

**HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY
FACULTY OF COMPUTER SCIENCE AND ENGINEERING**



**ELECTRICAL ELECTRONIC CIRCUITS (CO2038)
Practical session - Semester 231**

LAB 01 REPORT:
Requirement Engineering

**GROUP 8 – L05
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1. Create a hardware specs document

1.1 Plain text description

In a vehicle project, we are on the way to develop a two-wheeled vehicle that utilizes two motors, thus we make a custom-designed circuit board that can directly connect to the Arduino UNO R3 Microcontroller Shield. This expansion board will handle the power supply, powering the entire vehicle by using a 3S20C battery. The circuit board will provide two output channels used for controlling the speed and direction of the DC motors. These output channels will be capable of adjusting the voltage from 3V to 12V to accommodate various types of motors, with a maximum current rating of 1.5A. The circuit will be able to interface with other modules, such as a Bluetooth HC05 module through a plug-in connection and an 8-sensor line detector module tracking through a cable connection. Furthermore, any unused functions and pins of the Arduino UNO R3 will be put on the circuit board for future purposes.

Requirement

- Inclusion of suitable connectors to seamlessly connect with sensor modules, avoiding the need for messy and unreliable wiring.
- Inclusion of built-in voltage regulation and stabilization components, eliminating the need for external modules.
- Integration of an H-Bridge Motor Control IC to facilitate motor control.
- Integration of a 5V buzzer.
- Provision of a power switch and a reset button for convenient power control and program reset.
- Additional connectors for other functionalities, such as Bluetooth HC05 and servo motors.
- Capability of being compact, lightweight, and suitable for robot vehicle construction.



1.2 The specs document

MAIN SPECIFICATIONS	
GENERAL	
Motor output power	adjustable 3 - 12V, maximum 1.5A
Motor channels	2
Sensor	8-sensor line detector module, tracking through cable connectors
MECHANICAL	
Weight	<100g
Width	53.4mm
Length	68.8mm
POWER	
Battery	
Battery Type	3S20C
Battery Voltage	~11.7 - 12.6V
Battery Discharge Current	20C
Input	
Input Voltage	6 - 12V
Input Current	maximum 5A
Sensor Power	
Input Voltage	3.3 - 5V

Input Current	~100mA
Digital Signal (The same as Arduino)	
HIGH	3.3 - 5V
LOW	0.0 - 0.8V
DC Motor Power	
Output Voltage	adjustable 3 - 12V
Output Current	maximum 1.5A
ARDUINO	
Name	Arduino UNO R3
Used Power	6 - 9V
Recommended Power	5V
Digital I/O Pins	13
Analog Input Pins	6
PWM Pins	6
USB Connector	USB.B
Main Processor	ATmega328P 16MHz
USB-Serial Processor	ATmega16U2 16MHz
Memory	2KB SRAM, 32KB FLASH, 1KB EEPROM

2. Hardware conceptual design

2.1 Find suitable connectors

The suitable connectors that we use include:

- Arduino-compatible male header pins, connecting to the Arduino board.
- Two dual connectors, connecting the two DC motors.
- A 10-pin connector, interfacing with the 8-way sensor module.

