Ahsanullah University of Science & Technology

Department of Computer Science & Engineering

Semester Spring 2021

CSE 3216

Microcontroller Based System Design Lab

Project Proposal

Project Name: Solar Charger

Submitted To

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Objective

The objective of this project is to understand the basics of Microcontroller based system design. To do so, we made a solar device that will track the sun and use the energy to charge devices like phone chargers. A solar tracker is a device that orients a payload toward the Sun. Payloads are usually solar panels. solar trackers adjust the direction that a solar panel is facing according to the position of the Sun in the sky. By keeping the panel perpendicular to the Sun, more sunlight strikes the solar panel, less light is reflected, and more energy is absorbed. That energy can be converted into power. We will try to use that energy in a way that phones can be charged.

Social Values

The main theme of this Arduino project is to use the power of the sun. The sun that redates limitless energy, and in this era of being in an ecofriendly world, we should not avoid any possibility of utilizing this fine resource at its best. It will produce zero waste and it is renewable. The energy is even free of cost, doesn't require the use of any fossil fuel, helping the environment on many aspects. This also does not require any heavy machinery. Instead, it can be modified into an easy and accessible source of energy. The device we are making will cause no or minimum harm to the environment. Less or no maintenance cost will be required if the product is looked after carefully.

Required Components

These following parts and tools are required for building this project

- Arduino Uno
- Gear Motor
- Photo Resistor
- Resistor 1k ohm
- Step Up DC-DC Boost Converter 3V to 5V 1A USB Charger
- N4007 Diode
- TP4056 5V 1A Micro USB 18650 Lithium Battery Charging and Protection Board
- 3.7V Lithium Battery
- Battery Holder
- L9110 Motor Control Board
- Solar Panel
- Wires

Working Procedure

The basic components that react to the input are

- Gear Motor
- Photo Resistor
- Resistor 1k ohm
- Step Up DC-DC Boost Converter 3V to 5V 1A USB Charger
- N4007 Diode
- TP4056 5V 1A Micro USB 18650 Lithium Battery Charging and Protection Board
- 3.7V Lithium Battery
- Battery Holder
- L9110 Motor Control Board
- Solar Panel
- Wires

The components that take stimuli from the environment is

- Photo Resistor
- Solar Panel

Our system will perform following actions

- **Gear Motor:** It is used to rotate the solar panels.

- **Photo Resistor:** It is that kind of sensor which changes its resistance when light shines on it. The resistance generated varies depending on the light striking at his surface. It is mainly used to detect the photon and move towards the photon.

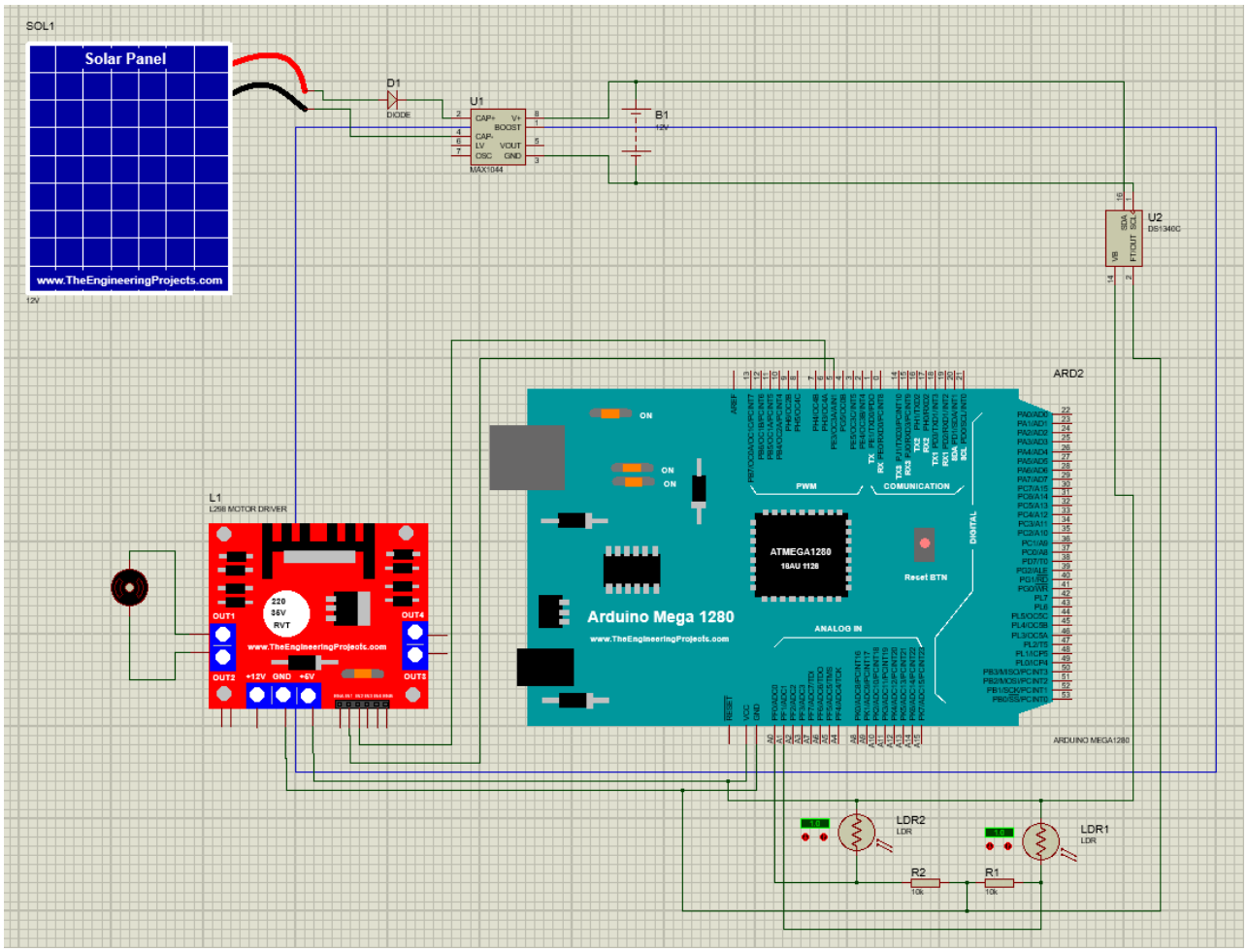
- **Step Up DC-DC Boost Converter 3V to 5V 1A USB Charger:** The lithium battery is 3.7V. The step up DC-DC boost converter basically converts the 3.7V to 5V that is used to charge the mobile phone.

