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**ENEL 351**

Functional Specification

Introduction : The main objective of this project is to design and build a fire fighter robot that can detect and extinguish fires using a combination of sensors and a microcontroller. The robot should be able to navigate through a hazardous environment and locate the source of the fire.

Minor Fixes : However, we can not test it with fire in the lab because of the safety reasons. We are also not able to spray water on the floor in the lab. So I replaced the fire sensor with the Light sensor and water sprayer with the red LED. The robot now will detect particular light intensity around it and starts moving towards it instead of follinwing the fire. The second output will be the Red Led which will glow when it comes close to the light which means it supposed to spray water at that moment.

Here is the updated working steps of the Robot:

- The robot will be built using the STM32F103 microcontroller, which will be used to control the movement of the robot and process sensor data.

- Light sensors will be used to detect the presence of light and its location. Ultrasonic Sensors will be used to change the path if there is an obstacle. These sensors will be connected to the microcontroller to provide input data.

- The robot will be equipped with a red LED, which will be activated when a light is detected.

Block Digram : Here is the initial block diagram of the robot that was proposed :
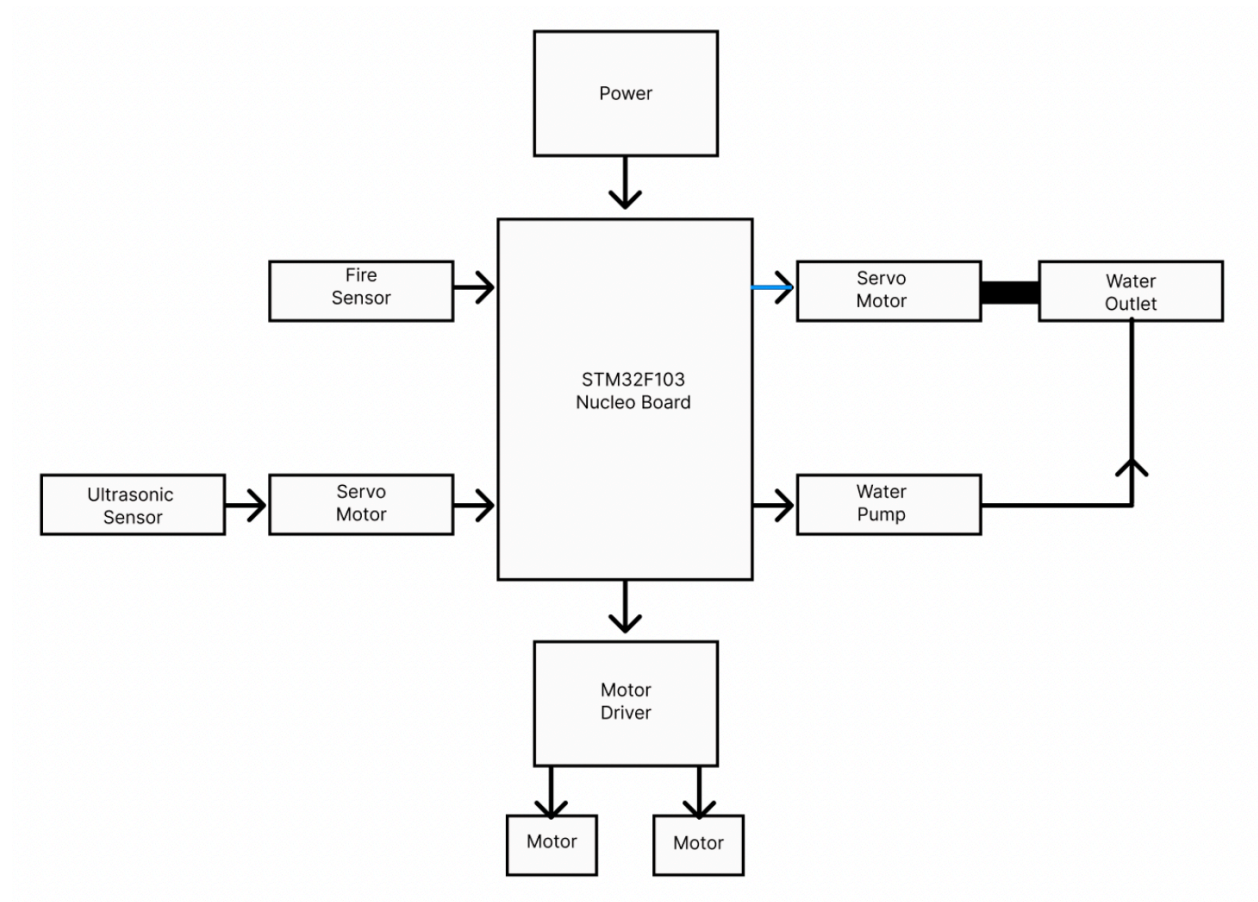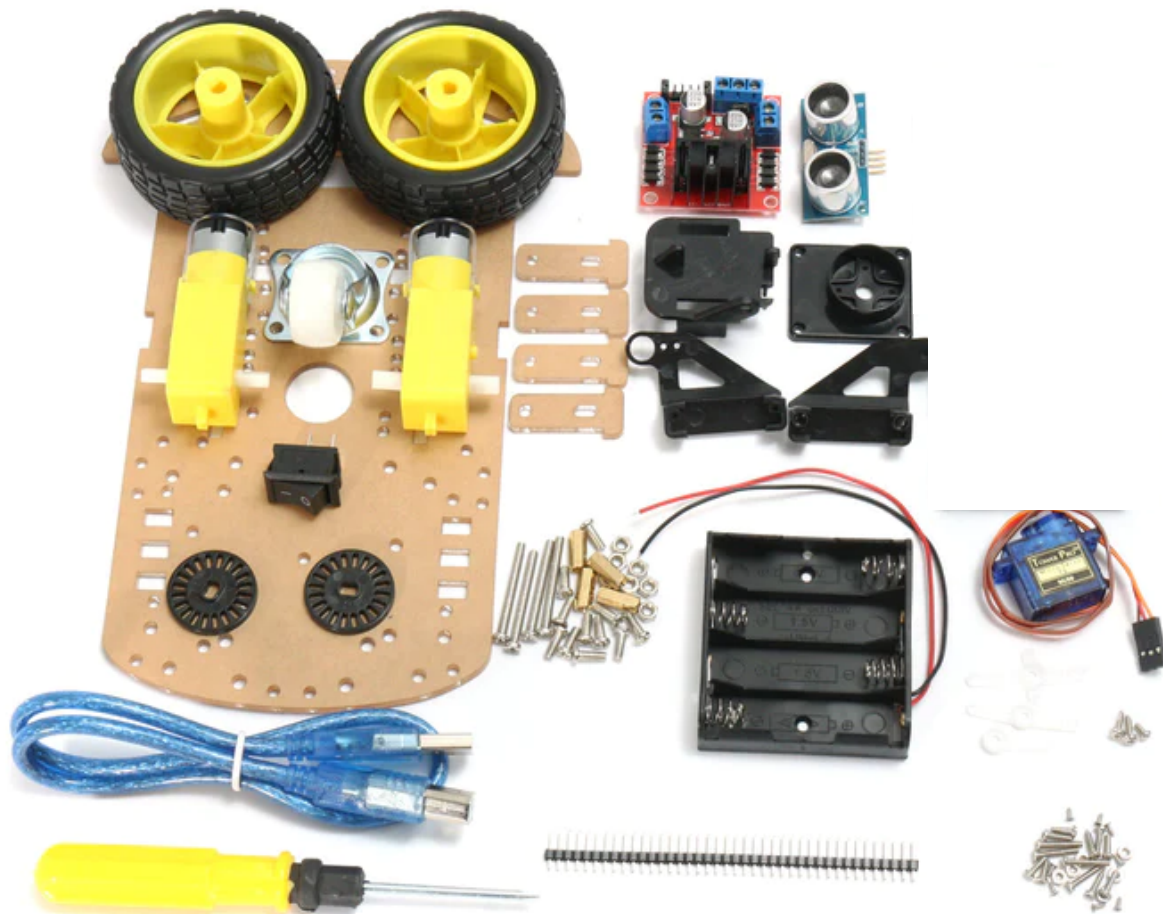

