Envirnomental Friendly Remote Controlled Solar Sprint Car

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ABSTRACT

Now-a-days, dealers of natural resources like fuel, coal etc. are facing a hard time to keep pace with the increasing demand. Therefore, to carry out this demand is quite necessary to make a new exploration of natural resource of energy and power. Therefore sunlight is now-a-days considered to be a source of energy which is implemented in various day to day applications. Solar energy is being used to produce electricity through sunlight. With the help of this technology we aim to make solar energy powered car in our project. The main component to build a solar car is the solar panel. The solar cells collect a portion of the sun's energy and store it into the batteries of the solar car. Before that happens, power trackers converts the energy collected from the solar array to the proper system voltage, so that the batteries and the motor can use it. After the energy is stored in the batteries, it is available for use by the motor & motor controller to drive the car. Preliminarily our objective would be to implement our idea on a remote control toy car and afterwards with help of this prototype we can extend our future work on building an actual car powered by the solar energy.

Keywords: Solar panel, Battery, Remote control;

1. INTRODUCTION

There must be some limits to the ability of the earth to sustain a growing population. Fortunately, population models suggest that the world's population will probably level out at about two to three times the present numbers over the next hundred years. The question is whether the earth's resources are sufficient to sustain that population at a high standard of living for all. In this the key issue is energy. Now-a-days, dealers of natural resources like fuel, coal etc. are facing a hard time to keep pace with the increasing demand. The limited resources are being quashed by the producers and dealers to satisfy this need which is leading us to an uncertain future with having the scarcity of fuel and minerals. Therefore, under this circumstance, it is quite necessary to make a new exploration of natural resource of energy and power. This effective source is "Solar Energy". It is

radiant energy that is produced by sun. Every day the sun radiates, or sends out, an enormous amount of energy.

The sun is a big ball of gases- mostly hydrogen and helium atoms .The hydrogen atoms in the sun's core combine to form helium and generate energy in a process called **nuclear fusion.** During nuclear fusion some matter is lost during nuclear fusion. The lost matter is emitted into space as radiant energy. Only a small portion of the energy radiated by the sun into space strikes the earth, one part in two billion. Solar energy is also absorbed by plants, the land, and the oceans. The rest could be used to supply our energy needs shown in figure 1 and figure 2.

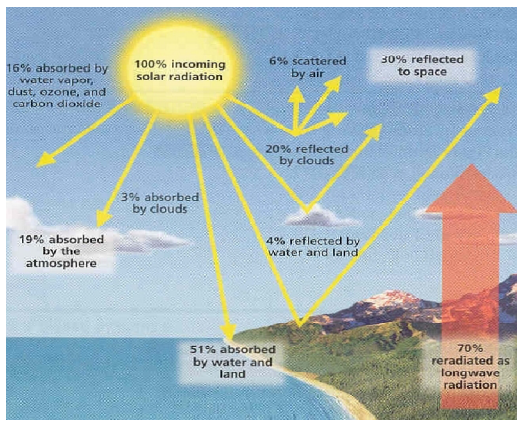

Fig1.Distribution of Solar Energy

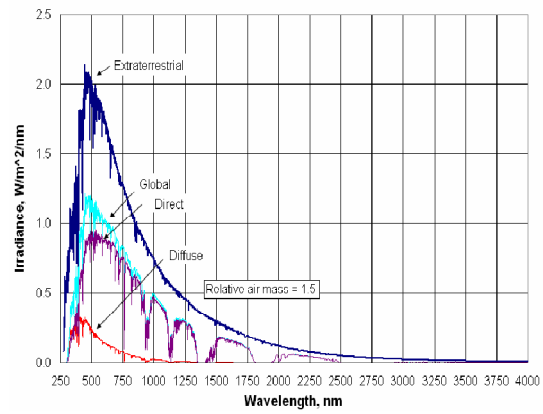

Fig 2. Graphical representation

Solar technologies are broadly characterized as either passive or active. Active solar techniques use photovoltaic panels, pumps, and fans to convert sunlight into useful outputs. Passive solar techniques include selecting materials with favorable thermal properties, designing spaces that naturally circulate air, and referencing the position of a building to the Sun

