e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

CONTROLLING SOLAR ENERGY CHARGE USING MPPT

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ABSTRACT

The project allow for battery charging system from a solar panel. With the help of the solar panel solar energy is converted into electrical energy through photo – voltaic cells. The system is beneficial for storing the energy for night time use. The project even controls the charging mechanism i.e. when the battery gets overcharged or undercharged. It requires a set of op-amp that constantly monitors the parameters like panel voltage, load current etc. When the battery is fully charged it show the battery voltage in LCD display and when the battery is overcharged or undercharged then also show the result in LCD display. MOSFET is used to cut off the load when it gets overcharged or undercharged whereas a transistor used to switch the load to another dummy one when it is fully charged thereby it protect from damaged.

Keyword: Solar Energy, MPPT, Charge Controller, Arduino Nano, Battery.

I. INTRODUCTION

A solar charge controller is fundamentally a voltage or current controller to charge the battery and protect electric cell from overcharging and undercharging. Generally, electric storage devices require around 14 to 14.5 volt to get completely charged. The solar charge controller are available in all features, costs and sizes. The range of charge controllers is from 4.5Amp and up to 60 to 80 Amp.

MPPT Solar charge controller

The core function of the solar charge controller is to protect the battery from overcharging and undercharging so when the solar panel charges the battery, charge controller protect the battery from overcharging and undercharging. In other word it simply perform the function of the battery cannot be damage from overcharging.

We use the MPPT [Maximum Power Point Tracking] circuit it is used to improve the efficiency. The efficiency loss in a basic system due to a miss match between voltage produced by the PV panels and that required to charge the batteries under certain condition. If the battery if fully charge, unregulated charging will cause the battery voltage to reach exceedingly high levels, causing electrolyte loss, heating etc. So we can say that charge controller maintain and improve battery life.

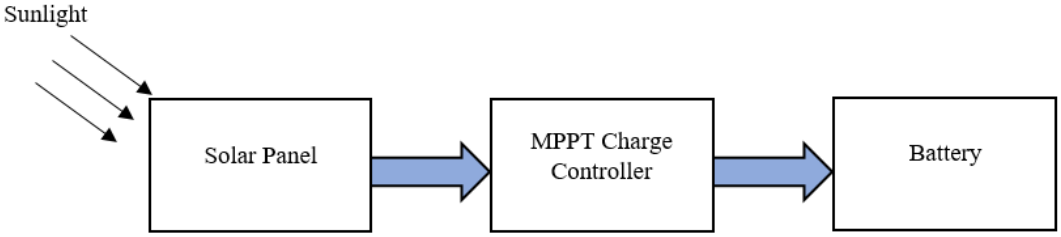

Fig. MPPT Charge Controller

II. METHODOLOGY

Solar panel convert the solar energy into electrical energy. Basically MPPT [Maximum Power Point Tracking] perform the extra function to improve the system efficiency. In our project lithium ion battery is used, the main responsibility of the battery use to store charge. In our project Arduino is used to give the more accurate result voltage regulator is used to convert the 12volt supply to 5volt. Finally all the reading are shown in the LCD display.

