Smart Parking System

Developed by

Md. Hasibul Islam

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Objective

Traffic jam is one of the biggest inconveniences we face everyday. And the main reason behind this issue is unplanned and illegal parking. Even if there are arrangements for parking, people face a lot of unwanted incidents due to improper management. This project is the simulation of a simple, yet smart car parking system that can be calibrated for any scenario or institution like hospital, school, shopping mall, etc.

Social Values

This system is developed with a view to automating the parking process in a crowded area so that we can use the valuable manpower on something sophisticated and important. The increasing rate of vehicles on the road is a concern now a days. As a result, the parking places also face difficulties to accomodate the vehicles in the right places. Therefore, this system will make the task easier to park the vehicle efficiently in a parking area.

Required Components

These following parts and tools are required for building this project,

- Arduino UNO R3
- IR Proximity Sensor
- Servo Motor
- Ultrasonic Sonar Sensor
- LCD Module Display
- RC522 RFID Card Reader Module Kit

- Buzzer

- LED's & Resistors

- Male & Female Wires

- 9 Volt Battery

- Breadboard

- 4 Toy Car

- Various Type of Tapes

- Plastic Sheets

- Cutter Knife

Working Procedure

The primary I/O components of the systems are,

- IR Proximity Sensor

- RC522 RFID Card Reader Module Kit

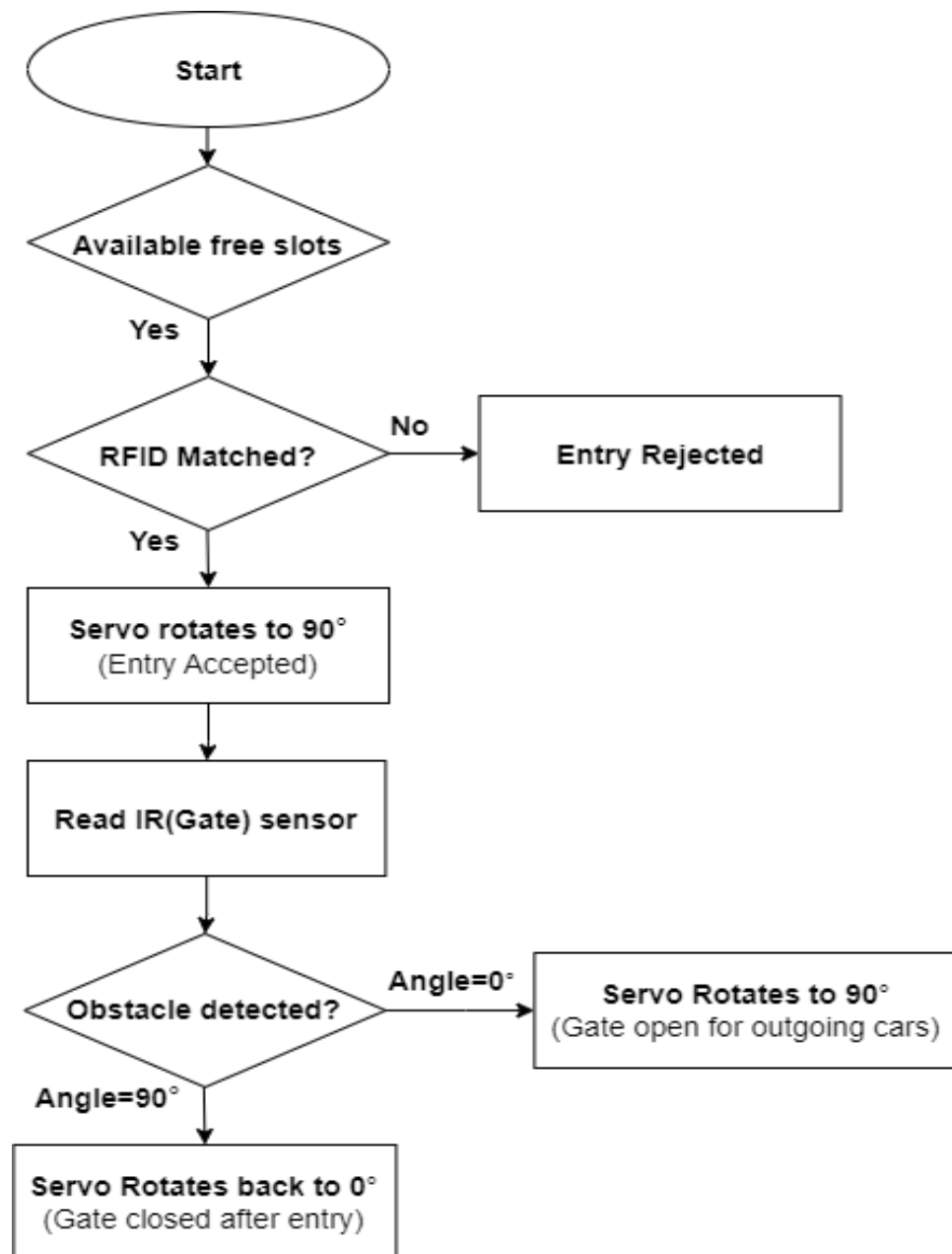- Servo Motor

- Ultrasonic Sonar Sensor

- LED & Buzzer
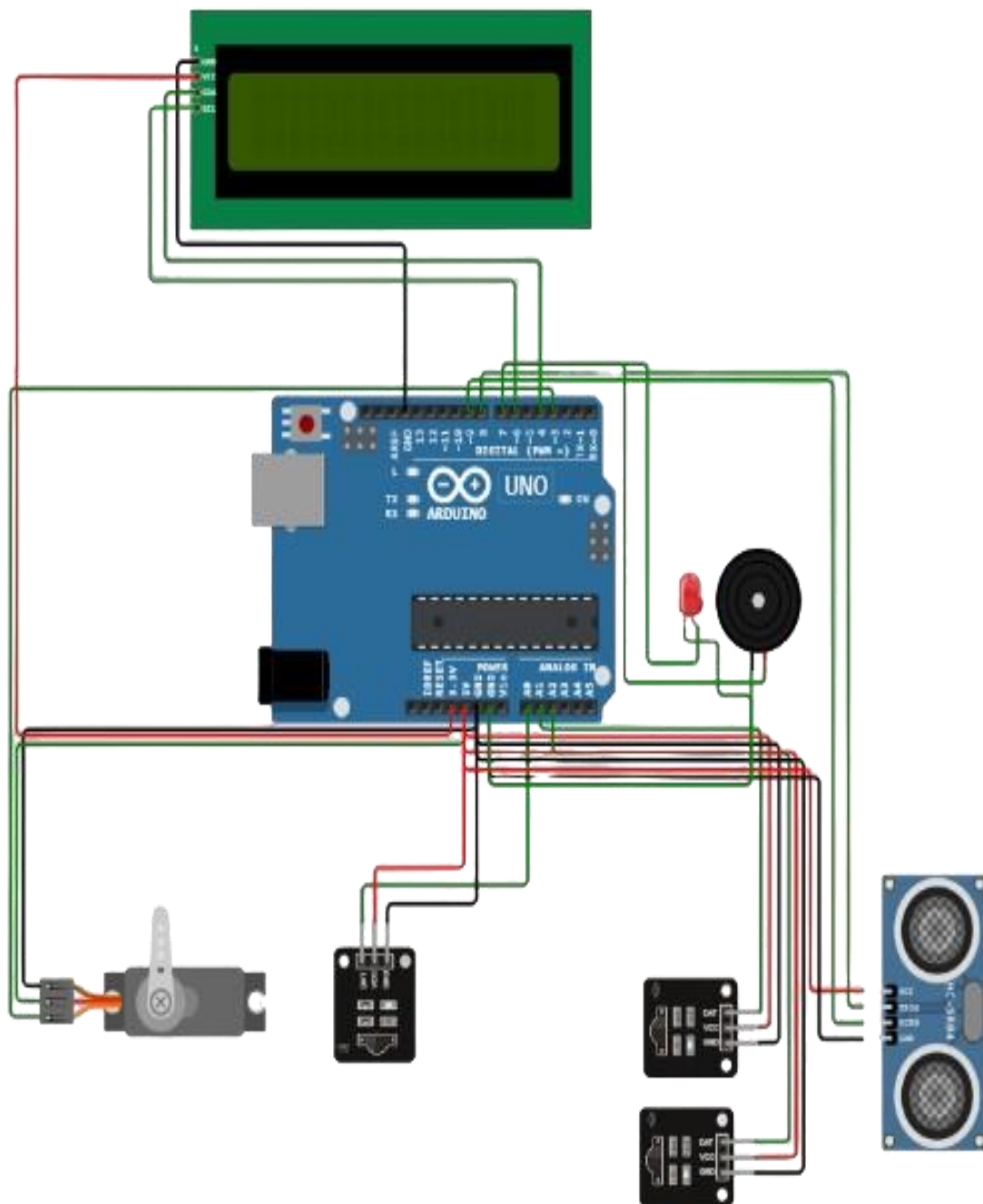
Fig-1: Circuit of Smart Parking System

