Car Parking system

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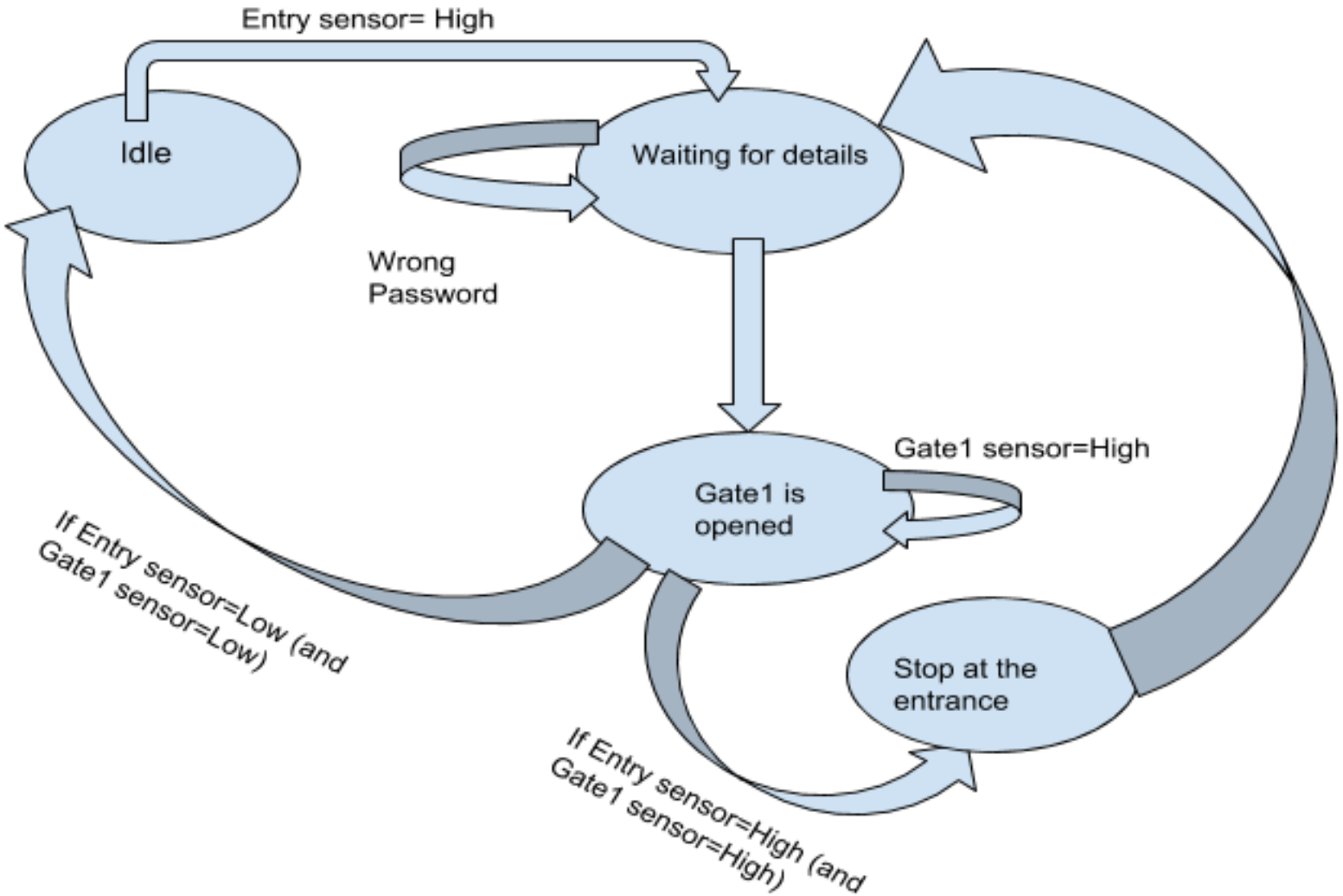
Introduction

The objective of this project is to implement a car parking system. A sensor is used to detect the presence of a vehicle. Once detected, the username and password is asked. If they match, the vehicle is allowed to enter. When a car is entering, if another car tries to enter, the new car is asked to enter its details.

The exit time is noted by the sensor at the exit gate and the difference of 'enter time' and 'exit time' is used to find the cost the car has to pay.

