International Journal of Psychosocial Rehabilitation, Conference Special Issue
ISSN: 1475-7192

Littium Battery Charger design for a-watt solar module robot car using Android interface system

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ABSTRACT-- *Using a watt of solar module, the chargering of battery is applied to project or device design. In this study, A watt of solar module is used to charge the robot car battery by using bluetooth hc-05 module and android control system interface. Deriving from the study, it found that each module works at 5VDC such as servo motor,LDR, and hc-05 module interfaces displaying a monitor serial information. Whereas the input of 1298n controller and driver is 7.4 VDC and it comes from 2 battery cells for each cell has 3.7 VDC. The chargering starts at 10.11 until 12.14. while the battery is chargering, android data is dispatched F,B,L,R and S command data to hc-05 interface in order to activate ic 1298 output that is DC motor.*

Keywords -- *Controller, Charging battery using a-watt of solar module, Car robot control.*

I. INTRODUCTION

Today the demand for electrical energy is increasing so that energy reserves are made from fossil fuels. The effect of fossil based energy can also pollute the atmospehere and damage the environment. The depletion of energy reserves forces humans to look for renewable energy sources and also does not have an impact on environment[1].

Solar energy is a renewable energy thas uses sunlight as source. Photovoltaic energy is an alternative solution for fules that are lower cost and fairly easy maintenance. Solar cells are photovoltaic energy, an active element that coverts sunlight into electrical energy. Solar cells generally have minimum thickness of 0.3mm, which is made from pieces of semiconductor material with positive and negative poles. In general, solar cells are permanently installed with a fixed elevation angle that causes solar cells not absorb sunligth optimally due to changes in the sun's position with time[2].

Therefore an effort is needed to determine the optimal method by directing the surface of the solar cell so that it is not always perpendicular to sunlight, because the electrical power produced depends on the amount of sunlight intensity captured by solar cell.Robot technology is an effort to capture the intensity of sunlight. Robot technology

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Received: 02 Jan 2020 | Revised: 12 Feb 2020 | Accepted: 17 Mar 2020

plays an imporant role in technological development. One of the robotic technologies that is currently developing is a car robot[4].

Robot cars are widely used in industries where the robot moves based on the path that has been made. However, for now the robot no longer uses the path but can be controlled. But this robot technology requires a power source to control it, one of the resources is a lithium battery. The lithium battery can be used to drive the robot car. Lithium batteries have several advantages such as good ability, power and efficiency, speed in charging and long lasting. Lithium battery charging can be done using solar cells.[5-7].

Based on the description above, in this study, we want to design or apply lithium battery charging using as 1-watt solar panel with intermediate IC TP4056. The battery to be charged is used to active the load on the robot car that is controlled using the HC-05 interface via Android. In addition, the solar panel will also seek the position of the higest intensity of sunlight by utilizin the working principle of the LDR.

II. MATERIALS AND METHODS

In this research, the method used is the method of literature study and laboratory experiments. This paper presents a simple implementation and controller for flexible battery chargers on Arduino boards.

The first focus in this research willbe on the control interface between Android and the robot car (controller), by reading the minimum distance of work. The second focus is the length of charging 1-watt solar module to charge the battery that supplies dynamo or motor on the robot car, and supply batteries to the controller that connect the interface to the robot car or controller. This system block diagram can be seen in Figure 1.

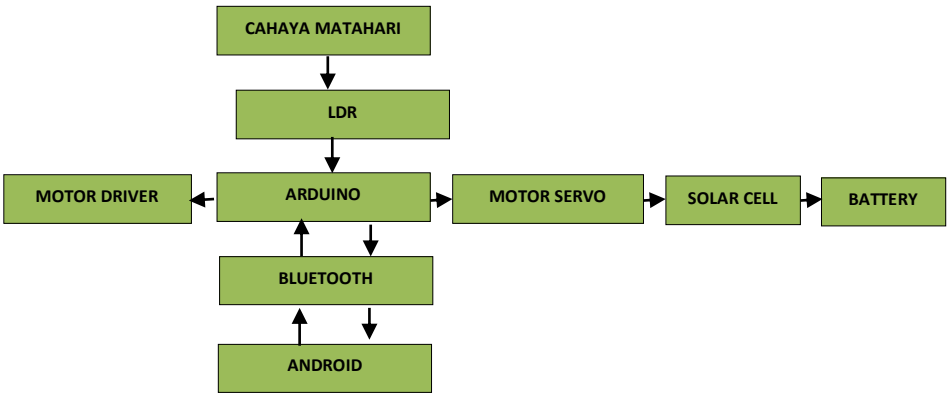

Figure 1: Litthium Battery Charging Block Diagram with 1-watt solar module on robot cars.

The voltage source i this robot control car is a lithium battery. LDR receives input based on solar energy. Then LDR input is processed by the arduino microcontroller, giving a signal to the servo motor and motor driver to change the postion and angle of direction towards the sun's light energy. After getting the right position the solar cell fills the voltage to the lithium battery according to the incoming sunlight energy. The interface on this system uses an android version that is connectef via bluetooth module. This inteface functions as a motor driver controoler manually so that it can be controlled via android.

