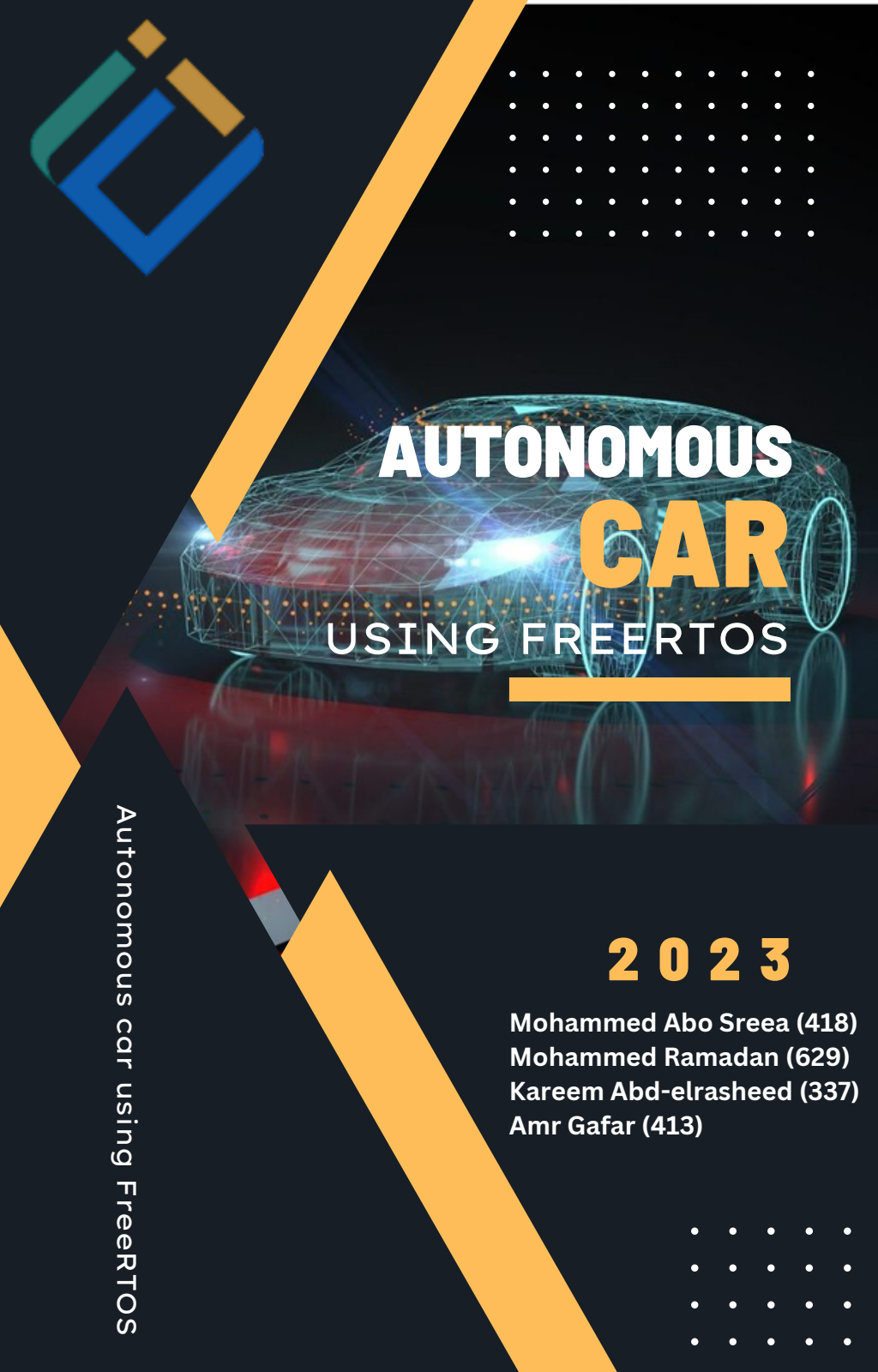

AUTONOMOUS CAR

USING FREERTOS

2023

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Autonomous car using FreeRTOS

vol.1

INTRODUCTION

INTRODUCTION

Welcome to our car control system! Our system is designed with several features to ensure smooth and automated operation. Here's a brief overview:

