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Solar Street Light Model

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Abstract: ***Our solar street light model consists of many advanced features. We have been working on not just using the solar energy but also using it for other local purposes rather than selling it to centralized electricity suppliers. We have decided to use that energy to solve local issues and address them locally. We will be using 3-4 street lights to connect to a common power storage rather than having separate power storage for separate street light which will reduce the cost of the entire model considerably, rotating solar panel will be mounted on the top of the street light and also it will be having automatic on/off aspect. The main motive behind this idea is to reduce the use of non-renewable source of energy and use solar energy which is non exhaustible and sustainable source of energy. This also helps in reducing the pollution as it is harmless to environment.***
Keywords: Street light, Arduino, Chargeable Battery, Rotating solar panel.

I. INTRODUCTION

As use of non-renewable source of energy is increasing which is polluting environment, burning them releases harmful chemicals into air, including carbon dioxide and sulfur dioxide. These gases cause climate change and respiratory problems. Renewable source of energy does not produce such emission.

Using renewable source of energy like solar energy which is not harmful to environment which is also inexhaustible in nature. Renewable source of energy also supports pollution free environment as it does not produce any greenhouse gas and polluting emission which are produced by non-renewable source of energy. Also, renewable source of energy is cost effective.

We will be using renewable source of energy in our model in which energy can be re-used for some other useful work. Solar energy will be stored in a chargeable battery for some future use.

II. LITERATURE SURVEY

A LED street light's automatic control circuit is created. A solar cell supplies power to the circuit, and a battery stores electrical energy. It operates in three modes: low power, delay plus quenching, and light control. A LED street lights automatically turns on at night and turns off during the day when it is in the light management mode. During the day, the LED street light is turned off while it is in the delay quenching mode. It would automatically switch off after the setting time and light up at night. A LED street light in the delay plus low power mode turns on automatically at night and switches to low power pulsed lighting after the predetermined amount of time. During the day, it would be turned off. Additionally, the circuit protects the battery from overvoltage and undervoltage and automatically resumes charging.[1] It is suggested to build and install a boost DC-DC converter topology Maximum Peak Power Tracking system for a solar array. To calculate the instantaneous power, voltage and current are continuously monitored using a closed-loop microprocessor control system. To extract maximum power, the duty cycle of the converter is continuously adjusted using an output pulse width modulation signal, which is based on the determined power level. Thevenin power source and solar panel simulator are used in system design testing to verify that simulation yields predicted outcomes and theoretical operation is achieved.[2]

It involves using particular sensors, LDRs, and microcontrollers to regulate a circuit of street lights both during the day and at night. It is evident that during off-peak hours, including early in the morning, high light intensity is not necessary. In fact, by lowering the intensity during these periods, energy can be saved to some degree. Street lights are powered by solar energy that is captured with the help of a solar cell and battery that is charged during the day. Additionally, we may maximize the energy we receive from the sun by utilizing a solar tracking device. This project describes the system that uses an LED and microcontroller to automatically adjust the street light's intensity.[3]

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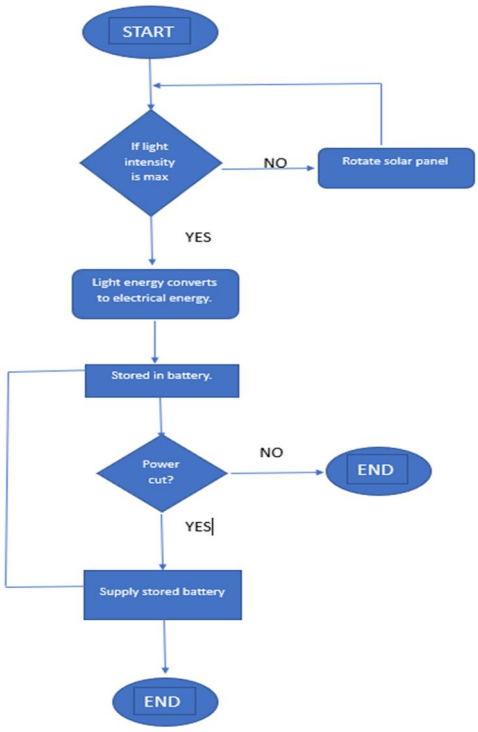
III. METHODOLOGY/EXPERIMENTAL

A. Algorithm

Our model consists of solar panel mounted on street lights. To track maximum intensity of the sunlight we have included the concept of possibility of rotation of solar panel according to the position of sunlight. In order to achieve this, we have used LDR (light dependent resistor) to track the intensity. The position of LDR sensors will be at the upper side and bottom side of solar panel. LDR will give the feedback of sunlight's intensity and will command the Arduino to rotate the panel. The panel will be rotated with the help of servo motor.

