Design & Development an Irrigation System through Automation

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Abstract:- We live in era where energy crises are bound to hit. The globe shelters us as survival to perceive our livelihood where our country India part of it dominates the sector of agriculture. Indian economy is totally based on agriculture. Actually, survey makes it clear that where up to 80% of total nation population depends on agriculture & allied business. Thus, this structures the main source of income & the main aspect of agriculture is irrigation. Our project is truly focusing to fully atomize the entire irrigation system with using solar energy as supply unit. The deep vision aim & intention of this project is to facilitate farmers to use effective water with solar for any present & future scarcity regarding water or electricity which forces us write this paper.

Keywords:- Automation Irrigation System, Maximum Point Power Tracking, World of Internet.

I. INTRODUCTION

Sun has always been a powerful center of attention in field of technology. Solar energy is the only greatest sources clean & inexhaustible sources energy. Advance developed in solar science offers sustainable & efficient solution to use pure renewable energy in today's energy crisis which is also environmentally friendly.

The basic physics behind 'Solar' is to convert sun light as source into electricity. Using semiconductors materials that possess photovoltaic effect is utilized for generation of electricity known as photo sensors. This mainly concentrates on generating voltage & current when it is subjected to sunlight.

Our concept is to combine the solar energy using Maximum Power Point Tracker technique to generate electricity. Further using this generated electric supply to power the irrigation process. Irrigation is the main aspect of agriculture & our designed model makes the entire irrigation process automatic & self-happening.

The genuine reason behind this paper is focus the attention in field of agriculture for more updated technological growth in this sector. The entire paper is vision to focus to introduce advance technology in field of agriculture & to reduce unnecessary tedious efforts of framers in affordable value contributing national economy.

II. LITERATURE REVIEW

In [1] this paper author presents an automated pc based irrigation system operates in different modes. This system is fully automated microcontroller based Delphi based graphical system & control by the computer which is easy to operate and also it is more attractive. It works on the solar energy and energy is stored in the form of DC to the battery.

In [2] the research mainly focused on smart irrigation using solar pump & solar power. The automatic irrigation system is a solution to reduce wastage of water & reduces human efforts. Solar is the solution in energy crises & is also eco-friendly.

In [3] proposal represents an irrigation system offering automation by raspberry pi. This system further offers user to control its operation with-in range of Bluetooth as connectivity that to with range. Such, system come with complex raspberry pi coding making slow computing if lack the configuration and come at price.

In [4] this main focus is to develop model in which an automatic irrigation system irrigates indoor plants. But the entire model runs on Man-made electricity as supply unit for its working. Thus, a frequent power cut o sudden power cut due to any reason leads its failure.

In [5] this model which an embedded system is used to perform different operations for irrigation. Generally, the embedded system programming is quite a difficult task & obviously come at higher price point when comes to implementation.

III. METHODOLOGY

The overall system mainly consists of two modules:
1. Automatic irrigation kit
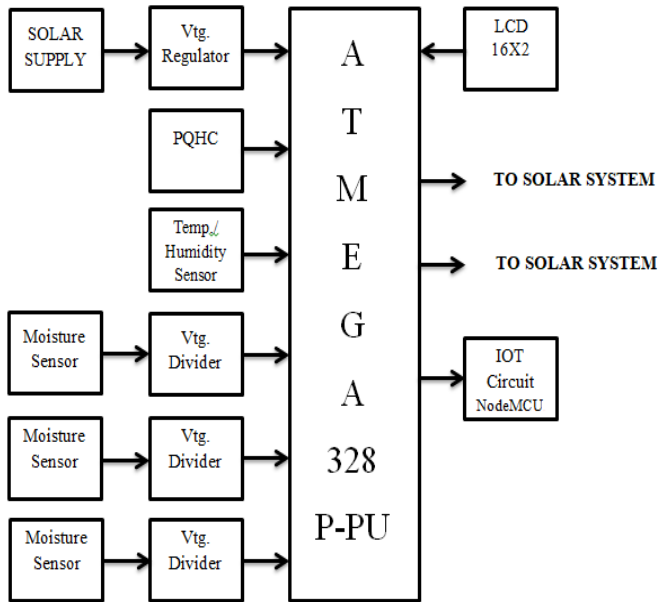2. Solar module (MPPT)

Fig.1: Block diagram of Automatic Irrigation System.

This consists of Atmega328p-pu controller, voltage regulator IC LM7805, DHT 11 sensor, capacitive moisture sensor and pH sensor. The used controller requires 5V of constant supply & that is achieved by the voltage regulator. Used sensor provided information regarding surrounding temperature, soil dry/wet condition status as well as pH level of soil. (Optimum pH value range for most is between 5 to 7)

The sensed information for the sensors is directly feed to the controller as the controller has its own built in A/D convertor. According to the sensed data the controller analysis the information and computes the operation through software dump in the controller an irrigated the filed thus, preforms it operation.

To have clear idea of the operation performed by the controller the controller kit involves displays which give the status of ongoing operation. The inlet of water from tank is tapped through valves. The on/off of the pump double motor operating signals are provide by the controller on the basis of the sensor information. The use battery sprayer pump lets the water to irrigates the filed in drip fashion.