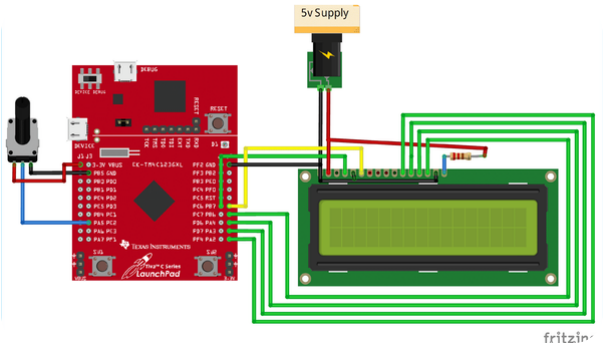
- Starting the car motors using one of two on-board switches.
- The car will stop if the other switch is pressed or after one minute has elapsed.
- The car moves towards the area with the highest illumination.
- Temperature, LDR difference, and elapsed time are displayed on the LCD.
- If the car gets closer to an obstacle by a maximum of 10 centimeters, the ultrasonic sensor activates. The car reverses its direction and then rotates by 90 degrees.

vol.2

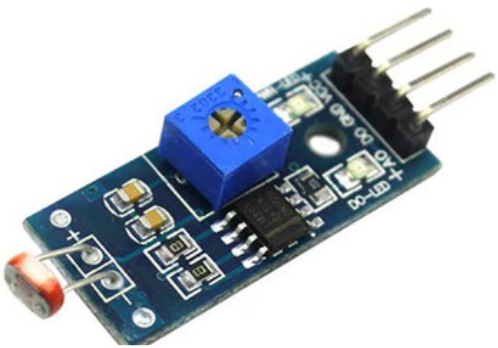
Overview and the circuits Topologies

OVERVIEW AND THE CIRCUITS TOPOLOGIES

LCD used to display temperature, LDR difference, and elapsed time.



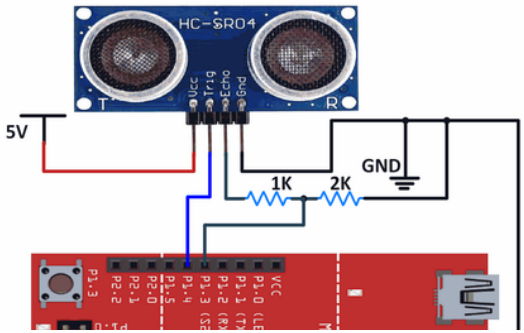
LDR sensor used to detect illumination so car will move towards the area with the highest illumination



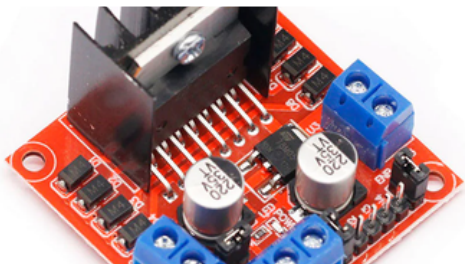
Temp sensor implemented internally to TivaC used to measure the room temperature.