Preliminarily our objective would be to implement our idea With the help of solar energy to produce electricity through sunlight on a remote control sprint car and afterwards with help of this prototype we can extend our future work on building an actual car powered by the solar energy which is both cost effective and of course environment friendly

2. ANALYSIS

To successfully complete the whole project, initially we need to choose the proper solar panel with appropriate power rating and weight. Because, these things are directly related to the efficiency of the car. So, we did an experiment which involved the load management of the car while driving along with the V-I rating. Here, we chose a random car and put different bars with different

weights on different position. Then we connected the multi-meter to the respective input pins (‘+ve’ and ‘-ve‘) of the battery of that particular car in parallel. Through this process we found out the voltage required to drive the motor of the car at different situation. Again, after that, we connected an ammeter with those respective in series to find out the current flow required to drive the motor of the car. The result we found out for that random car is shown in table 1.

Table 1: Effect of Load (Weight) on the sprint Car

Weight (gm)	Different positions of car	V-I rating				Power rating	
		At full speed		*At less speed*			
		V (volt)	I (A)	V (volt)	I (A)	*At full speed* (W)	*At less speed* (W)
200	Seat	8.21	7.63	6.08	5.41	62.6423	32.8928
	Back	8.27	7.60	6.73	5.29	62.8520	35.6017
	Front	8.23	7.52	6.58	5.28	61.8896	34.7424
400	Seat	8.20	7.38	5.43	4.85	60.5160	26.3355
	Back	7.77	6.76	4.87	3.86	52.5252	18.7982
	Front	7.49	6.68	4.46	3.37	50.0332	15.0302
600	Seat	7.51	6.66	4.30	2.89	50.0166	12.4270
	Back	7.49	6.60	4.12	2.77	49.4340	11.4124
	Front	7.30	6.50	3.96	2.65	47.4500	10.4940
800	Seat	7.30	6.28	3.73	2.48	45.8440	9.2504
	Back	7.15	6.38	3.70	2.49	45.6170	9.2130
	Front	7.30	6.44	3.76	2.45	47.0120	9.2120
1000	Seat	7.07	6.03	3.64	2.35	42.6321	8.5540
	Back	6.98	5.93	3.63	2.40	41.3914	8.7120
	Front	6.90	5.00	3.45	1.90	34.5000	6.5550

Table 2: Measurement of voltage rising with respect to time

Time(min)	Voltage(volt)
0	4.43
3	7.45
10	10.32
20	10.53
30	10.78
40	10.91
50	10.97

This experiment gave us the idea about the solar panel we should collect for our future project implementation. Now we have the solar panel, so it is important to measure the rise time of the voltage of the panel. As a result we can get the idea about how much time it will take to charge up the battery and use it for further application. The result we got was as shown in table 2. Corresponding T-V curve was as shown in figure 3. After collecting the solar panel it is important to measure the V-I rating of the panel for further implementation. So, we went outside in an open place under the sunlight at midday and did the job. We connected different loads with the panel to measure the voltage and current at different loads. But at first we found out the voltage and current at 'without any load' situation. The end result of the experiment is as shown in table 3. The respective characteristic curve was shown in figure 4

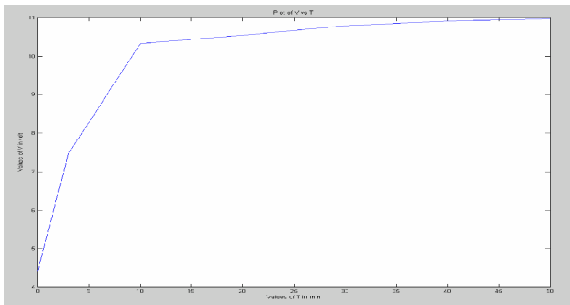

Fig 3: T-V Curve

Load resistance, R (ohm)	Voltage, V (volt)	Current, I (mA)
0	0	170
1.2	0.19	167
7.2	1.18	164
10.5	1.7	162
18.8	3.01	159
30	4.71	157
35	5.39	154
45.2	6.81	150
50.1	6.83	136
122	15.02	122
335	18.76	56
964	19.28	20
3790	19.74	0