2.2 Sketch the form factor

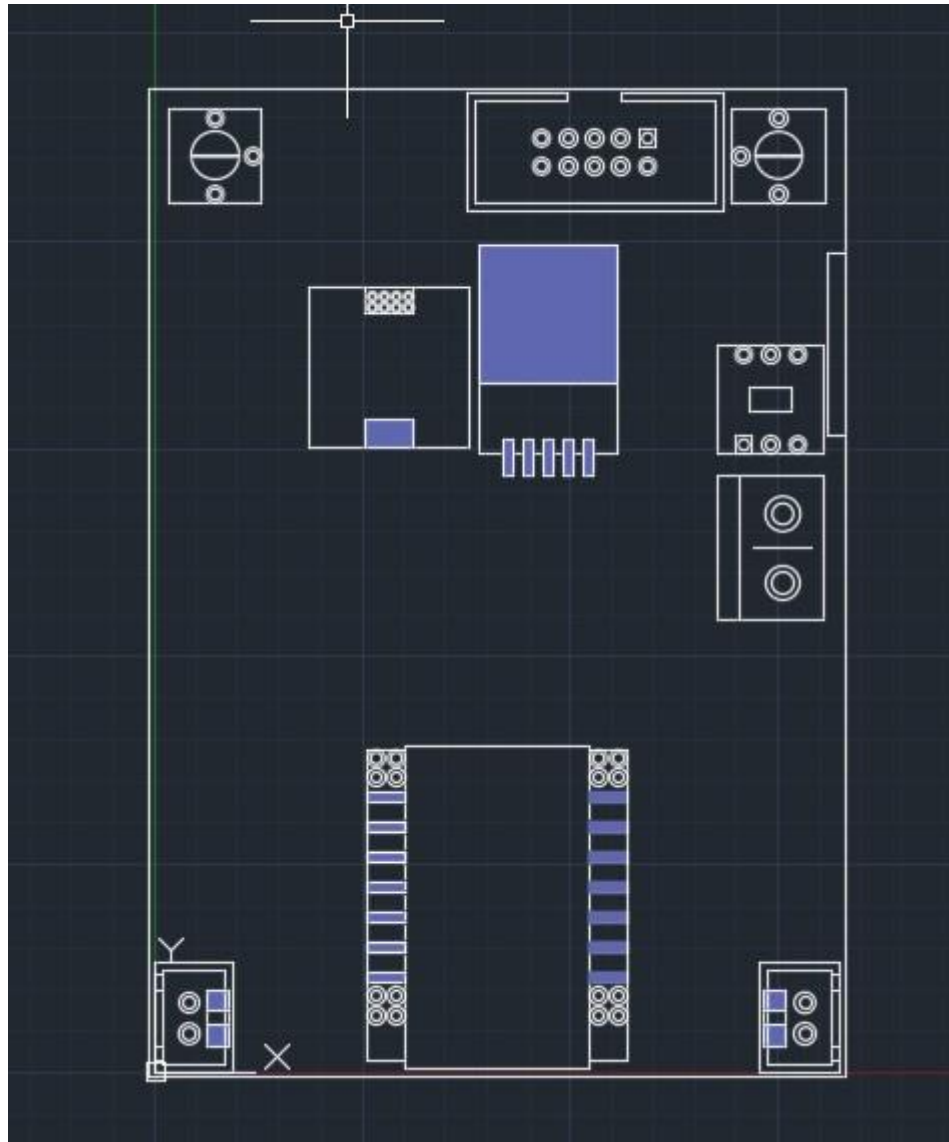


Figure 1: AutoCAD-sketching form factor design

2.3 Describe the hardware interface

Backside: Used as a shield for Arduino UNO R3

