Electronics Circuits Lab Project

Smart Car Parking System

Motivation:

In today's life, on a daily basis, we struggle to find empty car parking slots. So we planned to overcome this problem by building a Smart Car Parking System which tells the customer about the nearest parking slot available to him/her. Also from the parking slot manager's point of view, this will be beneficial, as fare will be calculated automatically according to the time spent by the car in the parking slot.

Overview:

- When the car enters the parking lot, the user enters the car registration number (using a keypad made from push buttons(numbered from 1 to 9)) , The nearest empty parking slot is displayed on an LCD module.
- While entering, the car will initially get an OTP. This OTP will be used for the total bill calculation in the future while exiting. Also, the time when the car enters the parking lot is noted.
- Each parking slot has 2 IR sensors that will detect whether a car is present in it or not.
- Now when a car parks in an empty slot, the IR sensors detects it, and its state is changed to "occupied" in the program.
- When the car leaves the parking slot,the state is changed to "empty" in the program. Now as the car is leaving through the exit gate, the IR sensor detects it and asks the users for the car registration number and the OTP which was issued in the beginning.
- After the person enters OTP (using a keypad made from push buttons), the fare receipt generated will be displayed on LCD and the gate opens.

- The keypad is made using 9 push buttons numbered from 1 to 9. Since there are 9 pushbuttons, we would require 9 digital pins for reading the input. In order to reduce the number of pins, we will be using boolean logic so that reading the input from the user would only require 6 pins instead of 9 pins.

Logic for keypad:

	Column 1	Column 2	Column 3
Row 1	A1	A2	A3
Row 2	A4	A5	A6
Row 3	A7	A8	A9

Here, A1 denotes the number 1, A2 denotes the number 2 and so on.

- Logic for Column 1: A1+A4+A7
- Logic for Column 2:A2+A5+A8
- Logic for Column 3: A3+A6+A9
- Logic for Row 1:A1+A2+A3
- Logic for Row 2:A4+A5+A6
- Logic for Row 3:A7+A8+A9

Components:

- Arduino Uno
- Breadboard
- Resistors
- IR sensors(10)
- I2C LCD Module(2)
- Push Buttons(18)

- Jumper Wires

Budget:

- Arduino Uno, Breadboard, Resistor, Green LEDs and Red LEDs are already available in the lab.
- IR sensors: We require around 10 IR sensors for the project - (as we are planning to implement 4 parking slots, and each parking slot requires 2 IR sensors, which sums up to 8 sensors. Further, we need 2 more sensors for implementing the entry and exit gates. **(Cost / IR sensor: 52.8 rs)**
- I2C LCD Module: We intend to use 1 LCD Module each for entry and exit. We need an I2C module as the number of pins in Arduino is limited and we want to use the minimum number of pins. **(Estimated cost/module: 399 rs)**

Component	Cost / item	Item nos	Total
IR Sensor	52.8	5	264
I2C LCD	399	1	399
I2C Module	180	1	180

Total = 843 rs

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