The solar panel will convert light energy to electrical energy and will be transmitting the power to a chargeable battery. This battery will be a common power storage for 3-4 street lights. This is implemented to reduce the cost of the model. Due to tracking of sun's position for maximum intensity, chargeable battery will surely have the charge more than sufficient to light the streets light. We have decided to use this extra power for local household in case of a power cut.



IV. RESULT AND DISCUSSIONS

The integration of solar plates, servo motors, LEDs, and a stable power supply contributed to an overall efficient solar street light system. The combination of these components allowed for reliable energy capture, storage, and utilization, minimizing dependence on external power sources. It significantly reduces the reliance on conventional energy sources, contributing to a lower carbon footprint and environmental sustainability. The use of solar energy promotes cleaner and greener alternatives for outdoor lighting systems.

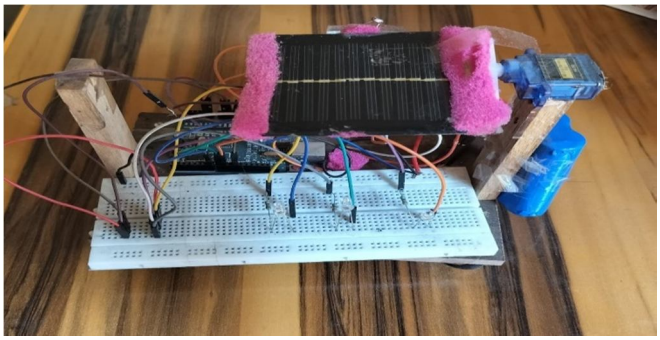


Fig-1 Front side view of the model

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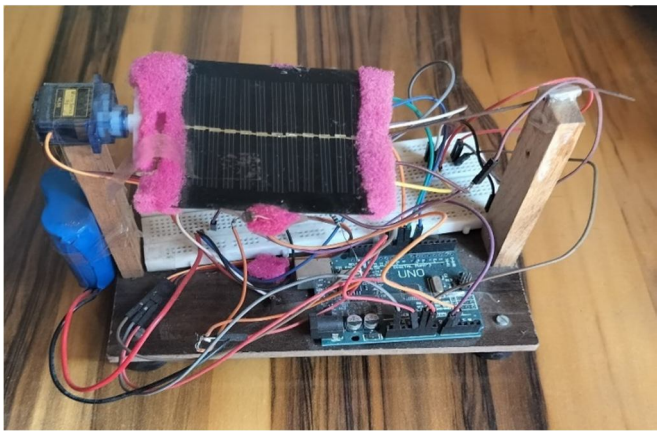

Fig-2 Back side view of the model

V. CONCLUSION

The solar plates demonstrated remarkable efficiency in transforming solar radiation into electrical energy, offering a reliable and sustainable power supply. Servo motor integration made it possible to precisely position solar plates, which enhanced energy capture by tracking the movement of the sun throughout the day. This function guarantees optimal use of the solar resources that are accessible while improving the system's overall efficiency.

VI. FUTURE SCOPE

As technology continues to evolve, we can have improvements in solar panel efficiency, battery storage capacity, and LED lighting. We can involve intelligent algorithms to predict energy generation and consumption patterns, allowing for better energy planning and storage. we can Design the solar street light model to be scalable and adaptable to various environments and applications. Solar street lights contribute to environmental sustainability by utilizing clean and renewable solar energy.