OVERVIEW AND THE CIRCUITS TOPOLOGIES

Ultrasonic sensor used to calc the distance between car and forward obstacles



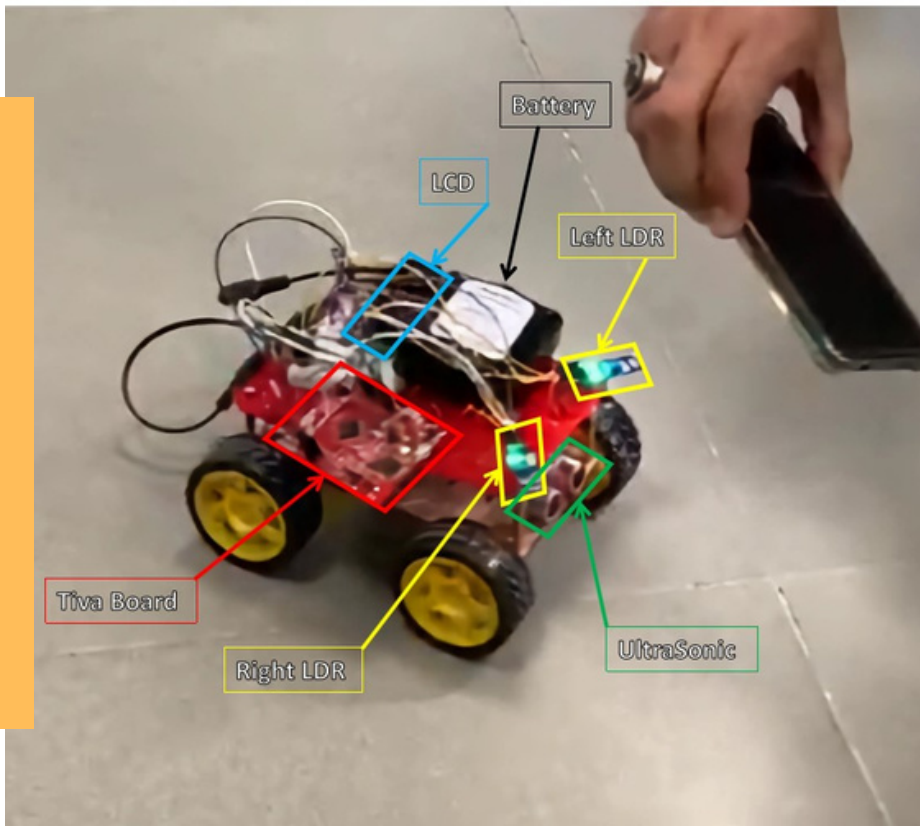
DC motors + H bridge are connected with PWM pinouts to move the car with selected speed



vol.3

LAYOUT

LAYOUT

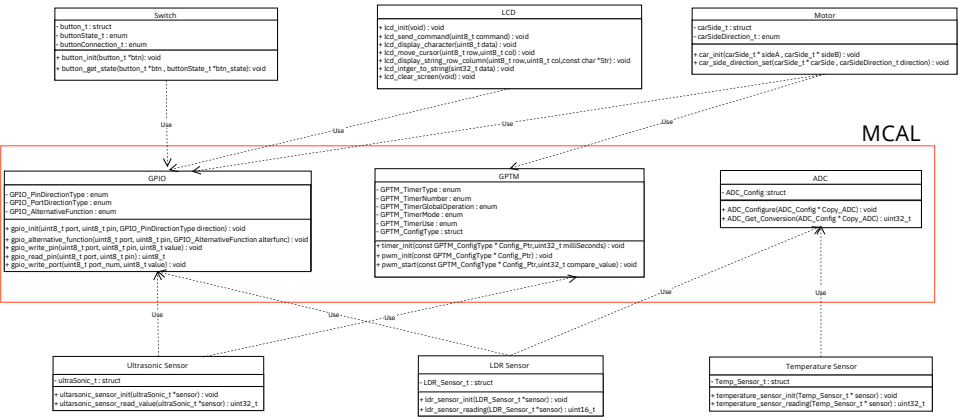


vol.4

Static design FreeRTOS

STATIC DESIGN FREERTOS

Autonomous Car bases on RTOS
(Static Design)



