CMPE 443 PRINCIPLES OF EMBEDDED SYSTEMS DESIGN

Final Project - Interim Submission #002

"Ultrasonic and LDRs Connection"

"Power Management"

1) Problem Description

In the first interim submission of the Final project, you had added 1 Motor Controller and 4 LEDs to a CmpE443 Robot Car, which consists of a 4-Wheel Robot Smart Car Chassis, LPC4088 Board and other components such as sensors, battery etc. In this way, you had made your CmpE443 Robot Car move and signal correctly for specified commands given via the joystick on the LPC4088 Experimental Base Board.

In this second submission, you will use the same setup and some parts of the software of first interim submission as the base configuration. This time, you will add 1 Ultrasonic sensor and two LDRs to the system to make your CmpE443 Robot Car semi-autonomous. Your robot should move according to the sensors' data:

- At the front-middle, an Ultrasonic sensor is placed.
- At the front-left and front-right, there are two LDR circuits

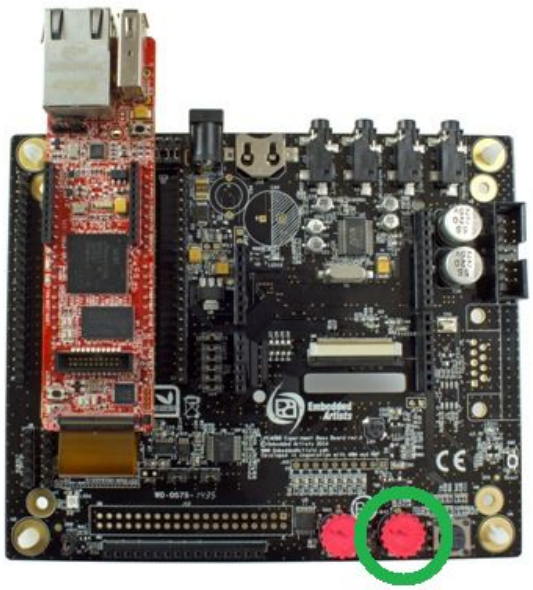
Your robot start the Demo with the Deep-Power Down mode (You will press Joystick Center button and the board will enter Deep-Power Down mode). When you pressed the Reset Button, your robot will start the complete the tasks which are listed below (robot is initially at the stop state):

- ➢ When Joystick Center button is pressed, your robot should stop and board should go to Deep Power Down State.
- ➢ When Joystick Up button is pressed, your robot should drive in forward direction.
- ➢ When Ultrasonic sensor detects an obstacle which is 10 cm away from the robot, robot should drive in backward direction until ultrasonic sensor reads at least 30 cm. Then, drive in forward direction.
- ➢ When Left LDR detects a light source (higher value than Right LDR), your robot should start to rotate counter-clockwise direction (Point Turn is not necessary) until Left and Right LDRs gives similar result. Then, drive in forward direction.

- ➢ When Right LDR detects a light source (higher value than Left LDR), your robot should start to rotate clockwise direction (Point Turn is not necessary) until Left and Right LDRs gives similar result. Then, drive in forward direction.

Each task has a different priority in this project. The priority of each task is as the listed above, i.e., first task has highest priority; the second task has a lower priority than the first task, but has a higher priority than the rest, etc. For example, when center button is pressed, no matter which task is processing, your robot should go to Deep Power Down State. While your robot performs the third task, even if your robot detects a light source, your robot will not rotate in light source direction.

Also, your robot should have an ability to change its speed. The speed of the robot will be determined by the Trimpot which is located on the Experiment Base Board (You can see the Trimpot in the green circle). The speed scale of the robot should be between 50% - 100% Duty Cycle.



Your robot car has 4 LEDs which are located to the Front-Left, Front-Right, Back-Left and Back-Right The state of the LED is changed according the action which robot performs:

- ➢ When robot stops, all the LEDs should be turned off.
- ➢ When robot drives in forward direction, Front-Left and Front-Right LEDs should be turned on and the other LEDs should be turned off.
- ➢ When robot drives in backward direction, Back-Left and Back-Right LEDs should be turned on and the other LEDs should be turned off.

- ➢ When robot drives counter-clockwise direction, Front-Left and Back-Left LEDs should blink (2 times in a second) and the other LEDs should be turned off.
- ➢ When robot drives clockwise direction, Front-Right and Back-Right LEDs should blink (2 times in a second) and the other LEDs should be turned off.

2) Group Report

Your report has to be genuine. It should include all necessary details such as Block Diagram(s), System-Level Functional Diagram, Sequence Diagram(s), Connection Table(s) and Circuit Schematic(s). In addition, you should write the pseudocodes for each function in your code.