And the battery can be stored 12v supply can provides into the printed circuit board. On that PCB the power supply will be decreases firstly with the help of voltage regulator which can be mounted on PCB . And the remaining components on the PCB gets the 5v supply   which are sensor, microcontroller atmaga328, ceramic capacitor, crystal oscillator, LED screen, driver IC. The LED screen can be shows the timing of solar tracking. But the LED screen required only the 3v supply hence resistance of the 270 ohm can be connected in series with that resistance to drop 2v supply.   The microcontroller atmage328 can be performs of program in the loping form and the ceramic capacitor can be used for reducing the unwanted noise from the system. And the relay also required the 12v supply and hence driver IC can be provided   there for operation of relay. When relay will   on at that time pump will be off and vice versa. The sensor can be senses whether the soil is wet or dry when the sensor will dipped in the soil and when the soil will be dry then automatically water tank containing the submersible pump takes out the

International Journal of Research in Advent Technology, Vol.4, No.4, April 2016
E-ISSN: 2321-9637
Available online at www.ijrat.org

water from tank when required. When the moisture sensor threshold value which is fixed in the microcontroller At mega328 will be equal to the moisture of the soil then the water will be stops to flows in the farm and when that two value will be not equal then the relay will be off and water can be flows in the farm automatically which is nothing but automatic plant irrigation system.

4. ADVANTAGES AND DISADVANTAGE:-

4.1 Advantages:-
1. Elimination of man power.
2. Works according to soil condition.
3. Highly sensitive.
4. No consumption of electricity.
5. Low cost and reliable circuit.
6. System can be switched automatic made whenever required.
7. It is highly efficient.
8. It consumes low energy
9. It turn on and turn off automatically.
1o. Solar rays can directly converts solar radiation into electrical energy.
11. It is pollution free.
12. Easy maintenance.

4.2 Disadvantage:-
1. Cost is high.
2. It doesn't work properly in rainy season.
3. Required battery for storage.

4.3 Applications:-
1. Irrigation in farm.
2. Irrigation in garden and park.

5. RESULT AND CONCLUSION:-

The project   will help to make proper use of water, as the soil moisture level differs from crops to crops and this will be taken care of by the soil moisture sensor. As the entire system will be powered by solar energy which will be stored in the rechargeable batteries, one need not think of the electricity consumption, as life of solar panel which is available these days is 25 years. Using this system, one can save manpower, water to improve production and ultimately profit. In today's life human being is becoming so busy that he can't pay his attention to work like water supply. But plants and trees are the sources of oxygen for human being and their existence is also important from growth is also important, but it is necessary that excess supply of water should be avoided to save the water. The system is efficient and compatible to changing environment. the moisture sensor sends the signal to the relay   which triggers the Water Pump to turn ON and supply the water to respective plant using the. When the desired moisture level is reached , the system halts on its own and the Water Pump is turned OFF which is an main function of our project.

REFERENCE:-

[1] 1. Hemant Ingale and N.N.Kasat, "Automated Solar Based Agriculture Pumping" in International Journal of Advanced Research in Computer Science and Software Engineering Research Paper, Volume 2, November 2012

[2] 2. M.A. Panait and T Tudorache, "A Simple Neural Network Solar Tracker for Optimizing Conversion Efficiency in Off-Grid Solar Generator", Intl. Conf. on Renewable Energy And Power quality, no.278, March, 2008.

[3] 3. Prof. Rupali S. Sawant, "Solar Panel Based Automatic Plant Irrigation System", International Journal of Innovative Science , Engg and technology, vol 2 March 2015.

[4] 4. S.V. Devika, "Arduino Based Automatic Plant Watering System" In International Journal of Advanced Research in Computer Science and Software Engineering, October - 2014, pp. 449-456

[5] 5. Venkata Naga Rohit ",Gunturi Micro Controller Based Automatic Plant Irrigation System" In International Journal of Advancements in Research & Technology, Volume 2, April-2013