The temperature condition also affects the growth of the crop. Tremendous high rise in temperature damages the plant by burning of leaf etc. hence to avoid this and to maintain the surrounding atmosphere at required level foggers are used which all so sprinkle require amount of water on the leaf surface.

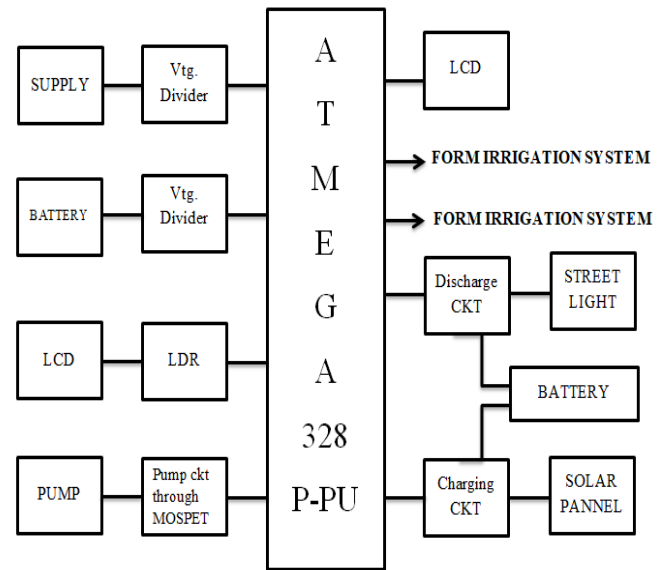The entire process is fully automatic a uses solar as its supply.

Fig.2: Block diagram of solar system.

In the irrigation system we take the supply from solar panels. The solar energy is renewable energy source present in large amount in the solar system PV modules techniques used, in this technique at one single operating point; solar energy is generated in very large amount. So we need to operate the system at that energy generation should be maximum. The process of maintaining the PV module to operate at that particular point is known as maximum point power trading (MPPT) technique.

The MPPT technique improves the efficiency of solar panels. In this model the out power is high when the source or supply impedance is equal to the local impedance. To chance the output voltage in load side, bulk converter is connected in the source side of model. To achieve the condition of source impedance is equal to load impedance; duty cycle of bulk converter is adjusted by PWM technique. The MPPT technique is clarified in various types but, most deficient and widely used techniques are perturb and observe (P&O) and incremental conductance (INC).
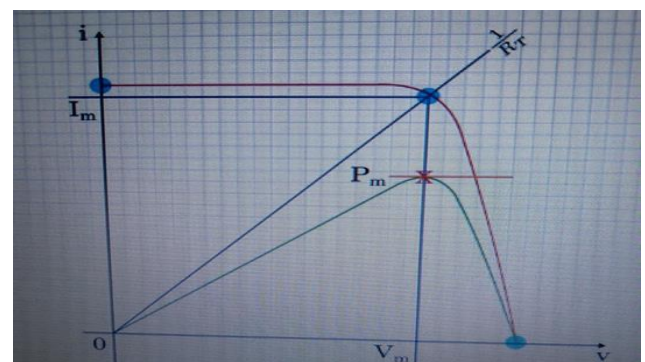
This technique has some limitations that, it oscillates at point with rapidly changing an atmospheric condition. In proposed model by using array, controller adjusts the voltage by changing in small amount and power is measured. If the power increases then farther arrangement is carried out to make the power constant.

IV. HARDWARE DESCRIPTION

➢ *ATMEGA328P-PU*:

Here we are using Microcontroller ATMEGA328P-PU comes from the 8051 family of Atmel microcontrollers. The Arduino board is used for build electronics projects. The microcontroller takes output form the different sensor like temperature sensor, soil moisture sensor and Arduino program will be uploading computer code to the Arduino physical board.

Features-
- ATMEGA328P-PU, P stands for Pico-power.
- 14 digital pins can be used as I/O.
- Pin.no: 5, 11,12,15,16 can be used for PWM.
- Single chip microcontroller belongs to Mega AVR series.
- 8 bit AVR combined 32k flash memory with 1k bytes of EPROM, 2K bytes of SRAM.
- General purpose I/O lines: 32
- Working resister: 32
- 3 flexible timers.

➢ *IOT [NodeMCU]:*

The IOT application is API store and receive data form sensor like temperature and humidity etc. In this HTTP protocol is used over the internet communication.

By IOT we can create a channel for each and every sensors data. The channel can be private or you can share the data publically through public channel.

Features-
- Collect data in private channel.
- RESET API and MQTT APIS
- World Wide communication.

➢ *DHT 11 Sensors:*

It is used for the measure the Temperature and Humidity sensor. It is automatic climate control and environment monitoring. Its temperature range is 0 - 50 C and humidity range is 20% to 90%.

➢ *Capacitive Moisture Sensor:*

Capacitive moisture sensor is measure humidity of atmosphere and water droplet present in the soil. Its measure the three different condition of soil - dry, wet, water they specific ranges are divided for the different condition of soil.