- **TP4056 5V 1A Micro USB 18650 Lithium Battery Charging and Protection Board:** It is used to charge 18650 Lithium battery. It has a protection circuit that prevents current from leaving the battery if the voltage gets too low.

- **L9110 Motor Control Board:** The function of motor control board is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor.

- **Solar Panel:** to convert light from the sun, which is composed of particles of energy called "photons", into electricity that can be used to power electrical loads.

Diagram


SOL1
Solar Panel
www.TheEngineeringProjects.com
12V
D1
DIODE
U1
MAX1044
B1
12V
U2
DS1340C
L1
L298 MOTOR DRIVER
220
35V
RVT
OUT1
OUT2
OUT3
OUT4
+12V
GND
+5V
ON
ON
ON
ATMEGA1280
18AU 1128
Reset BTN
PWM
COMUNICATION
DIGITAL
ANALOG IN
Arduino Mega 1280
www.TheEngineeringProjects.com
ARD2
ARDUINO MEGA1280
LDR2
LDR
LDR1
LDR
R2
10k
R1
10k

Estimated Budget

Equipment	Base Price (Tk)	Quantity	Budget (Tk)
Arduino Uno	670	1	750
Gear Motor	70	1	100
Photo Resistor	120	2	160
Resistor 1k ohm	18	20	25
Step Up DC-DC Boost Converter 3V to 5V 1A USB Charger	900	1	1100
N4007 Diode	15	5	25
TP4056 5V 1A Micro USB 18650 Lithium Battery Charging and Protection Board	50	1	80
3.7V Battery	50	1	80
Battery Holder	40	1	60
L9110 Motor Control Board	140	1	200
Solar Panel	580	2	700
Wires	150	As Required	200
Total			3500

Final Expenditure

Equipment	Buying Price total (Tk)	Quantity	Budget (Tk)
Arduino Uno	749	1	750
Gear Motor	450	1	100
Photo Resistor	100	4	160
Resistor 1k ohm	20	5	25
Step Up DC-DC Boost Converter 3V to 5V 1A USB Charger	500	2	1100
N4007 Diode	6	2	25
TP4056 5V 1A Micro USB 18650 Lithium Battery Charging and Protection Board	80	2	80
3.7V Battery	150	2	80
Battery Holder	55	1	60
L9110 Motor Control Board	120	1	200
Solar Panel	598	2	700
Wires	190		200
Total	3018		3500

Budget Comparison

At the very beginning of our project, we investigated the market then estimated the prices of the product. While deciding our budget we finalized a little more than the that price. While actually buying the products, we noticed, some components were pricier than we thought, and few products were cheaper than we estimated.

Out total budget was – 3500 takas
Total expenditure of the project – 3018 takas
So, we have been able to complete the project being in budget.

Contribution of Team

- **18.02.04.009: 25%**
- **18.02.04.010: 25%**
- **18.02.04.019: 25%**
- **18.02.04.035: 25%**

Challenges of the project

While working on the projects, we did face some difficulties, like welding the wires to the circuits, as it was completely new to us. Then we had to customize the workability of the Gear Motor. Making the structure of the system was the real challenge as there is a lot of wires. Also the wires connected to the panel was tangling as the panel was moving to the direction of light. We managed all these problems together, most of them by re-constructing or re arranging the structure and the wires.
Future problem the system may face, When the panel's energy cannot flow through to inverter, it may become overloaded and radiate excess heat, so they get 'hot'. Hot spots can reduce your solar panel's performance and lifetime. Good structural design can fix the problem.
Snail trails are the brown lines that form on your solar panels which give the appearance of snail tracks on the surface of your panels. They are caused by a build-up of moisture. It can also reduce solar panel's performance and lifetime. Good maintenance is necessary to avoid this problem.

Conclusion

Solar charger is cost effective and easy to use. Can be installed easily in places and highly efficient. We believe it will be very useful if can be installed properly in nearly every place as everyone has phones nowadays. Lastly, this is not the end of the project, we aim to work on this more, mainly on the structure and optimization of it.