The smart parking system works on the simple principle of detecting obstacle and sending a visual feedback. Therefore, the system will perform following action,
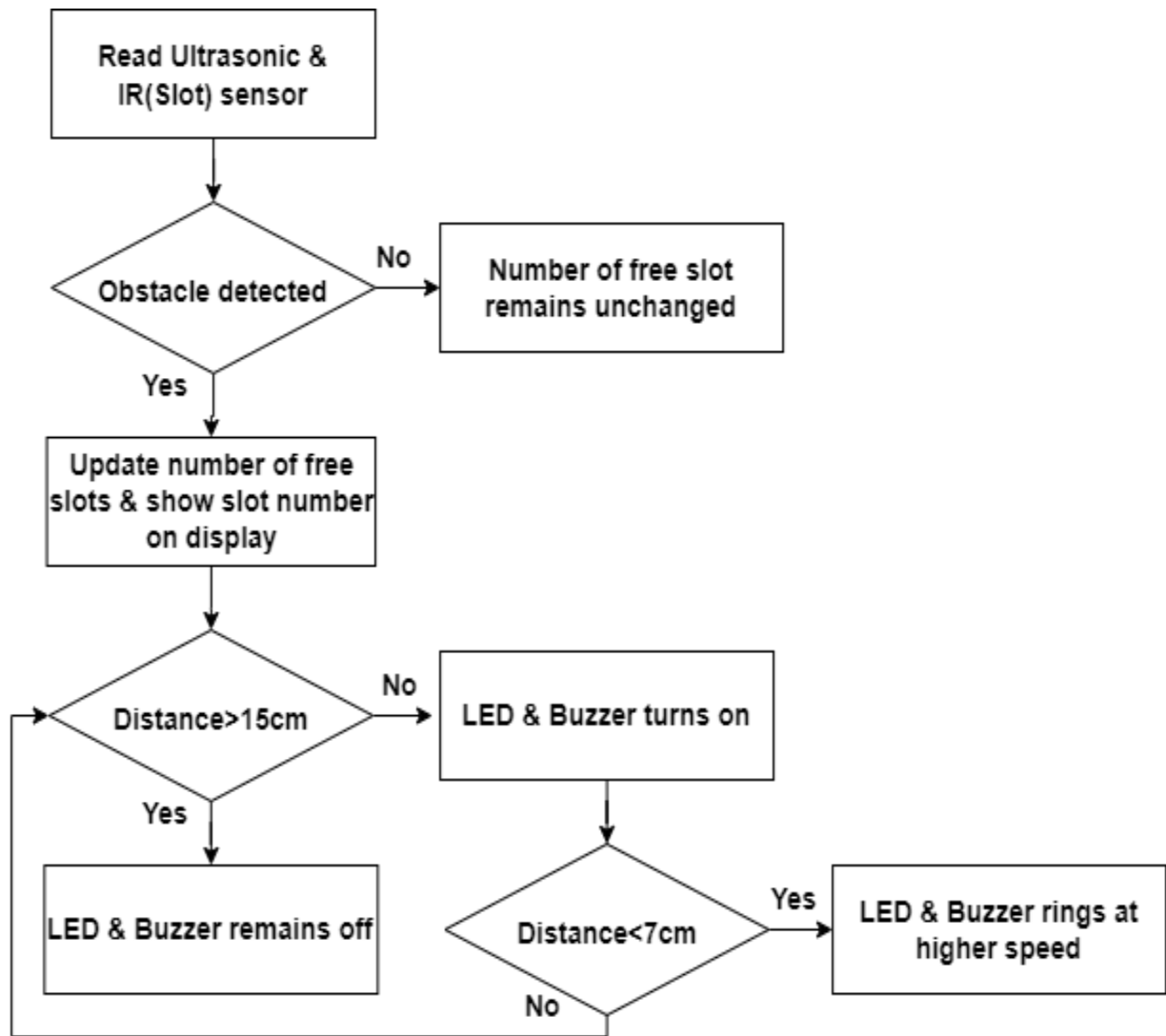
➢ Proximity sensors will detect movement or presence of a vehicle and convert them into an electrical signal. Thus, the system will understand the arrival of any vehicle in front of the parking lot.

➢ The servo motor will control the gate for the entry & exit.

➢ When a vehicle arrives in front of the gate, the driver will need to show the RFID card to cross the barrier on the entrance of the parking lot.

➢ If an invalid ID is shown or given in front of the RFID sensor, the system will not allow the entry.