➢ *IRF3205 MOSFET:*

The IRF3205 is N-Channel MOSFET it's used to switch currents up to 110A and 55V and it has very low resistance for switching circuits like Inverters, motor speed control.

V. DESIGN & IMPLEMENT

The proposed model is practically implemented at "RISING INNOVETERS, SANGLI" & work fine with good results having better yield crop benefits the user with daily vegetation as required for consumption.
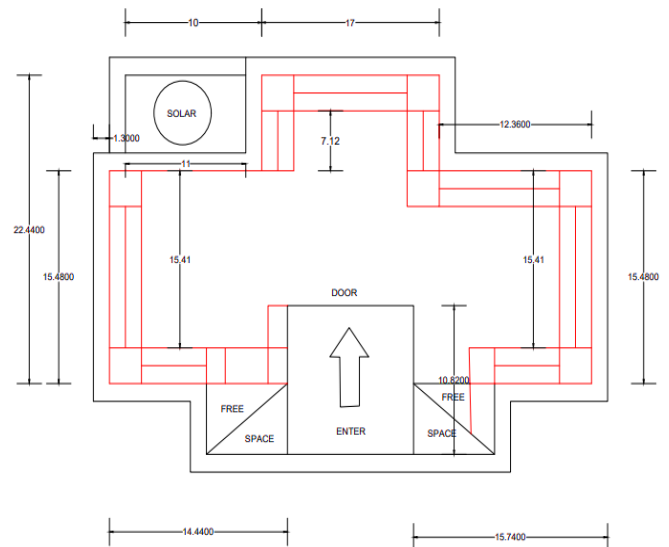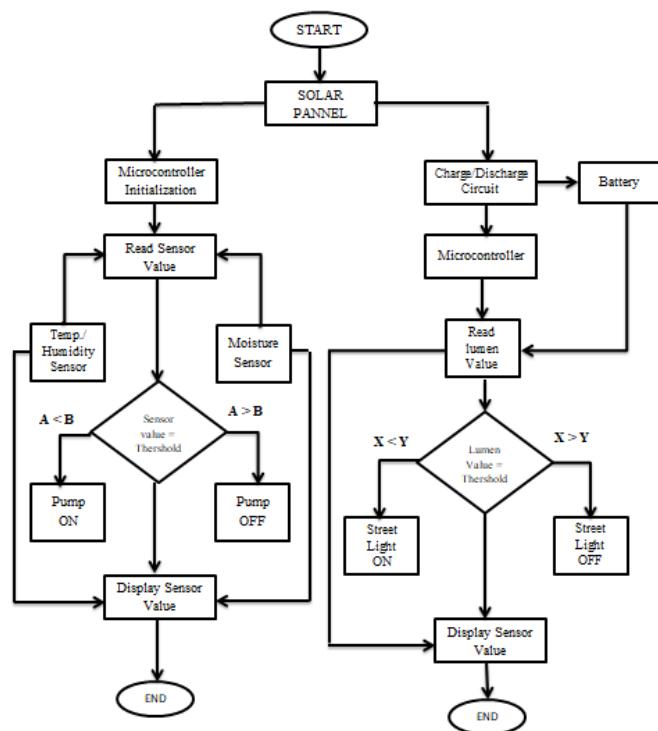

Fig.3: Layout of site implementation.

Same pictures on the site we have implement the propjet.

VI. FLOW CHART

VII. RESULT TEST DATA

Table 1:- Readings of sensors

Sr No.	Parameters	Timing	Result
1.	Temperature	7:30 PM	30.00^0 C
2.	Humidity	7:30 PM	50.00%
3.	Lumen	3:50 PM	1267.5 lumens
		4:00 PM	1237.3 lumens
		5:10 PM	1201.7 lumens

Table 2:- Readings of battery voltages and current

Battery Voltages	Timing	Result	
		Voltages	Current
	8 AM	12.00 V	2.1 A
	9 AM	12.45 V	3.2 A
	11 AM	14 V	6.4 A
	12:30 AM	14.2 V	7.5 A
	1 AM	14.51 V	6 A
Low battery cut-off	-	11 V	-
Over charge cut-off	-	14.5 V	-

Table 3:- Readings of solar panel

Sr. No.	Parameters	Voltage	Current
1.	Max. panel voltage	17 V	-
2.	Max Panel current	-	8.9 Amp
3.	Max load current	-	4 Amp

VIII. FUTURE SCOPE

We are at edge where we have to be self-dependent. This pandemic has taught us many things & the concept of terrace kitchen garden will help us for better health survival at small scale. So this system will help individual people for making automation in terrace gardening and will also make them self-reliant in this pandemics issue.

Watering resources can be utilized efficiently thus save water contributes to natural ecosystem. It can even be more important in areas running in scarcity of water allows filed to have better growth with sufficient amount of irrigation required to the crop.

IX. CONCLUSION

Evolution in Irrigation using automation", has been designed to provide a real time monitoring & controlling the drip irrigation to improve the quality & yield of crops. Using this system, one can save water as well as improve the production for profit.

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