The Finite State Machine



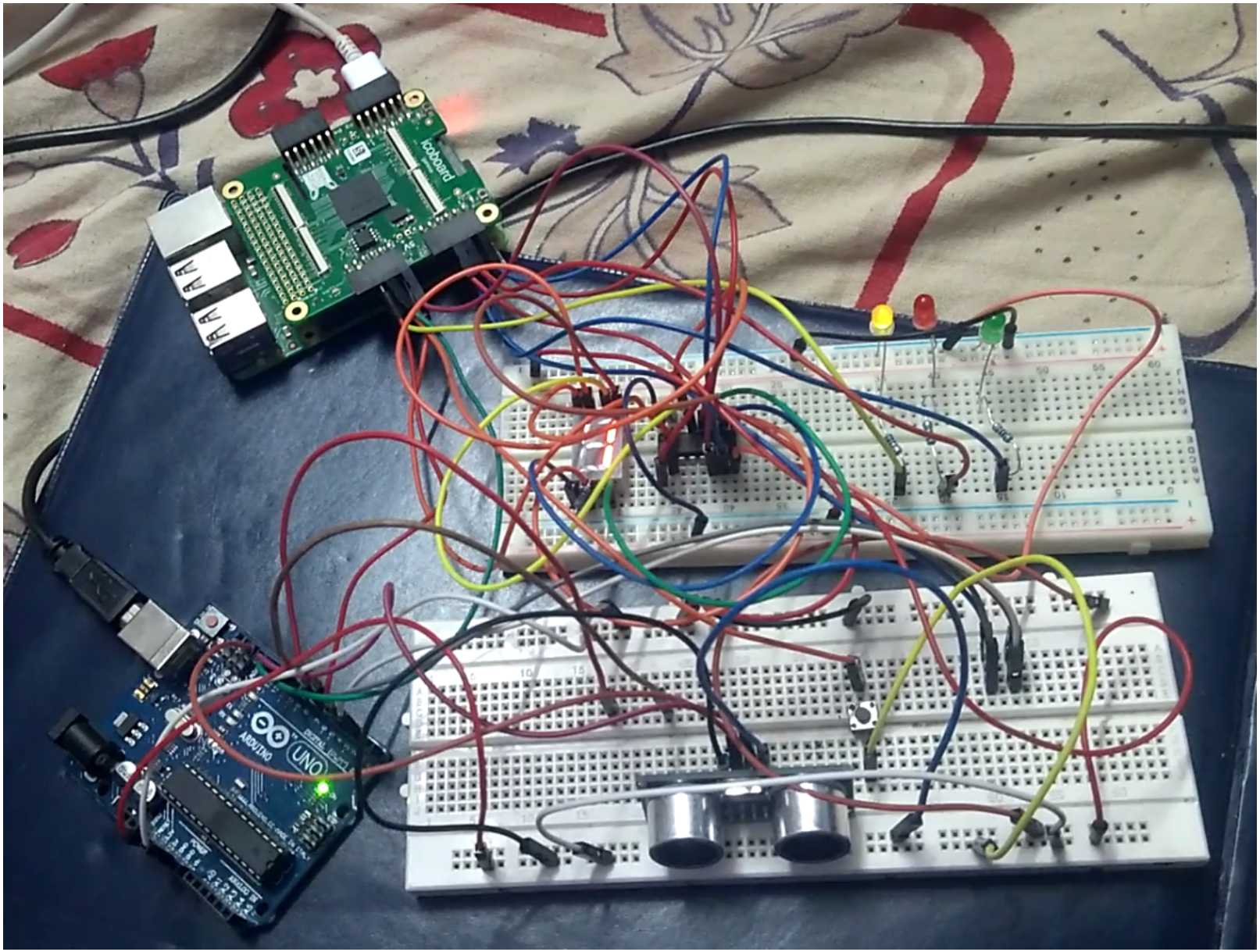
Description

The states:

- Idle: No car is waiting at the entrance.
- Waiting for password: A car has been detected at the entrance and we are waiting for the car owner to enter the username and the password.
- Right Password: The gate has been opened for the car which just now entered its details.
- Wrong password: The password enered is incorrect.

The parking lot has a capacity of 4 cars. There are 4 users whose passwords are the data used for identifying who is entering and who is exiting.

The setup



Approach for the Entry part

- The initial state would be the 'IDLE' state.
- If the capacity is full, the state will remain 'IDLE' until a car exits.
- When the distance measured using ultra-sonic sensor is less than the threshold distance, the state switches to 'WAIT_PASSWORD'.
- If the entered password is correct:
  - The state goes to 'RIGHT_PASSWORD' and switches back to 'IDLE' after the time given for entering.
  - At the time of entry, the entry time is noted down. The number of cars in the lot is incremented and is shown on the SSD.
- If the entered password is not valid, the state goes to 'WRONG PASSWORD' state and switches back to 'IDLE' after some time.

Approach for the Exit part

When a car wants to exit, the exit push button has to be pressed. This will make it wait for user to enter the password. We need the password to identify the car which is trying to exit so as to calculate the cost.

- Once the user enters the correct password, the difference between exit time and the entry time is taken and is scaled by a factor to calculate the cost.
- The cost is displayed and the car is allowed to exit. The number of cars in the lot is decremented and is shown on the SSD.

Problems faced and Further Improvements

- Giving password via push-buttons did not work due to switch bounce.
- Serial Communication losses and errors.
- Interference between the waves sent by the Ultrasonic sensors.
- Keypad for entering password.
- Pressure sensor instead of Ultra-sonic sensor.

Thank you...