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III. DESIGNING ROBOT CAR PROTOTYPE

Achive interface control, all inteface control, all interface module pins of HC-05 are connected to android, with details of the TX-hc-05 pin connected to the RX controlled, and the RX hc-05 pin connected to the TX controller pin. Pins IN 1,2,3, and 4 of the L298n driver IC are connected to pins 2,3,4 and 5 of the controller, and outs A and B are connected to motor 1, and outs C and D are connected to motor 2. GND on the L298n IC is connected to GND 3.7 VDCx 2 battery power is connected to the L298n 5VDC IC supply. While pin 1 of the LDR is connected to the 5V controller, pin 2 of the LDR is connected to the 1K resistor, and connected to A0 controller, and the other resistor leg is connected to the GND path. While the brown cable servo motor is connected to the GND line, the red to pin D9 controller and the red cable is connected to the 5V controller line. The design of this system prototype can be seen in Figure 2.

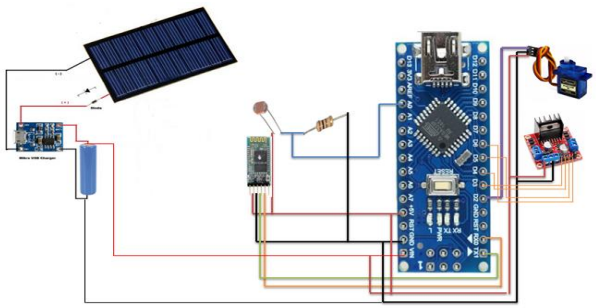

Figure 2: Design of lithium battery charger prototype with 1-watt solar module on robot cars.

While for solar module charging, the anode path on the 1-watt solar module is connected to the diode cathode pole, and the diode anode, is connected to the positive input on the TP4056. The cathode path on a 1-watt solar module it is connected directly to the negative input on the TP4056. The input output of the TP4056 is connected to a battery that is connected to the supply controller and the load driver supplay o n the IC L298n is shown in Figure 3.

Figure 3: The design of a-watt solar module on a robot car with interface control system from android

While the test result of each module are shown Table 1.

Received: 02 Jan 2020 | Revised: 12 Feb 2020 | Accepted: 17 Mar 2020

Table 1: LDR voltage testing with Arduino

Voltage	Condition	Serial monitor	Information
3.3 VDC	Light	-	Off
	Dark	-	On
5 VDC	Light	1023	On
	Dark	350	On
9 VDC	Light	-	Of
	Dark	-	Off

The working voltage of the servo is at 5-9VDC, and in the application, the servo is inserted into the 5VDC voltage supplied by Arduino shown in Figure 2.

Table 2: Servo voltage testing with Arduino

Voltage	Servo starting position	Servo End position	Command	Information
3.3 VDC	0^0	0^0	Servo.Write (90) Servo.Write (0)	Voltage cannot be used
5 VDC	0^0	90^0	Servo.Write (90) Servo.Write (0)	Voltage cannot be used
9 VDC	0^0	0^0	Servo.Write (90) Servo.Write (0)	Voltage cannot be used

HC-05 works at 5VDC voltage supplied from Aruino VCC, with a maximum delivery distance of 10 meters shown in Table 3.

Table 3: Testing HC-05 working voltage with Arduino

Arduino voltage	**Address HC 05**	**Android**	$\mathbf{S_{max}}$
3.3 VDC Internal	Non Conected	Not Connected	10 M
5 VDC Internal	Conected	Connected	

The output of the dc motor in driver IC l298n finds the right voltage to drive the motor wheels at a voltage of 7.4 VDC or equivalent to 2 lithium batteries, each voltage is 3.7 VDC shown in table 4.

Table 4: L298N IC Voltage Testing

Voltage	Pin Motor	Status	Information
3.3 VDC	A1	HIGH	Not Moving
	A2	HIGH	Not Moving
	B1	HIGH	Not Moving
	B2	HIGH	Not Moving

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5 VDC	A1	HIGH	Move slowly
	A2	HIGH	Move slowly
	B1	HIGH	Move slowly
	B2	HIGH	Move slowly
7.4 VDC (Eksternal Voltage)	A1	HIGH	Move fastly
	A2	HIGH	Move fastly
	B1	HIGH	Move fastly
	B2	HIGH	Move fastly

Table 5: a-watt solar module test results with IC tp4056

Battery	Charger Time	TP4056 Lamp Conditions	Time Over	TP4056Lamp Conditions
3,7 / 2000 mAh/1860	10.11	Red	12.14	Green

Based on table 5 above found that 1 lithium battery with a capacity of 3.7VDC and a current of around 200 mAh, found that the charging time is in the span of 2 hours 3 minutes.

Table 6: Solar panel test results with ldr and servo

LDR	Servo	Panel Surya / out TP4056	Baterry	Time
0	0^0	3,1 VDC	3,7 x 2	10.11
1023	180^0	4,7 VDC	3,7 x 2	12.15

Table 6 above explains the testing of solar panel angles with ldr, which is obtained when the value of ldr 0 describes the angle of servo degrees 0^0, and a maximum angle of 180^0 with a maximum value of ldr 1023ADC.

Table 7 : Testing android data delivery with L298N output

Command	Motor M1-M2	Motor MA-MB
F	HIGH	LOW
	HIGH	LOW
B	LOW	HIGH
	LOW	HIGH
L	HIGH	LOW
	LOW	LOW
R	LOW	LOW

	HIGH	LOW
S	LOW	LOW
	LOW	LOW

Based on table 7 above, it is found that the data sent by Android matches and is the same as the data written in the controller, so that the activated output matches the data sent.

IV. CONCLUSION

1. Charging the lithium battery on a robot car with the HC-05 interface, using a-watt solar module can be done, with a charging time ranging from 2 hours 3 minutes.
2. The interface that can be sent by Bluetooth between Android and the controller is about 10 meters.
3. A-watt solar module, used for charging a battery used to activate the controller and a battery to activate the dc motor.

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