*We will replace water pump outcome with red LED and fire sensor input with light sensor
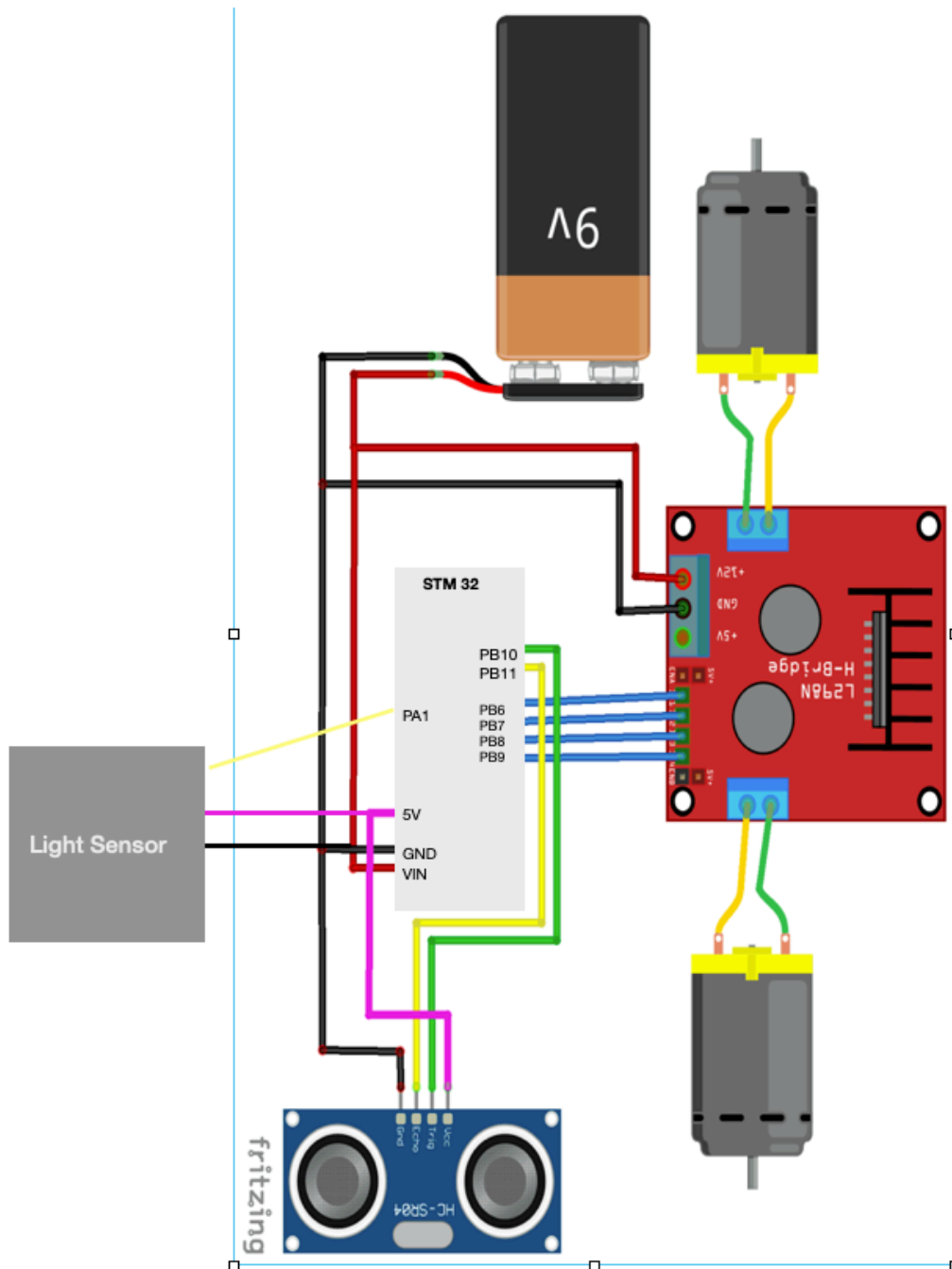
Equipments :

