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Solar Tracking on Movable Object

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Abstract **-** In today's world sustainable mobility issues are gaining increasing attention not only because of the reduction of fossil fuel in the next half century. Electric vehicles are a clean alternative to traditional vehicle. In this paper we have represented an idea of mounting a solar tracking system on movable objects. The portable automatic solar tracking system in which solar panel is mounted on circular rotating disc, which rotates itself with the help of processing data from Ldr sensor in such a way that solar panel directs towards the direction of light with maximum intensity thereby increasing the efficiency of solar panel. At the same time the power generated is hybridized with battery which further can be used to maintain the battery charging level at a desired value.

Keywords- *Sustainable Mobility, Solar Tracking, Ldr Sensor.*

I. INTRODUCTION

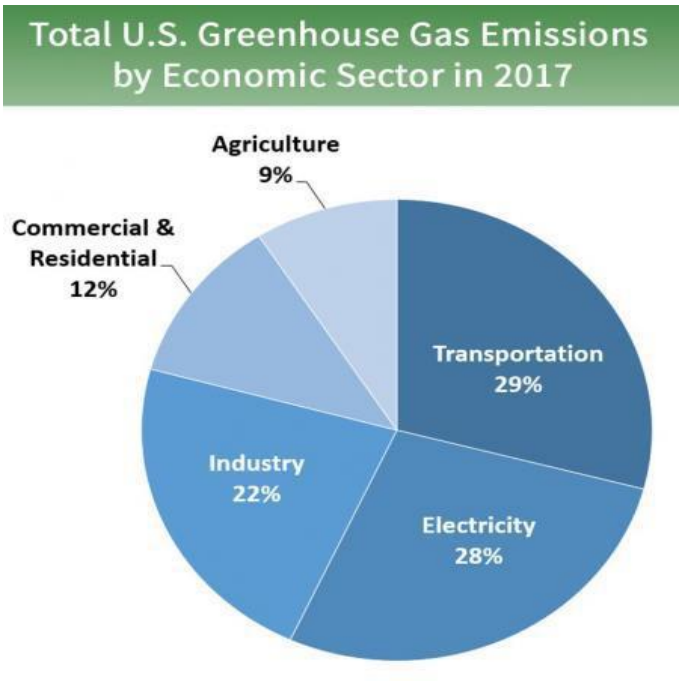
In photovoltaic system trackers help minimize the angle of incidence (the angle that a ray of light makes with a line perpendicular to the surface) between the incoming light and the panel, which increases the amount of e energy the installation produces. Concentrated solar photovoltaic and concentrated solar thermal have optics that directly accepts sunlight, so tracker must be angled correctly to collect energy.

Single axis tracker rotates on one axis moving back and forth in a single direction. Dual axis tracker continually faces the sun because they can move in two different direction. There are also several methods of driving solar trackers. Typical dual axis solar tracking uses tip-tilt and azimuth-altitude to orient a panel and redirect sunlight along a fixed axis towards a stationary receiver.

One such method of solar tracking is used in this system which is mounted on movable objects. Solar tracking on fixed surface is very easy to implement because the surface on which the system is mounted are stationary. In this method of solar tracking the circular rotating disc is mounted on moving object and it rotates with the help of motor-belt. Solar panel is made fixed on radius of circular disc with some tilted angle >60 degree. Sensor (LDR) sense the direction of incoming light and release signal to guide motor-belt mechanism and rotates the circular disc in such a way that the solar panel directs towards maximum incoming light.

II. SUSTAINABLE MOBILITY ISSUES

Across the globe, government have been tackling the concerning problem of air polluting emissions by committing significant resources to improving air quality. Achieving the goal of air purification will require that both the private and public sectors invest in clean energy technology. It will also need a transition from conventional house to smart houses and from conventional vehicles to electric vehicle (EVs). It will be necessary to integrate renewable energy sources (RESs) such as solar photovoltaic. Statistic indicate that transportation is responsible for 14% of global greenhouse gas (GHG) emissions. There are indeed many technology and strategies which reduce transportation emission such as public transportation, vehicle light weighing, start stop trains, improve engine technology, fuel substitution and production improvement, hydrogen, power-to-gas and natural gas heavy fleets. This work concentrates on EV adoption integrated with RES. Specifically, this paper examines the feasibility of significantly reducing GHG emissions by integrating EVs with RESs for sustainable mobility.



