Smart Car Parking System with RFID Based Payment System

Arjyama Seal[1], Debjit Bera[2], Pratyusha Bhattacharya[3], Nabaneeta Banerjee[4] Sunipa Roy[5]
[1,2,3,4] *Department of Electronics & Communication Engineering, Guru Nanak Institute of Technology, Kolkata, India*

***Abstract*— Smart car parking system mainly uses RFID and IR sensors to locate free space in parking lot and it enables the scope of automatic toll tax collection. The system is designed to reduce the time and effort of human being that they put in case of car parking.**

***Index Terms*— RFID, Car parking, Arduino UNO**

I. INTRODUCTION

In the present scenario, we can see excess vehicles and also face severe problems to manage them in proper order. Day by day as the population increases, the usage and utilization also increases and coping up with all these becomes a task [1].

A very common problem regarding car parking is to find a parking space to park your vehicle. The general process of finding a parking space is to go around and drive erratically until a free space is found [2-3]. The time and fuel are consumed unnecessarily because the destination is uncertain. The easiest approach is to provide a destination specific driving within a parking structure to save fuel, energy and time as well [4]. In case of RFID tag, things could be tracked, controlled or monitored using remote computers. As parking becomes a vital part of our daily life, this system looks forward to solution.

The main objective is to develop an intelligent, user friendly automatic car parking system which can reduce the manpower and traffic congestion and to offer safe and secure parking [5]. This task is comparatively easy in case of side roads and interior lanes, but the actual problem arises when it comes to the point of malls, multi-storey parking structures, IT hubs and parking several cars, also most importantly finding a free space creates a very hazardous situation. The common approach to find a parking space is to go around and drive pointlessly until a free parking space is found [6]. Finding a parking lot could be the most boring task, when it involves wide acres of space across multiple levels. The time and fuel are consumed needlessly because of the unknown destination. The main approach is to provide a destination specific driving within a solid parking structure.

II. HARDWARE REQUIREMENTS

1. *Arduino UNO:-*

It is an open source micro controller board which uses the processor named ATmega328P.

The hardware structure of Arduino UNO

- Microcontroller
- 14 Digital pin
- 6 Analog pins
- Power Supply
- Power Jack
- USB Port
- Reset Button
- Microcontroller

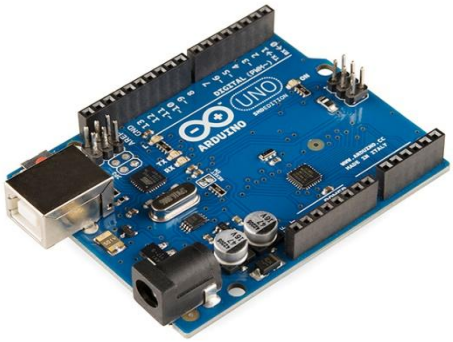

Fig1. Diagram for Arduino UNO

2. *IR Sensor* – An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. IR sensors act as proximity

sensors, and they are commonly used in obstacle detection systems.

Fig2. IR Sensor

3. *Servo Motor*- These are not a specific class of motor, although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system

Fig3. Servo Motor

4. *RFID Card*- RFID is a technology that helps to identify the animate or inanimate through radio waves. RFID is one of the most fundamental technologies that enable wireless data transmission.

Fig4. RFID Card

5. *RFID Antenna*-RFID antennas take energy from an RFID reader and transmit it in the form of RF waves to RFID tags in the vicinity. If RFID readers are the "brains" of an RFID system, RFID antennas are the arms because they actually transmit RF waves to the tags.

Fig5. RFID Antenna

6. *16*2 lcd screen*-The term LCD stands for Liquid Crystal Display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc.

III. WORKING PRINCIPLE

When a car will come near the gate of the parking lot the signal will be send to the arduino-UNO by IR sensor. Then the vacant place will be checked by other IR sensors. The information, if there is any vacant place and where it is, is sent to Arduino-Uno. The information will be visible to the 16*2 Lcd screen. If there is any vacant place present the gate will open for entry otherwise not. Our system is also payment friendly. For payment here we are using RFID card and RFID antenna. The RFID card is attached to the top or side of the car. The RFID antenna is attached at the parking lot. When the car reached at the range of the RFID antenna, it will deduct the money from the card automatically. If the sufficient money is not there then it will give the message o recharge it. After deducting the money the gate will open for entering.

IV. ADAVANTAGES & DISADVATAGES

Advantages

1. The system uses wireless sensors for monitoring the cars in the parking slots. Each car consists of an active RFID tag embedded in it for quick identification.
2. Gate management service: another use of RFID tags is gate management.
Eg - a gate can be automatically opened using RFID reader and the vehicle's tag at the gate.

Disadvantages
1. Initially it may create confusion for the new users.
2. There is no driver guidance system to the parking lot.

V. CONCLUSION

Automation is the right step towards the future of transportation system. It gives us solid solutions to the problems that people face, regarding transportation. The design of the whole system can be altered according to the availability of space in a parking slot. The smart parking system's design, fabrication and testing is under construction which we hope can provide accurate results. It can be concluded that, with the correct connection of some electrical components, it is possible to build a hustle free automatic car parking system.

REFERENCES

[1] J. Silar et al., "Smart parking in the smart city application", 2018 Smart City Symposium Prague (SCSP), pp. 1-5, May 2018
[2] P. Sadhukhan, "An IOT-based e-parking system for smart cities", 2017 International Conference on Advances in Computing Communications and Informatics (ICACCI), pp. 1062-1066, Sep. 2017.
[3] P. F. Felzenszwalb et al., "Object detection with discriminatively trained part-based models", IEEE Trans. Pattern Anal. Mach. Intell., vol. 32, no. 9, pp. 1627-1645, Sep. 2010.
[4] G. A. Bertone, Z. H. Meiksin and N. L. Carroll, "Investigation of a capacitance-based displacement transducer", IEEE Trans. Instruments. Meas., vol. 39, pp. 424-428, Apr. 1990.
[5] R. C. Luo and Z. Chen, "An innovative micro proximity sensor", Proc. 1993 JSME Int. Conf. Advanced Mechatronics, pp. 621-625, Aug. 1993.
[6] P. Melnyk, S. Djahel and F. Nait-Abdesselam, "Towards a Smart Parking Management System for Smart Cities," 2019 IEEE International Smart Cities Conference (ISC2), Casablanca, Morocco, 2019, pp. 542-546, doi: 10.1109/ISC246665.2019.9071740.