- 2x Gear motor
- 2x 65 mm wheel
- 1x Car chassis plate (Acrylic material)
- 1x L298N motor driver
- STM32 board
- 1x Holder kit for 6 V batteries
- 1x Mini servo
- 1x Ultrasonic module
- 1x USB cable

- BreadBoard
- Jumper cables

Schematic :

I/O Component Connections :

The following table describes the connection details for all I/O components used in the

light detection robot with obstacle avoidance.

Component	Pin Number	Connections
STM32 Nuclei F103RB	5V, GND	Connected to power supply
Ultrasonic Module	VCC, GND	Connected to power supply
Ultrasonic Module	Trig	Connected to PB10
Ultrasonic Module	ECHO	Connected to PB11
L298 Motor Driver	VCC, GND	Connected to power supply
L298 Motor Driver	IN1	Connected to PB6
L298 Motor Driver	IN2	Connected to PB7
L298 Motor Driver	IN3	Connected to PB8
L298 Motor Driver	IN4	Connected to PB9
Mini Servo	Signal	Connected to PA0
Light Sensor	VCC, GND	Connected to power supply
Light Sensor	Analog Out	Connected to PA1

Conclusion : In conclusion, the light detection robot with obstacle avoidance is a small butpowerful robot designed to detect light and avoid obstacles. With its four gear motors, two wheels, L298N motor driver, STM32 Nuclei F103RB microcontroller, acrylic car chassis plate, mini servo, and ultrasonic module, the robot can move in a straight line, turn on a dime, detect light using a light sensor, and avoid obstacles using an ultrasonic module. It is a great educational tool for teaching students about robotics, electronics, and programming. The detailed functional specification manual, including the block diagram and I/O component connections, provides a comprehensive guide for building and operating the robot.