Implementation of Photovoltaic (Solar) System Data Logging System

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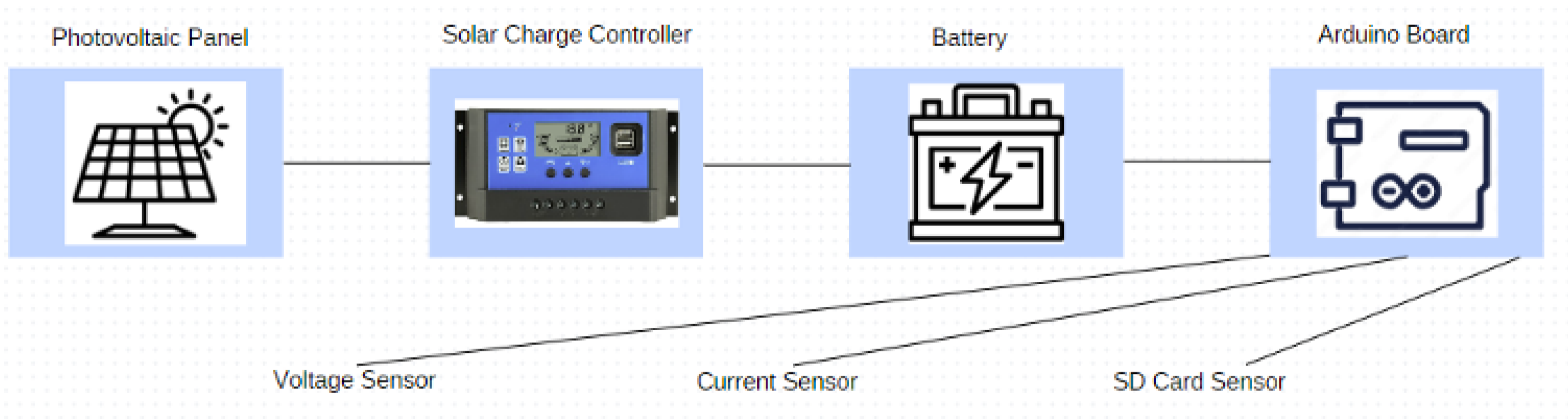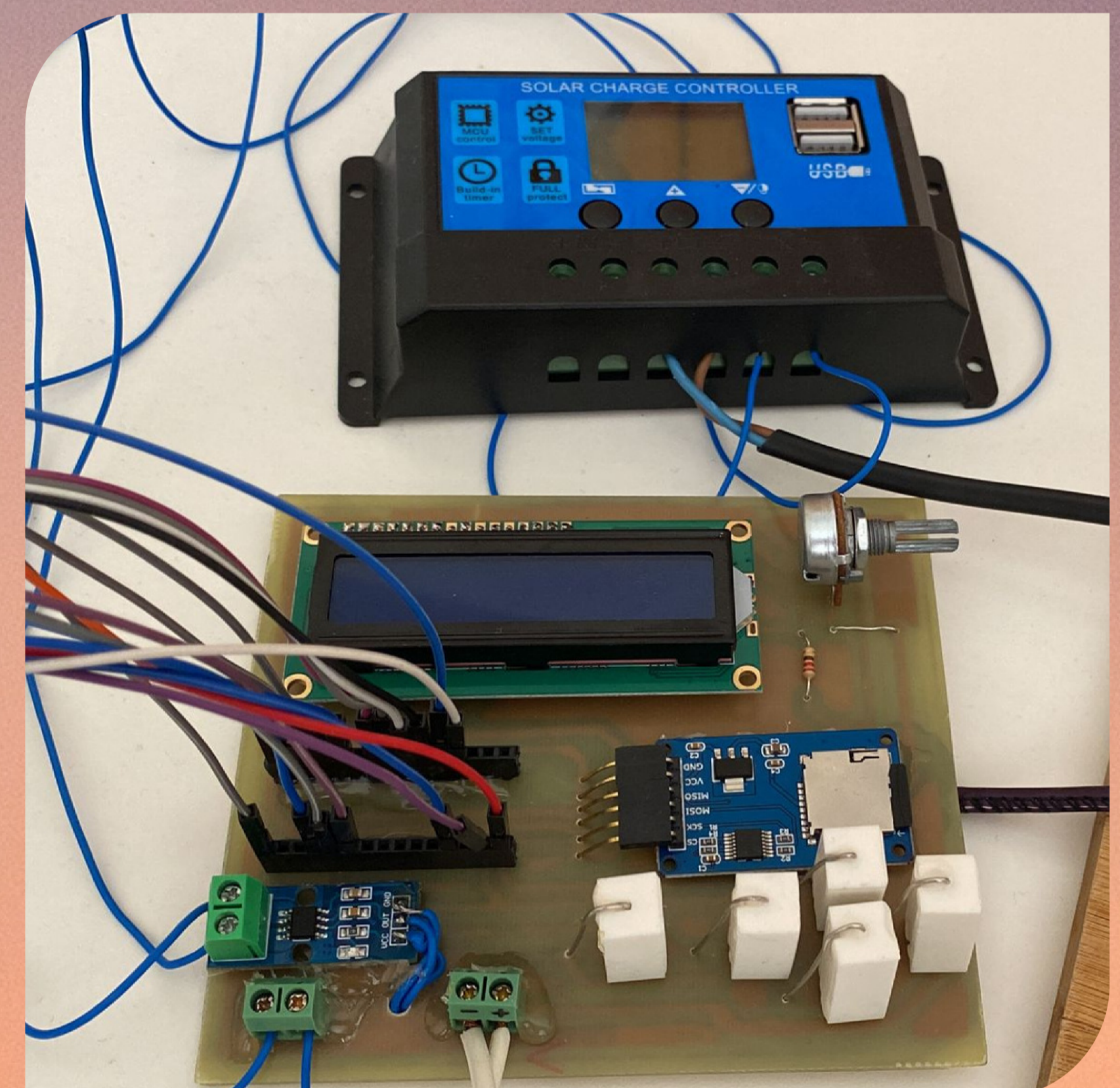Hacettepe University Electrical and Electronics Engineering