Data shows that:-

- The greenhouse gas emission by electricity production and transportation is larger among all.
- GHG emission by transportation is highest among all.
- This can be reduced to almost negligible by converting conventional energy sources with renewable energy sources such as solar energy.
- The battery is important component in solar energy storage.
- Here the efficiency in solar energy generation come into picture which is possible only with the help of solar tracking.

III. SOLAR TRACKING

The conversion of solar light into electrical energy represents one of the most promising and challenging energetic technologies, in continuous development, being clean, silent and reliable, with very low maintenance costs and minimal ecological impact. Solar energy is free, practically inexhaustible, and involves no polluting residues or greenhouse gases emissions. The conversion principle of solar light into electricity, called Photo-Voltaic or PV conversion, is not very new, but the efficiency improvement of the PV conversion equipment is still one of top priorities for many academic and/or industrial research groups all over world. Trackers direct solar panels or modules toward the sun. These devices change their orientation throughout the day to follow the sun's path to maximize energy capture. Single-axis solar trackers

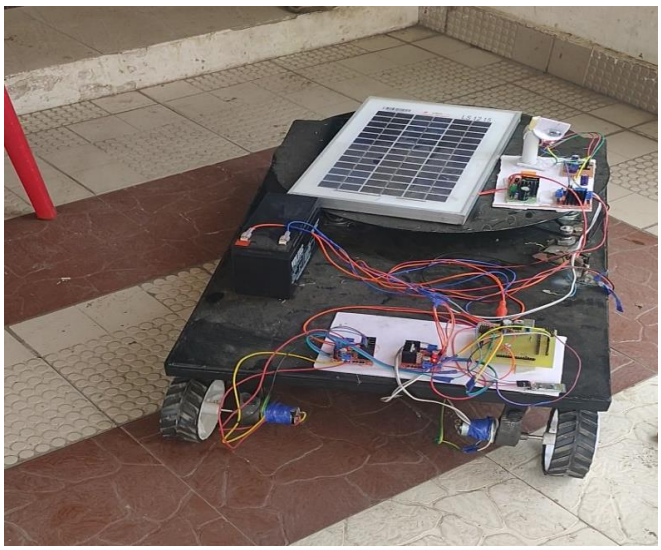
rotate on one axis moving back and forth in a single direction. Different types of single-axis trackers include horizontal, vertical, tilted, and polar aligned, which rotate as the names imply. Dual-axis trackers continually face the sun because they can move in two different directions. Types include tip-tilt and azimuth-altitude. Dual-axis tracking is typically used to orient a mirror and redirect sunlight along a fixed axis towards a stationary receiver. Because these trackers follow the sun vertically and horizontally, they help obtain maximum solar energy generation. There are also several methods of driving solar trackers. Passive trackers move from a compressed gas fluid driven to one side or the other. Motors and gear trains direct active solar trackers by means of a controller that responds to the sun's direction.

A. Rotating circular disc

Figure 2: Circular Rotating Disc

The circular rotating disc is mounted on moving object and it rotates with the help of motor-belt. Solar panel is made fixed on radius of circular disc with some tilted angle >60 degree. Sensor (LDR) sense the direction of incoming light and release signal to guide motor-belt mechanism and rotates the circular disc in such a way that the solar panel directs towards maximum incoming light.

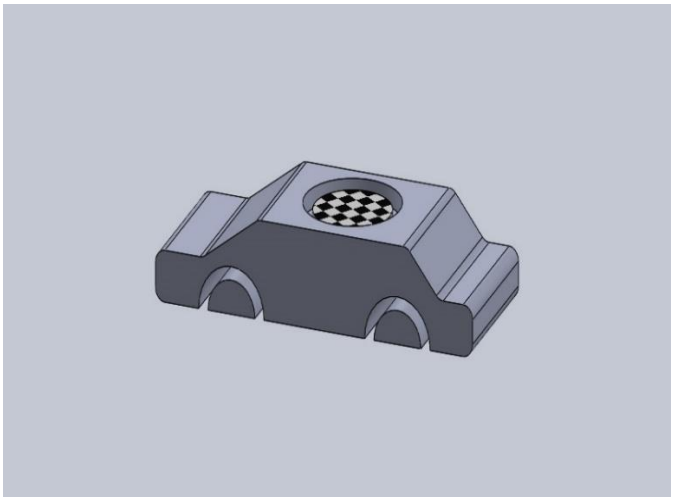
B. Actual Photograph



C. Advantages

- It increases the solar panel output.
- The more efficient a panel is, the less space it will take up.
- Maximize power per unit area.
- Abel to grab the energy throughout the day.