➢ After entering the parking lot, the driver can park the vehicle very easily with the help of alert system which will be made of ultrasonic sonar sensor, LED & buzzer.

➢ The system will have a LCD module display on the entrance, where the driver can know if there is any slot available for parking or not.

➢ Upon entry and exit in the parking lot, the stats on the LCD display will be updated every time.

Flow Charts

Start

Available free slots

Yes

RFID Matched? — No → **Entry Rejected**

Yes

Servo rotates to 90°
(Entry Accepted)

Read IR(Gate) sensor

Obstacle detected? — Angle=0° → **Servo Rotates to 90°** (Gate open for outgoing cars)

Angle=90°

Servo Rotates back to 0°
(Gate closed after entry)

(i) Parking Entry System

Fig-2: Flowchart of Parking Entry System
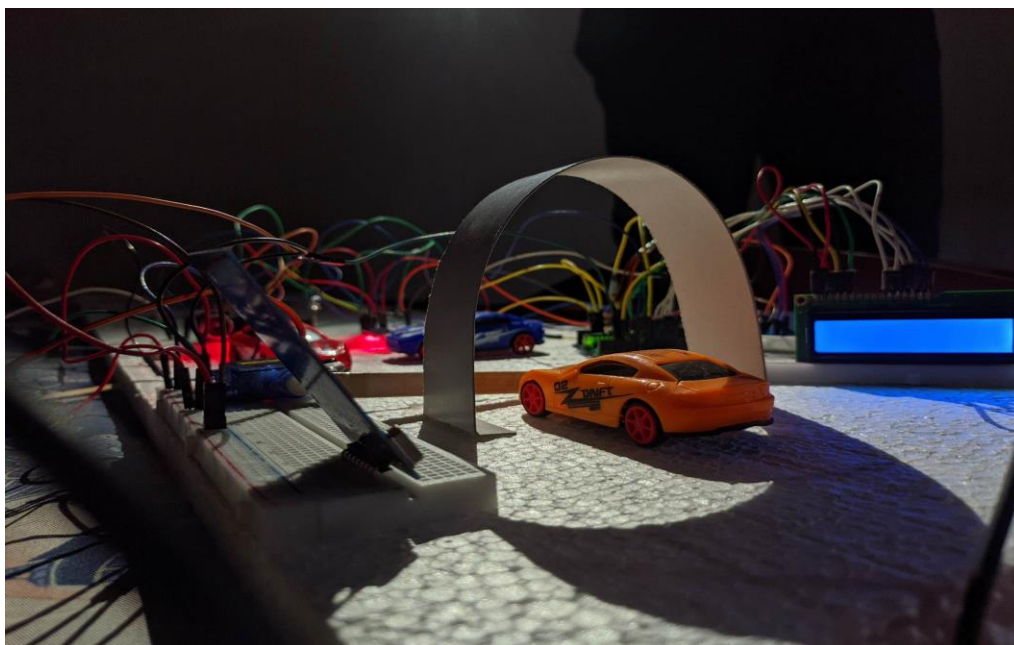
(ii) Parking Slot & Warning Management System

