Mobile Robot

Name	ID
Mina Adel Attia	1029
Omar Ahmed Dawood	170
Khalid Amr Hassan	264
Moamen mahmoud mohamed	173

SEPTEMBER 14

Introduction

Real time operating systems are composed of various tasks. Tasks are infinite loop functions that serve certain functionalities. The operating system Kernel switches the processor resources (processing time, hardware peripherals, etc.) between tasks. The goal of this project is to implement a simple scheduler that switches between various tasks non preemptively.
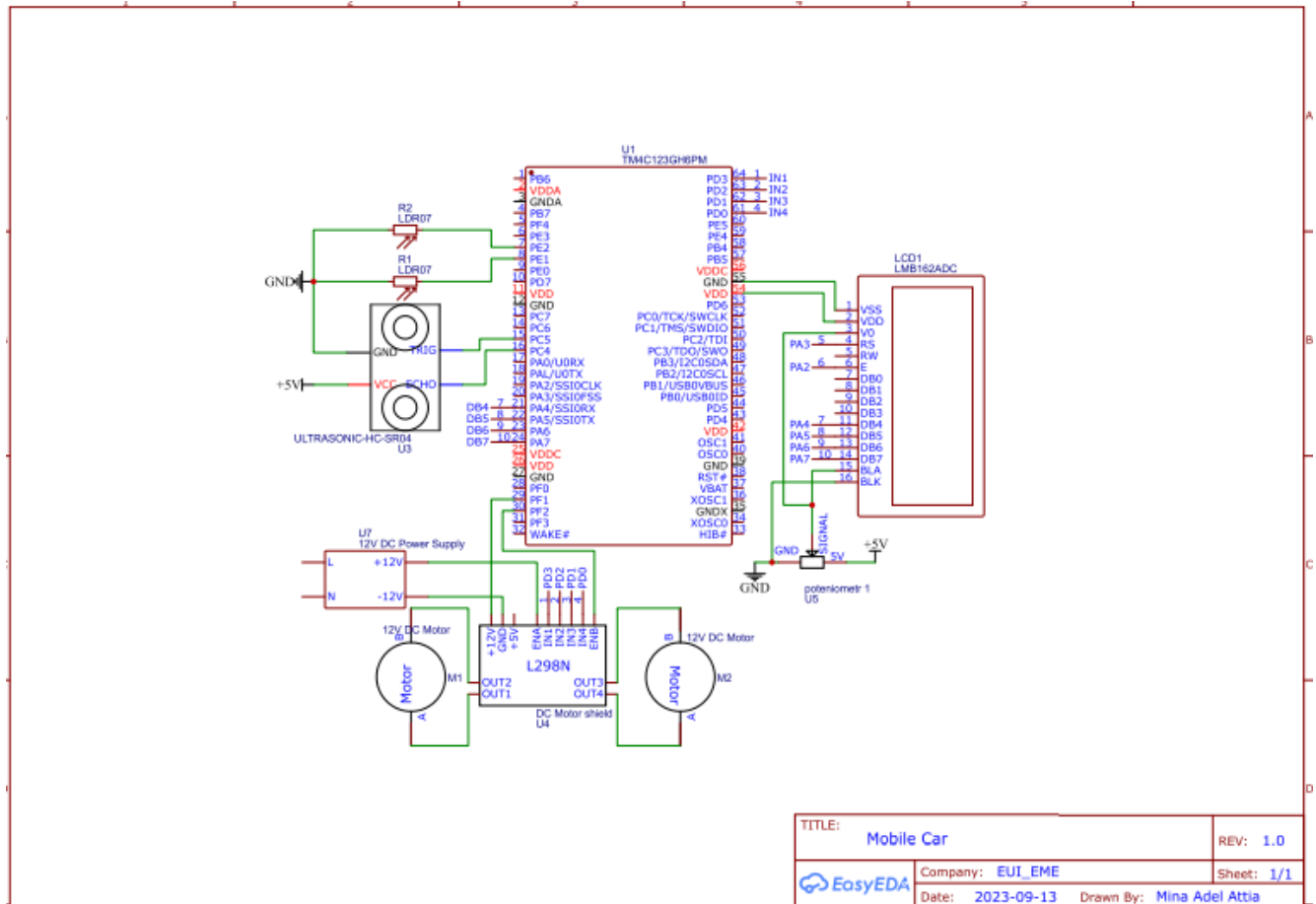
Components

- Two Photo-Resistors.
- One Ultrasonic Sensor Module HC-SR04.
- On-board Temperature sensor
- One LCD. 5. Four motors + Two motor drivers.

Tasks:

- Display Temperature on LCD.
- Detect object and avoid it.
- Moving into Light way.

System Layout

System topology

- E1 >> LDR1
- E2 >> LDR2
- E3 >> Temp. Sensor
- F1 >> PWM
- F2 >> PWM
- C4 >> ECHO
- C5 >>Trigger
- LCD >> A3 RS, A2 E, From A3 to A7 Data Pins

Verification and Validation

First, Verification:

- In verification stage, we are reviewing the requirements of the project and the code that we are implemented it.
- From reviewing, the software achieves its goal without any bugs
- Ultrasonic detects object less than or equal 10 cm and avoid it, Car moves into Light way by using LDR sensor, Measuring Temperature by using Temperature Sensor and display Temperature on LCD.

Then, Validation

- In Validation stage, Testing the car overall and compare actual results with the requirements.
- We found that all requirements are achieved.
- Ultrasonic detects object less than or equal 10 cm and avoid it, Car moves into Light way by using LDR sensor, Measuring Temperature by using Temperature Sensor and display Temperature on LCD.

Sensors quick overview

Ultrasonic Sensor

- It has 4 pins (Vcc, GND, Trig, Echo).
- Trig pin send signal and returning into echo pin if there is object in front of sensor.
- Sensor returns time of signal and we calculate distance by d = (v * t) /2 and v = 320 m/s.

LDR Sensor

- It has 3 pins (Vcc, GND, Signal).
- Sensor measure brightness as analog value and we take it to digitalize it and use ot in our calculations.

Temperature Sensor

- There is temperature sensor built in tiva c.
- We take from it temperature reading directly by using ADC.

Pseudo Code

- Systick time = 10 ms (Isr comes every 10 ms).
- Ultrasonic Periodicity = 1 sec.
- LDR Periodicity = 20 ms.
- LCD Periodicity = 3 sec.
- After power on, scheduler will run and choose task to run it.
- If ultrasonic detects object less than or equal 10 cm, motor moves backward and turns left.
- If one of LDR measures more brightness, motors will swing toward it.
- LCD display Temperature of room.