D. Application



The solar tracking assembly can be mounted on roof of the car.

- This system can also be used by installing on agriculture equipment
- Residential solar panel installation has near about 1-5 kW generation. Efficiency enhancement using solar tracking is reliable and less costly

E. Circuit Diagram

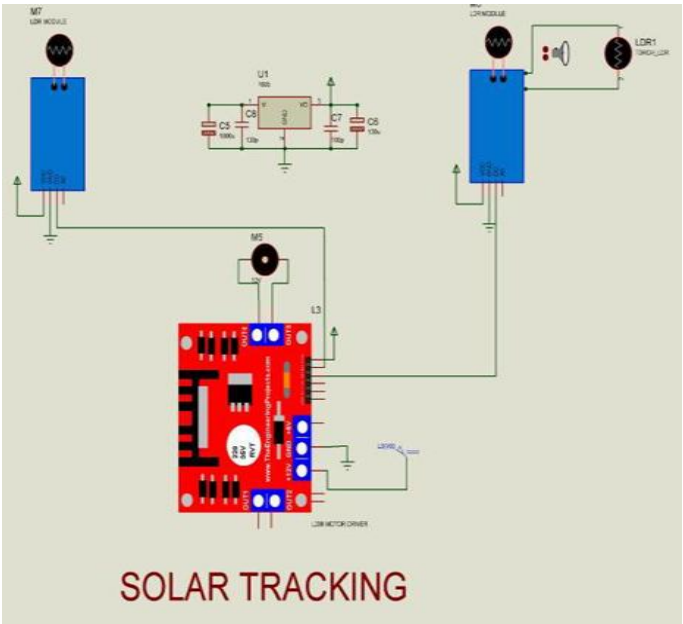


Figure 5: Solar Tracking

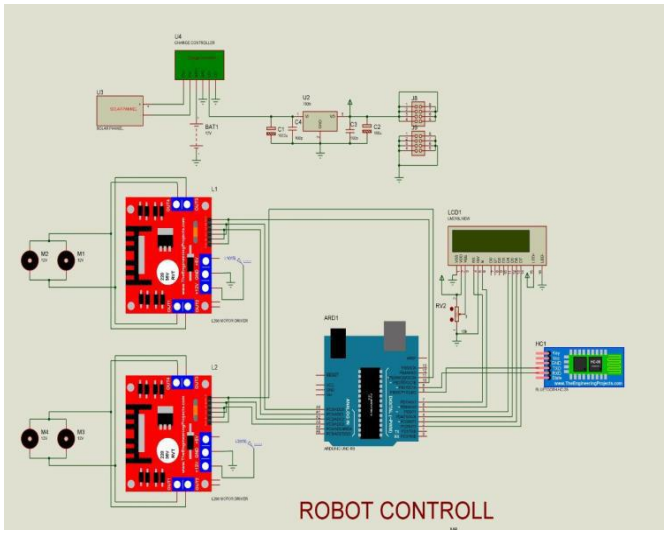


Fig.: -Robot Control

IV. RESULT AND OBSERVATION

Hour	Using solar tracker moving solar panel			Without using solar tracker static solar panel		
	Voltage (V)	Current (A)	Power (W)	Voltage (V)	Current (A)	Power (W)
0800	11.5	1	11.5	9.5	0.8	7.6
0900	11.8	1.1	12.98	9.9	0.91	9
1000	12.1	1.12	13.55	12.2	0.94	11.47
1100	13.5	1.18	15.93	12.5	0.98	12.25
1200	13.8	1.2	16.56	13	1.1	14.3
1300	14	1.25	17.5	13.7	1.17	16.03
1400	14.3	1.27	18.16	14	1.22	17.08
1500	13.4	1.23	16.48	13.7	1.20	16.44
1600	13	1.20	15.6	12.8	1.16	14.84
1700	12.4	1.17	14.50	11	1.13	12.43
1800	11.6	1.15	13.34	10.2	1.1	11.22

With Solar tracker: Total Pout =166.1watt. Without Solar tracker: Total Pout=142.66watt. Percentage increase in the Output: (166.1-142.66)/142.66=0.1643 0.1643*100=16.43%

CONCLUSION

In this paper an attempt has been made to implement the rotating circular plate solar tracking system, design is going to extract maximum power from the sun by tracking it using rotating circular plate at same time when the system is moving. Based on the obtained results we can affirm that proposed solution is effective and presents interesting advantages from the point of view of practical applicability to larger power PV structures.

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