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III. HARDWARE WORKING

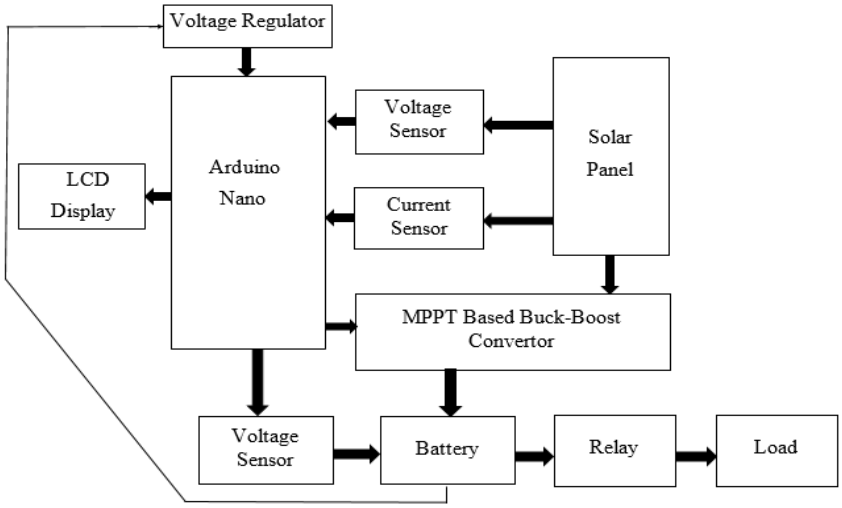
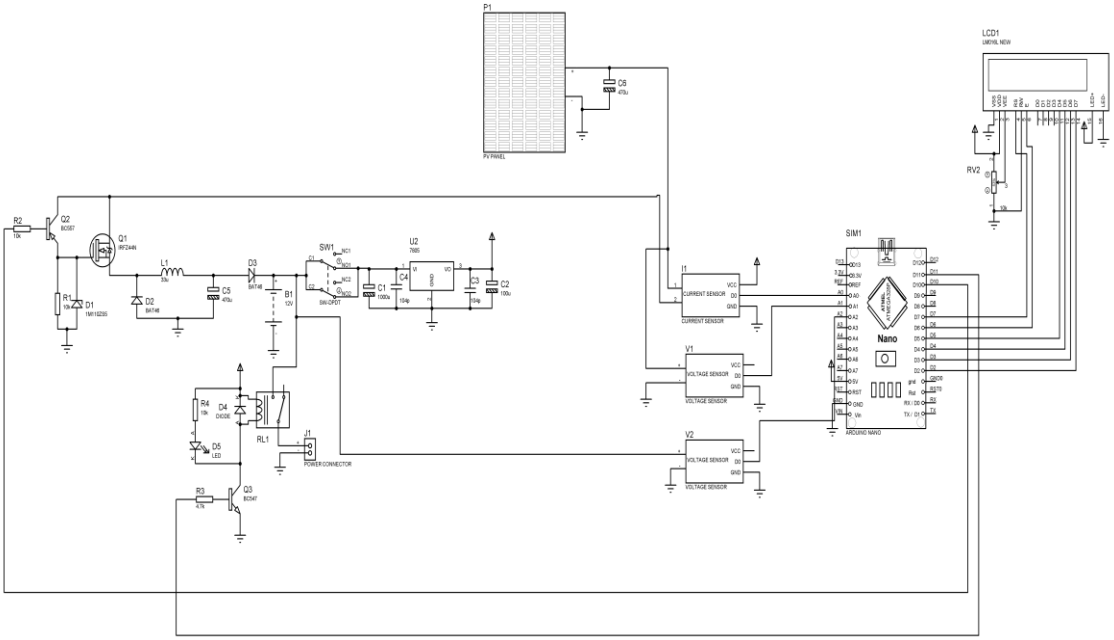


Fig. Block Diagram of Controlling Solar Energy Charge using MPPT

Block Diagram Explanation

Solar panel collected solar radiation from the sun solar panel convert the solar energy into electrical energy with no harm emission. A solar panel is the collection of many solar cell. In our project MPPT circuit is used. Basically a maximum power tracking [MPPT] perform an extra function to improve the system efficiency on other word says that [MPPT] use to boost the power. Two Voltage sensor and one Current sensor are used. One voltage sensor is used to measure the solar panel voltage and another voltage sensor is used to measure the battery voltage current sensor is used to measure the solar panel current. We are using the ATMEGA328P Arduino Nano it is used to give the more accurate result in our project. 20*4 LCD display it is used to show the result. We used battery In our project lithium ion battery is used the main responsibility of battery use to store the charge but in solar energy concerned selecting the right type of the battery is most important after that the battery supply is give to the Arduino but Arduino is work on 5V supply that's why we use voltage regulator. Voltage regulator are one of the most common electronic component.it is use to convert or regulate 12V voltage to 5V voltage this 5V supply given to the Arduino. Relay are used for the protecting purpose and finally load is connected as the output.