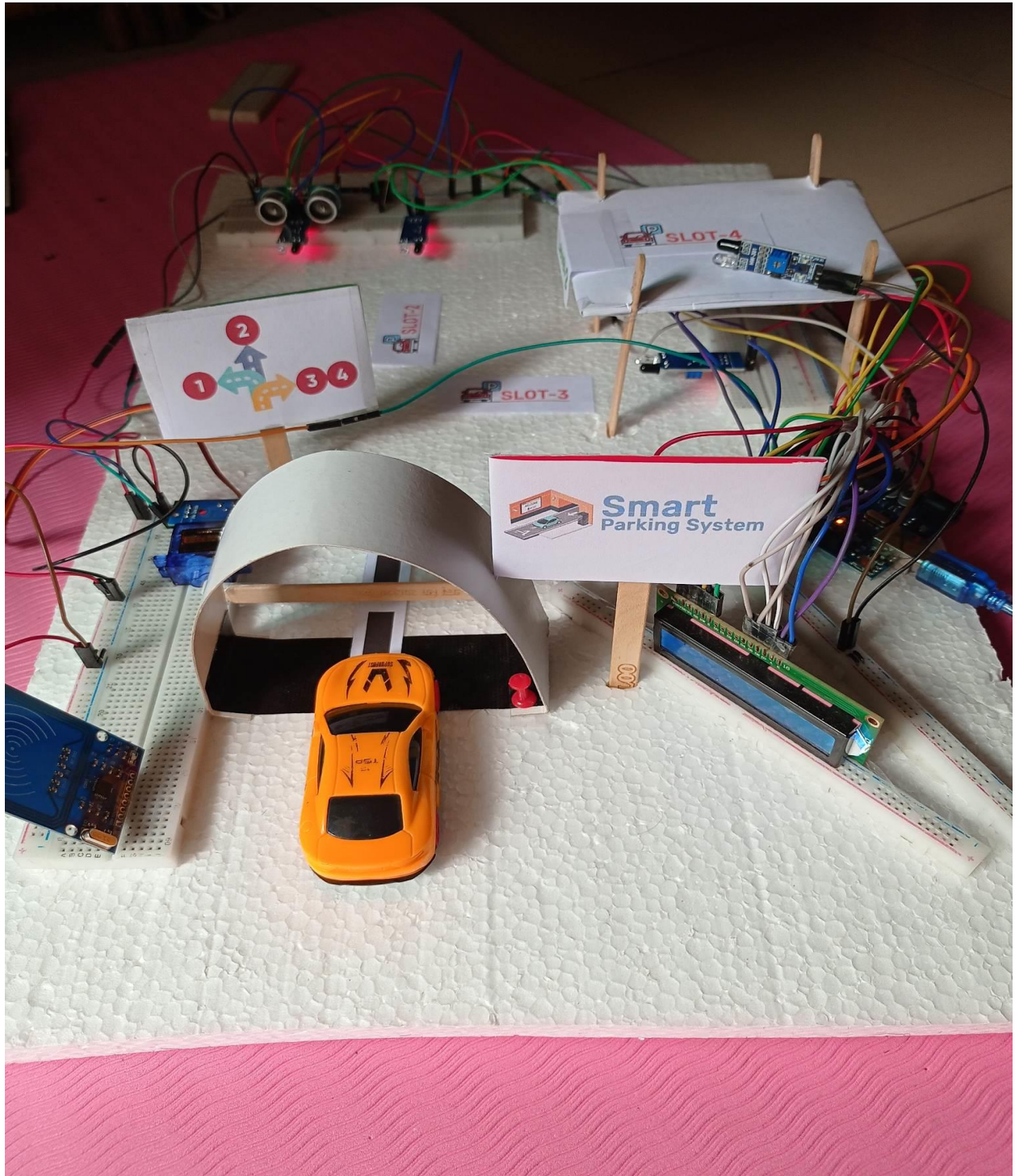*Fig-3: Flowchart of Parking Slot & Warning Management System*

Project Snapshot

Fig-4.1: Snapshot of Parking Entry System (Day)

Fig-4.2: Snapshot of Parking Entry System (Night)

Fig-5: Snapshot of Smart Parking System

Budget Comparison

Previous Estimated Budget: 3725 Tk /-

VS

Final Expenditure:

Equipment	Quantity	Budget (Tk)
Arduino UNO R3	1	950
IR Proximity Sensor	5	450
Servo Motor	1	145
Ultrasonic Sonar Sensor	1	100
LCD Module Display	1	240
RC522 RFID Card Reader Module Kit	1	190
Buzzer	1	20
LED's & Resistors	As required	30
Male & Female Wires	As required	80
9 Volt Battery	As required	85
Breadboard	As required	300
Toy Car	4	100
Various Type of Tapes	As required	110
Plastic Sheets	1	60
Cutter Knife	1	40
Miscellaneous	As required	200
Total		**= 3100/-**

Challenges of The Project

Several challenges were encountered during the implementation of the concept, such as:

- ❖ A shortage of ports required resourceful management of the available hardware.
- ❖ Despite port scarcity, resources were utilized efficiently.
- ❖ During the work process, a servo motor stopped functioning and could not be fixed. Instead of purchasing a new one, a servo motor was borrowed to complete the project.
- ❖ The display's high contrast made inscriptions invisible, but the issue was resolved by observing it from a specific angle.
- ❖ Although the code was flawless, the RFID card failed to respond. Multiple attempts were made to fix the issue, but it could not be resolved.

Conclusion

Automation is a step in the right direction for a future fulfilled in the world of transportation. This design will provide an effective solution to the common problem discussed. The "Smart Parking System" is designed, fabricated and tested which will provide results when the threshold distance will be calibrated and the obstruction will be detected. The switching of LED's & buzzer based on the vehicle in the parking space will be instantaneous based on no vehicle and vehicle detected. The design is flexible and can be altered based on the space available and can be installed even in tight and constrained space.