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Media Engineering and Technology
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Embedded Systems, Winter Semester 2022
Project Description
Deadline: 30/12/2022 11:59 pm

Overview

Modern day vehicles come with various safety and entertainment features to make our lives better.

However, safety features are considered more important than entertainment features, consequently they have higher priorities when it comes to execution.

In this project, you are going to implement some of these features using **Arduino Uno and Mega** boards, giving each feature a **suitable priority**. You will be using **Arduino C** alongside **FreeRTOS** to implement your project.

You will assemble your own project by selecting **one feature from each of the three main categories**. Each feature you choose corresponds to one or more **Tasks** that must be **prioritized** via **FreeRTOS**. Your whole system must be run by **FreeRTOS**.

You can choose any feature you feel feasible to implement, but you MUST choose one feature of each section of the three provided sections below.

To be able to assemble your project, you need to submit your features selection via the following link before **Friday 11th of November 2022 11:59PM**: `https://forms.gle/9tFkxxggnBFtqBUbA`

Note: Each feature has a capacity of 35 teams **(FIRST COME, FIRST SERVED)**.
The deadline for assembling and submitting your project is **Friday 30th of December 2022 at 11:59 pm.**

The **Project Guidelines** document is also posted containing some constraints for each feature and it contains the submission details.

1 Wheels on the Road!

You **MUST** implement one of the following features:

1.1 Lane Keeping Assist (LKA)

a) Autonomous lane departure system that detects if the vehicle is leaving its lane using sensors.

b) It will gently steer the car back into the lane if it begins to drift out of it while alerting the driver.

1.2 Active Parking Assist (APA)

a) Autonomous car-maneuvering system that performs parallel parking using sensors.

b) It will independently park the car between two cars parallelly while alerting the driver of obstacles.

Requirements

- All projects must be done on a physical moving car.
- **Example:** https://www.amazon.eg/-/en/Smart-Robot-Chassis-Kits-arduino/dp/B091C1ZPDW/ref=sr_1_14?crid=3K8MAG4SJL1JY&keywords=car+robot&qid=1667740105&qu=eyJxc2MiOiIzLjQyIiwicXNh3D%3D&sprefix=car+robo%2Caps%2C273&sr=8-14

2 Fears on the Road!

You **MUST** implement one of the following features:

2.1 Control Indicators (CI)

a) Current Gear.

- Display the current gear on a 7-Segment display.

b) Adaptive Headlights.

- Adapt the car headlights according to the surrounding light intensity.

Requirements

- The current gear should reflect one of the four automatic gears (P,D,N,R).
- You should be able to change gears via a joystick, however, it is not a must to control the car according to the gears.
- The light intensity should be detected using a sensor, and automatically adapt the car's headlights represented by LEDs.

2.2 Fluids Indicators (FI)

a) Automatic Rain Wipers.

- Control the rain wipers according to the weather.

b) Fuel Indicator.

- Display the fuel level on a 7-Segment display (0→Low, 1→Medium, 2→Full).

Requirements

- You should detect whether it is raining or not using a sensor, and control the rain wipers accordingly.
- The rain wipers should be represented using servo motors.
- The fuel level should be detected via a separate sensor.

3 Ears on the Road!

You **MUST** implement one of the following features:

3.1 Radio System (RS)

a) You should tune in your favorite radio station.

b) You should control the system through a touch screen, i.e: “LCD TFT With Touch Screen”, which performs the following operations:

- On/Off
- Change the frequency
- Display the current frequency

Requirements

- Your radio system should output sound according to the selected FM radio station.
- You should use a radio receiver sensor for the radio mechanism.
  Example:
  `https://store.fut-electronics.com/products/fm-radio-receiver-module-with-antenna-tea5767`

3.2 Sound System (SS)

a) You should play MP3 files via a speaker on the car.

b) You should control the system through a touch screen, i.e: “LCD TFT With Touch Screen”, which performs the following operations:

- Play/Pause
- Previous
- Next
- Display the song number/name

Requirements

- Your sound system should be able to perform the basic operations of playing/pausing an audio file, playing the next or previous audio file through an MP3 module.
  Example: `https://www.amazon.eg/-/en/Player-Module-Audio-Arduino-2724606709683/dp/B098N2X85P/ref=sr_1_5?crid=3VMRCXAYE9VDG&keywords=mp3+module&qid=1667740959&qu=eyJxc2MiOiIzL`
  `3D%3D&sprefix=mp3+modul%2Caps%2C704&sr=8-5`
- The sound should be heard explicitly from an external speaker.