Table 3: Measurement of voltage rising with respect to time

Table 4: V - P rating

Load resistance R (ohm)	Voltage V (volt)	Current I (mA)	Power P (mW)
0	0	170	0
1.2	0.19	167	31.73
7.2	1.18	164	193.52
10.5	1.7	162	275.4
18.8	3.01	159	478.59
30	4.71	157	739.47
35	5.39	154	830.06
45.2	6.81	150	1021.5
50.1	6.83	136	928.88
122	15.02	122	1832.44
335	18.76	56	1050.96
964	19.28	20	385.6
3790	19.74	0	0

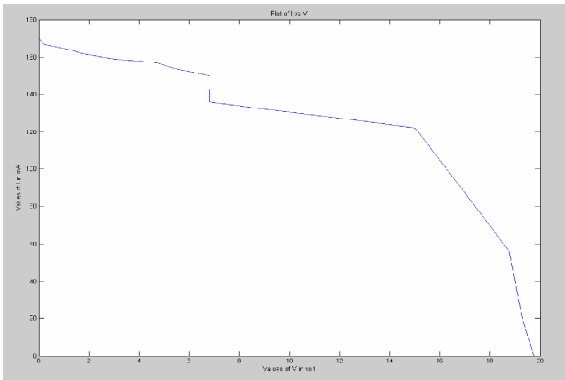

Fig 4: V-I Curve

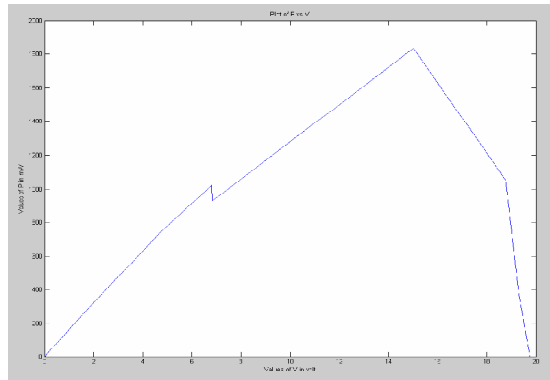

Fig 5: V-P Curve

The curve shows that voltage and current relates reversely with the increasing load. From the above experiment we can also find the voltage and power relation with this panel which is given in table 4. The respective characteristic curve was shown in figure 5. This curve shows us that the power of panel increases with the load up to a certain level and falls down after that quite rapidly. That means, we cannot use too much load in this project

3. INITIAL CONCEPT

In our project we are attempting to build a solar car that converts the sunlight into electrical energy. The main component to build a solar car is the solar panel. The solar cells collect a portion of the sun's energy so that power trackers can convert the energy collected from the solar array to the proper system voltage. After the energy is collected in the panel, it is available for use by the motor & motor controller (which was connected to the panel). After all these being proceeded, the motor controller adjusts the amount of energy that flows to the motor to correspond to the throttle. The motor uses that energy to drive the wheels. The demonstration of this initial plan was like this:

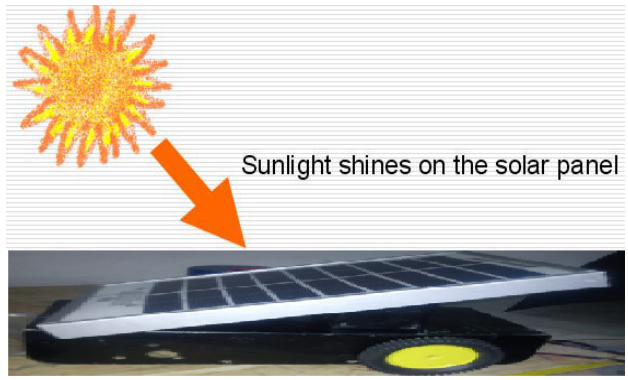

Fig 6: The solar panel converts sunlight to electrical energy

The solar panel and the rechargeable battery is connected with each other. Again, these two sources are connected to the comparator so that the comparator can compare their voltages and provide a single higher output the circuit. Here, two 6V batteries needed to be used for biasing purpose. After that, comparator output is connected to the transistor to multiply the current to drive the relay circuit on. Now, getting the required energy, the relay turns on and does the switching operation according to the respective input. The 'common' pin of the relay circuit which is the output of the relay circuit is connected to the car's motor. As a result, the car is getting enough electrical energy to drive its wheel and run along.

