Sprints

Description:

Suppose you have a four-diving wheel robot, you are required to design the system so that the robot avoid any object in front.

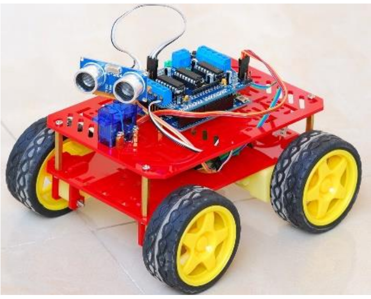

Figure 1: Object Detection Robot

Detailed Requirements

1. **Read System Requirement Specifications**
    1. **Car Components**:
        1. **ATmega32** microcontroller
        2. **Four** motors (**M1**, **M2**, **M3**, **M4**)
        3. **One** button to change default direction of rotation (**PBUTTON0**)
        4. Keypad button 1 to start
        5. Keypad button 2 to stop
        6. **One Ultrasonic** sensor connected as follows
            1. **Vcc to 5V in the Board**
            2. **GND to the ground In the Board**
            3. **Trig to PB3**
            4. **Echo to PB2**
        7. **LCD**
    2. **System Requirements**:
        1. The car **starts initially** from **0 speed**
        2. The default rotation direction is to the **right**
        3. Press **PB2** to start or stop the robot
        4. **After Pressing Start**:
            1. The LCD will display a centered message in line 1 **"Set Def. Rot."**
            2. The LCD will display the selected option in line 2 **"Right"**
            3. The robot will **wait** for **5 seconds** to choose between **Right and Left**
                1. When **PB1** is pressed **once**, the default rotation will be **Left** and the **LCD line 2 will be updated**
                2. When **PB1** is pressed **again**, the default rotation will be **Right** and the **LCD line 2 will be updated**
                3. *For each press the default rotation will changed and the LCD line 2 is updated*
                4. **After the 5 seconds the default value of rotation is set**
            4. The robot will move **after 2 seconds** from setting the default direction of rotation.

5. **For No obstacles or object is far than 70 centimeters:**
    1. The robot will move forward with 30% speed for 5 seconds
    2. After 5 seconds it will move with 50% speed as long as there was no object or objects are located at more than 70 centimeters distance
    3. The LCD will display the speed and moving direction in line 1: **“Speed:00% Dir: F/B/R/S”**, **F**: forward, **B**: Backwards, **R**: Rotating, and **S**: Stopped
    4. The LCD will display Object distance in line 2 **“Dist.: 000 Cm”**
6. **For Obstacles located between 30 and 70 centimeters**
    1. The robot will decrease its speed to 30%
    2. LCD data is updated
7. **For Obstacles located between 20 and 30 centimeters**
    1. The robot will stop and rotates 90 degrees to right/left according to the chosen configuration
    2. The LCD data is updated
8. **For Obstacles located less than 20 centimeters**
    1. The robot will **stop**, move **backwards** with **30% speed** until distance is **greater than 20 and less than 30**
    2. The LCD data is updated
    3. **Then preform point 8**
9. **Obstacles surrounding the robot (Bonus)**
    1. If the robot **rotated for 360 degrees without finding any distance greater than 20 it will stop**
    2. LCD data will be updated.
    3. The robot will frequently (each 3 seconds) check if any of the obstacles was removed or not and move in the direction of the furthest object

2. **Prepare your design**
    1. Please note that any functionality based on timers should be separated in a separate module, and all timers should be operating in **Normal mode, ICU** will be software implemented
    2. Create a PDF file with the name **Obstacle Avoidance Robot V1.0 Design**
    3. The design document should contain the below fields
        1. Cover Page
        2. Table of content
        3. Project introduction
        4. High Level Design
            1. Layered architecture
            2. Modules Descriptions
            3. Drivers’ documentation
        5. Low Level Design
            1. Provide the flowchart for each function in each module
            2. Pre-compiling configurations for each module
            3. Linking configurations for each module

Delivery

1. Deliver the Design Document
2. English Video recording 5 minutes maximum discuss your design