

Embedded Systems, Winter term 2019
Project Description
Deadline: 2/12/2019 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 an **Arduino (Uno or Mega)** board, 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 a **Task** that must be **prioritized** via **FreeRTOS**. Your whole system must be run by **FreeRTOS**.

To be able to assemble your project, you need to submit your features selection via the following link: <https://forms.gle/M34bCg9M9FE5TfSC6>

Note: Each feature has a capacity up to 37 team. **FIRST COME, FIRST SERVED**
Deadline for assembling your project is **Monday 14th of October, 2019 11:59 pm**.

The guidelines for the project submission will be posted later.

1 Eyes on the Road!

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

1.1 Lane Departure Warning (LDW)

- a) Warn the driver if the vehicle is leaving its lane.
- b) You should warn the driver with visual and audible warnings.

1.2 Automatic Emergency Braking (AEB)

- a) Alerts a driver to an imminent crash with audible warnings.
- b) It will independently brake and stop the car.

Requirements

- All projects must be done on a physical car.
- Example: <https://ram-e-shop.com/product/ro-base-dg008/>

2 Digital Dashboard

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

2.1 General Purpose Display and Automatic Headlights

Your dashboard must display the following information in **REAL-TIME** on an LCD Display:

- a) Date and Time.
- b) Temperature.
- c) Current Gear.
- d) Night Detection with Automatic Headlights.
 - You should turn on the car's headlights when it is dark.

Requirements

- The computer current Date and Time must be reflected on the dashboard.
- The Temperature must be measured using a temperature sensor, and displayed in Degrees Celsius.
- 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.
- The Night Detection should be detected using a sensor, and automatically turn on the car's headlights represented as LEDs.

2.2 Warning Indicators and Power Mirrors

Your dashboard must display the following information in **REAL-TIME** on an LCD Display:

- a) Rain Detection.
- b) Low Level Fuel Detection.
- c) Seat-Belt Detection with Audible Warning.
- d) Adjustable Mirrors in two directions.

Requirements

- The Rain Detection should be done using a sensor.
- The Fuel level should be detected via a sensor.
- The seat-belt buckle should be simulated using a button.
- The seat-belt audible warning should be done via a buzzer.
- You have to adjust your side mirrors in two directions via a joystick and an actuator for the mirrors simulation.

3 Luxury ★

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

3.1 Sound System

- a) You should play MP3 files via a speaker on your car.
- b) Your system should contain 3 buttons simulating the Steering Wheel Audio Controls:
 - Play/Pause
 - Previous
 - Next

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.
- The sound should be heard explicitly from an external speaker.

3.2 Keyless Entry

- a) Lock and Unlock your car without a physical key.
- b) Start/Stop Engine button.

Requirements

- The Keyless Entry mechanism should be implemented using an RFID reader/writer.
- The car should reflect the start and stop actions from the Start/Stop Engine button.