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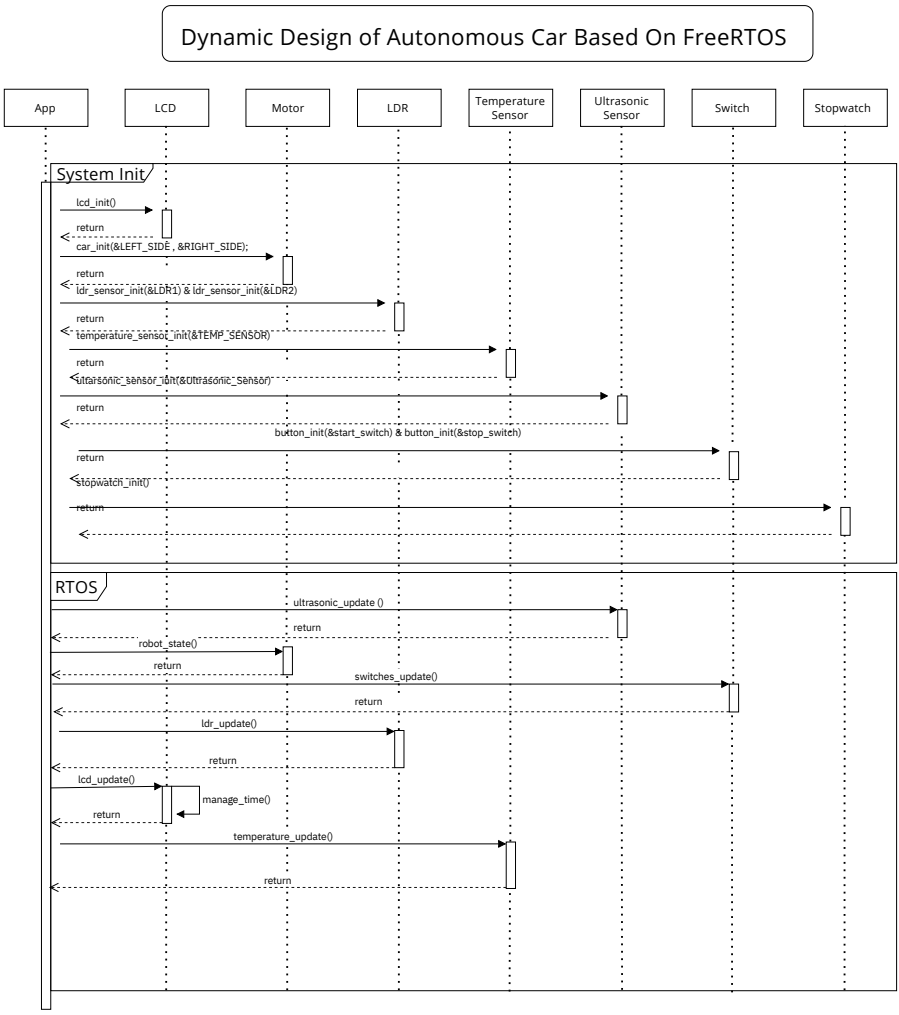
vol.5

Dynamic design FreeRTOS

DYNAMIC DESIGN FREERTOS



vol.6

Tasks description

TASKS DESCRIPTION

Task	Priority	Predicity
switches_update	6	120 ms
ultrasonic_update	5	40 ms
ldr_update	4	20 ms
robot_state	3	100 ms
lcd_update	2	40 ms
temperature_update	1	100 ms

vol.7

Validation and Verification

VALIDATION AND VERIFICATION.

- The car motors are started using one of the two on-board switches.
- The car stopped when the other switch is pressed.
- The car stopped when the time of one minute is elapsed.
- The car moved and swinged to the way with the highest illumination.
- Car reverses its direction first, moving to the back then rotates by 90 degrees when the ultrasonic fires obstacle by 10 centimeters or less.
- The Temperature, the LDR.s difference, and the elapsed time are displayed on the LCD.

vol.8

Pseudo-Code

PSEUDO-CODE

- Initialize the system peripherals and hardware.
- initialize of the scheduler with tick time 1 ms.
- Create the task of switches updates with periodicity 120 ms and first delay 1ms.
- Create the task of lcd updates with periodicity 40 ms and first delay 0ms.
- Create the task of ldr updates with periodicity 20 ms and first delay 0ms.
- Create the task of temperature updates with periodicity 100 ms and first delay 0ms.
- Create the task of robot state with periodicity 100 ms and first delay 0ms.
- Create the task of ultrasonic updates with periodicity 40 ms and first delay 0ms.
- Start OS scheduler.