Team Number : 26
Team Name: Embedded

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Project Idea:

The project is about a smart car that:

- parks on its own
- listens to radio and change channels using touchscreen
- senses if there's a rain and based on that it shuts up a servo motor as windshields.
- Measures the fuel tank capacity and displays the level (0 -> empty , 1 -> medium, 2 -> full) and displays it on a 7-segment display.

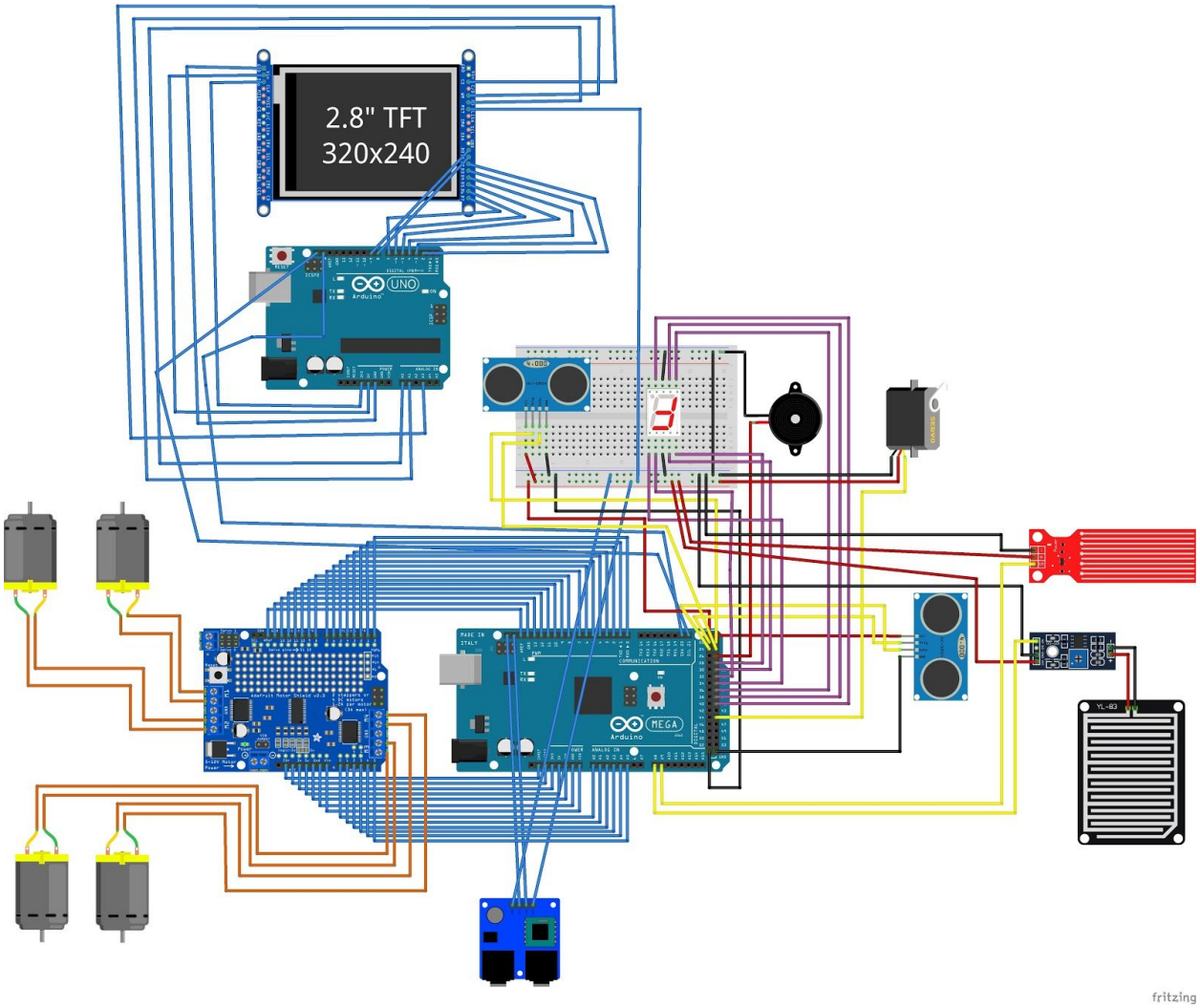
Approach:

- We used the arduino embedded system to design the project.
- We used two arduino boards to program and connect together and also connect the external components to them.
- We used the Arduino C language to program the arduino.

Components Used

- Arduino Uno board: A programmable device to upload the code on and connect external components to it and also to connect to the Arduino mega board.
- Arduino Mega board: A programmable device to upload the code on and connect external components to it and also to connect to the Arduino Uno board.
- 7- Segment display: used to show the current fuel level (0->low,1->medium,2->high).
- Two ultrasonic sensors to measure the distance between the car and the obstacles in order to help the car park on the right spot.
- A bread board to connect some components and wires together.
- A buzzer to buzz when the car is close to some object.
- A rain drop sensor to sense if there's a rain.
- A servo motor to act as a windshield and move back and forth when there's a rain.
- An arduino shield to control the dc motors and the servo motor.
- Dc motors to move the car.

- A car skeleton to put our stuff on and have wheels and dc motors to move the car.
- A water level sensor to sense the fuel level.
- A Radio receiver (TEA5767) component to receive radio signals.
- LCD Touch Screen display to display the current frequency and the radio state (muted / Unmuted) and to also change the received frequency and to also change the radio state (muted/unmuted).
- An external power supply.
- wires.



Libraries Used:

<Arduino_FreeRTOS.h> : To use the FreeRtos and divide the functionalities into tasks and priority between them.
<AFMotor.h> : To control the DC motors.
<Servo.h> : To control the servo motor.
<Wire.h> : To communicate between the 2 Arduinos.
<TEA5767N.h> : To use the radio module.
<Adafruit_TFTLCD.h> : To display on the touch screen module.
<Adafruit_GFX.h> : To display on the touch screen module.
<TouchScreen.h> : To sense the touch on the touch screen module.
<Wire.h> : To communicate between the two Arduinos.

Handling Inputs:

We Assign Pin numbers to be specific input pins to the external components.
We then specify the pin mode to be as an Input pin.
We choose the input pin based on the signal coming, whether it's an analog signal or a digital signal.
We read using one of two commands:
1- digitalRead(pin#) : to read digital data.
2- AnalogRead(pin#) : to read analog data.

Handling Outputs:

We Assign Pin numbers to be specific output pins to the external components.
We then specify the pin mode to be as an output pin.
We choose the output pin based on the signal outgoing, whether it's an analog signal or a digital signal.
We write using one of two commands:
1- digitalWrite(pin#) : to write digital data.
2- analogWrite(pin#) : to write analog data.

Prioritizing and dividing tasks using freeRtos:

We made 2 tasks, the first one handles the parking and has a priority of 2, The second one handles the rest of the functionalities and has a priority 1. The second task handles the rain detection, radio receiving, lcd and the water level sensor.

Problems faced:

- Difficulty in adding libraries.
- Difficulty in communicating between the two arduino boards.
- Difficulty in handling all components together in the freeRTOS.

Work Assignment:

- Pola Mawaad : LCD tft 2.8 display and communicating between the 2 arduino boards.
- Mohamed Ahmed Helmy : Parking
- Abdelrahman Khattab : Radio Receiving
- Omar Abdelhamid : fuel level sensor
- Ramez Mohamed : Rain detection and Wind shield