INTRODUCTION AND APPLICATION AREAS

Our primary goal is to provide real-time power monitoring of solar energy systems, which are renewable energy sources. We will be able to prevent energy losses caused by external sources if we can monitor power in real time.

In the ever-changing technological world, the demand for energy grows by the day. Energy losses in existing energy systems are a huge disadvantage for us. We will be able to address these losses and take early action to mitigate them with the monitoring system in place.

PROTOTYPE

In my project, I utilized an Arduino, a current sensor, a voltage sensor, an SD card module, an SD card, a solar charge regulator, a shunt resistor, and a solar panel. In general, if I were to describe the prototype, I connected my solar panel to the solar charge regulator and also connected the batteries to the solar charge regulator. This allowed me to examine the state of charge of the batteries and ensure that they are charged. Arduino is connected to the batteries, facilitating the execution of the necessary code loop and instructing the sensors to perform their tasks sequentially. We measure current and voltage values to calculate the power value.

Photovoltaic Panel — Solar Charge Controller — Battery — Arduino Board

Voltage Sensor — Current Sensor — SD Card Sensor

MY ALGORITHM

I preferred to use Arduino due to its cost-effectiveness and microcontroller capabilities. To visualize the data in real-time, I integrated an LCD screen into my system. I employed current and voltage sensors to collect data from the solar panels. Since the current sensor had a high limit in my project, I utilized a shunt resistor. To store the data, I added an SD card to my circuit. The data collected through sensors is written to the SD card every minute. I incorporated batteries into my system to provide power to the Arduino. To monitor the charge of the batteries, I connected a solar charge regulator to my circuit. The part that needs improvement in the system is enabling the visualization of the collected data through an application and training the system in advance to categorize and provide alerts for real-time errors."


```
00:00:17 ---> DC Voltage: 0.00V  DC Current: 0.00A
SOLAR PANEL DATA LOGGER
-----------------------------------------------
00:00:18 ---> DC Voltage: 0.00V  DC Current: 0.00A
SOLAR PANEL DATA LOGGER
-----------------------------------------------
00:00:19 ---> DC Voltage: 0.00V  DC Current: 0.00A
SOLAR PANEL DATA LOGGER
-----------------------------------------------
00:00:20 ---> DC Voltage: 0.00V  DC Current: 0.00A
SOLAR PANEL DATA LOGGER
-----------------------------------------------
00:00:21 ---> DC Voltage: 0.00V  DC Current: 0.00A
SOLAR PANEL DATA LOGGER
-----------------------------------------------
00:00:22 ---> DC Voltage: 0.00V  DC Current: 0.00A
SOLAR PANEL DATA LOGGER
```