VII. ACKNOWLEDGMENT

To our project guide, Mrs. Shradha Bora, we would like to convey our sincere gratitude for their invaluable advice and help during the project. Their in-depth knowledge of the subject has been extremely helpful in guiding our research and giving us astute criticism. We also appreciate Vishwakarma Institute of Technology for giving us the tools and resources we needed to complete this research. We also like to thank our friends and coworkers for their encouragement and support during the process. Their suggestions and criticism played a crucial role in helping us refine our concepts and raise the bar on our work. We would also like to take this opportunity to thank our families, who have been a constant source of encouragement and support for us throughout our academic careers.

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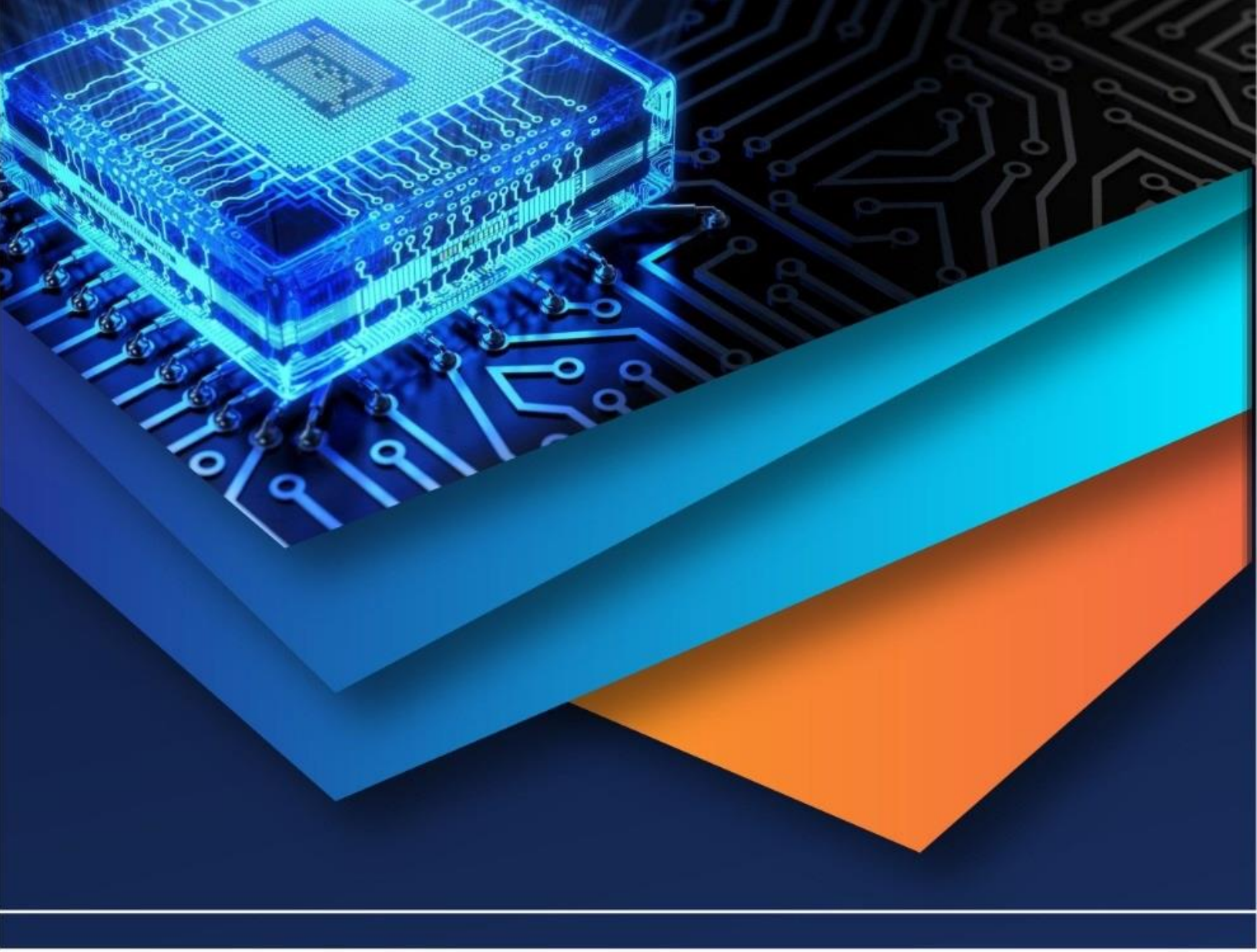

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