Circuit Diagram



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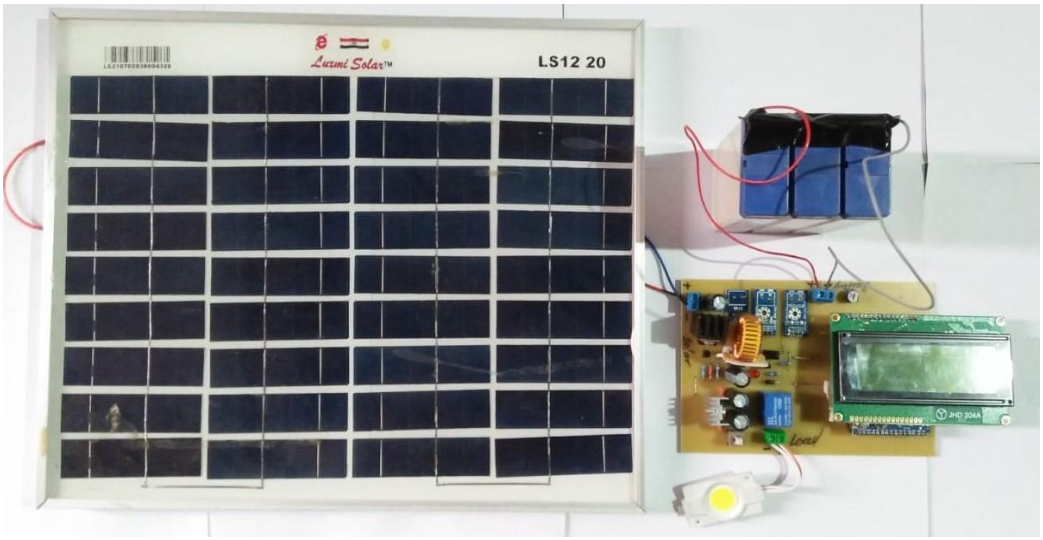
IV. HARDWARE DIAGRAM



V. RESULTS

Data Collected in sunny weather

No. of Observation	V(in)	I(in)	V(out)Battery Voltage	Power
1	14.93	2.12	11.32	31.65
2	13.19	1.91	10.89	25.19
3	15.21	2.22	11.58	33.76 (Pmax)
4	12.56	1.33	10.13	16.70
5	11.79	0.935	10.08	11.023

Data collected in a Partly cloudy weather

No. of Observation	V(in)	I(in)	Vout (Battery Voltage)	Power
1	12.37	1.33	11.12	16.45(Pmax)
2	12.09	1.07	10.83	12.93
3	11.47	0.569	10.37	6.526
4	12.27	0.937	10.61	11.49
5	10.83	0.397	10.01	4.323

Data Collected in Cloudy weather

No. of Observation	V(in)	I(in)	Vout (Battery Voltage)	Power
1	10.55	0.367	11.03	3.871
2	10.31	0.339	10.86	3.495
3	11.49	0.683	11.23	7.84
4	11.53	0.877	11.39	10.11(Pmax)
5	10.69	0.512	10.91	5.473

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VI. CONCLUSION

In our project we use the solar panel, battery and MPPT circuit this circuit includes the various component such as relay, microcontroller, MOSFET, voltage regulator, voltage sensor and current sensor etc. Solar panel convert the solar energy into electrical energy and the battery is used for charge storing purpose. We are using the solar charge controller for the protection of the battery for overcharged and undercharged suppose if the battery is the fully charged the Arduino will generate the signal and this signal is give to the transistor and transitor will switch ON the relay and load will be automatically turn OFF and for the undercharging protection, the Arduino will generate another signal this signal will give to the transistor and transitor switch ON the MOSFET and MOSFET will be suddenly ON or OFF and load will be automatically turn OFF microcontroller gives the command to the LCD display and result will show in it if the battery is undercharged then it also show the result in LCD Display and the load is turn off. We are used the relay for protection of the circuit.

VII. REFERENCES

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