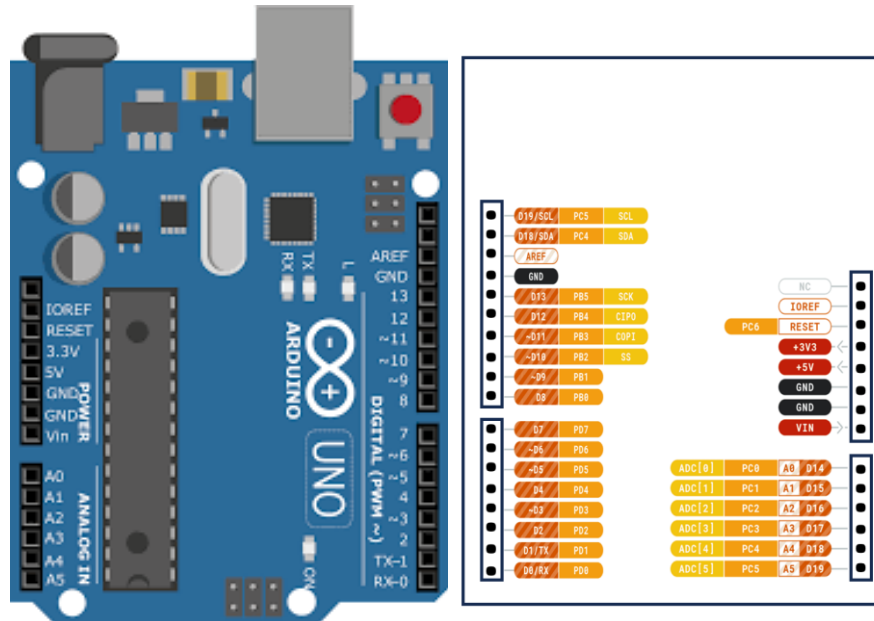


Figure 2: Backside hardware interface

Frontside:

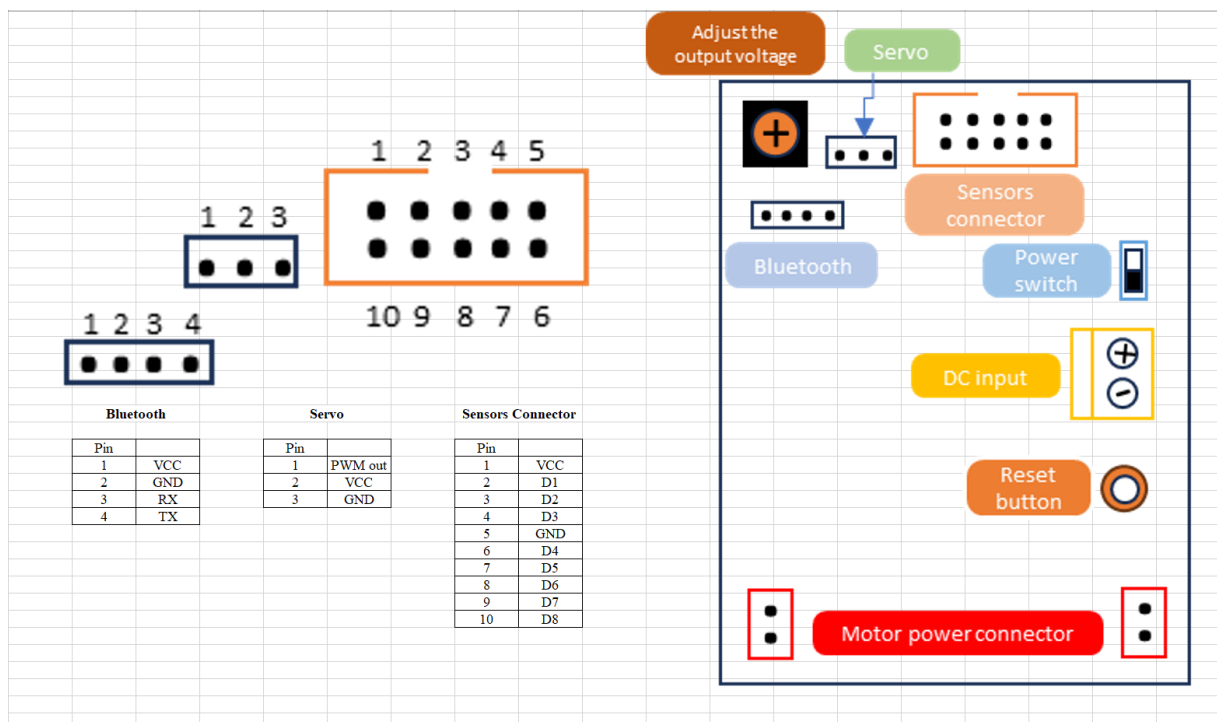


Figure 3: Frontside hardware interface