4. PRACTICAL IMPLEMENTATION

To make the car body, we collected a very light Aluminium plate which was inches long and inches wide. It was gm in weight. We cut the plate at different places smoothly to set the wheels after that we set those wheels the plate by setting two of them at back and one of them at front. We put the motor at back of the plate with the wheels. Then we connected a gear train along with the motor to drive the wheels. Let, we require to design, built and demonstrate a dc-dc converter that matches the output from a 10W solar panel to a permanent magnet DC motor mounted on aluminum chassis along with gear box (7:1) and a servo for steering the vehicle. The servo is an on-board item, which can be powered from an auxiliary battery source.

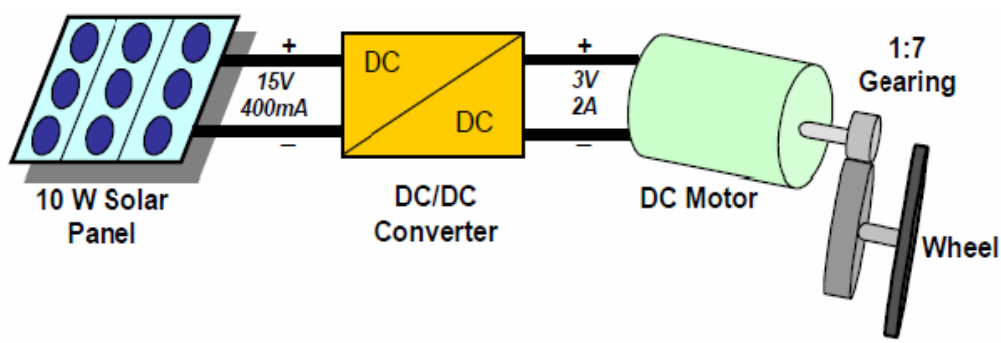

Fig.7: Model solar sprint car system block diagram with DC-DC converter

To do that we need to collect following equipments:

- A 3W solar panel
- A two rechargeable battery
- An OP-AMP comparator
- Two 6V batteries (may be rechargeable)
- A relay circuit
- A transistor
- A two DC motor

- An Aluminium plate (as car body) along with three wheels.

Collecting all these components and combining them together we get the result will quite satisfactory as it was reducing the voltage and increasing the current. Although the project is quite successful one but there might be some problems arises in future they are:

- Getting excessive voltage
- Getting Inadequate current flow
- Inability to take the load

5. CONCLUSION

From the above project, we can come up to some certain observations. They are as follows:

1. The solar panel and the battery are providing the associate voltage to the comparator.
2. The OP-AMP comparator is providing the proper output voltage so that the relay is working.
3. The converter is providing adequate V-I supply.
4. The motor is driven by the solar energy

The observation gives us a clear picture of having an effective and efficient environment friendly solar car.

6. FUTURE WORK

Since the relay and other devices are working and giving the required output to drive the handmade car, it is quite expected that it is going to work when the circuit will be implemented on the actual car. We just need to make sure that we get the appropriate solar panel, take the voltage-current-power rating accurately, and make the proper connection with the proper chip (IC) and other circuitry. In fine, it can be said that to cope up with the increasing demand of the fuel, it is quite necessary to alter our demand into the solar energy. It is cheap, efficient, supplied by an endless source of energy- the sun and of course free from any environmental damage. So, finally, we hope, it is not very far away that day when a great percentage of world's people will use the discussed technology and turn their car into or get their own **'Environment Friendly Solar Sprint Car'**.

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