

SMART VEHICLE PARKING SYSTEM (RFID BASED)

¹Abhishek Kharche, ²Siddhesh Jungade, ³Janak Damre, ⁴Vikas Sanap, ⁵Prof.Sonal V. Sawarkar

Department of Computer Engineering
Government College of Engineering Yavatmal, Maharashtra
Dr. Babasaheb Ambedkar Technological University Lonere, India

Abstract: The major goal is to minimize cramming in the car parking area by adopting an efficient auto parking system and a user-friendly application that makes it simple to operate. Normally, one feels uncomfortable seeking for an empty parking spot in public venues such as multiplex theatres, market areas, hospitals, function halls, workplaces, and retail malls, even if it is a paid facility with an attendant/security officer. To show hazard-free parking, a parking management system is presented. The proposed method provides infra - red transceiver sets to remote location interact the condition of parking tenancy to the Raspberry Pi and showcase the vacant slots on a display at the parking entrance so that the user is aware of the accessibility / lack of availability of parking spot prior to entering. The project involves minimum human contact and delivers a flawless parking experience, saving the user a significant amount of time in parking his or her vehicle.

Keywords: RFID tags, raspberry pi.

I. INTRODUCTION

The RFID-based vehicle smart Parking System is a project that uses RFID technology to provide an effective smart parking system. Many responsibilities are involved in parking management at businesses and malls, such as providing tokens, recording check-in and check-out times, computing fare, and eventually collecting the money. Although alternative identifying techniques, such as barcodes, exist, RFID offers more benefits. To begin with, unlike barcodes, numerous RFID tags might be read at the same time utilising anti-collision scanners and tags that did not require physical contact or sight lines. Although an RFID tag can be quickly read, written to, and rewritten to, when data is entered to a barcode, it does not permit updates as well as any updating will be a time-consuming operation.

Manual parking wastes a lot of time and frequently causes traffic bottlenecks. When there are human blunders, the problem becomes even worse. The use of a parking management system would decrease human labor and time while also providing added convenience. The smart parking system offers a visual depiction of the parking lot, to assist the user in deciding where to park their car. The system would indeed reduce time, but it would also manage automobile check-ins and check-outs using RFID readers/tags, with extra capabilities such as automated invoicing and recording data at the entry and exit points.

II. OBJECTIVE

The RFID-based vehicle smart Parking System is a project that uses RFID technology to provide an effective smart parking system. Many responsibilities are involved in parking management at businesses and malls, such as providing tokens, recording check-in and check-out times, computing fare, and eventually collecting the money. Although alternative identifying techniques, such as barcodes, exist, RFID offers more benefits. To begin with, unlike barcodes, numerous RFID tags might be read at the same time utilising anti-collision scanners and tags that did not require physical contact or sight lines. Although an RFID tag can be quickly read, written to, and rewritten to, when data is entered to a barcode, it does not permit updates as well as any updating will be a time-consuming operation.

Manual parking wastes a lot of time and frequently causes traffic bottlenecks. When there are human blunders, the problem becomes even worse. The use of a parking management system would decrease human labor and time while also providing added convenience. The smart parking system offers a visual depiction of the parking lot, to assist the user in deciding where to park their car. The system would indeed reduce time, but it would also manage automobile check-ins and check-outs using RFID readers/tags, with extra capabilities such as automated invoicing and recording data at the entry and exit points.

III. METHODOLOGY

RFID systems in this area operate at frequencies ranging from ultra-low to ultra-high. RFID Tags are used in the systems that operate in the low frequency range and employ wave propagation to transmit their data.

RFID tags come in a variety of types, including the previously mentioned passive type, multifrequency, powered, and tag-talks-first. RFID antennas can come in a variety of shapes and sizes.

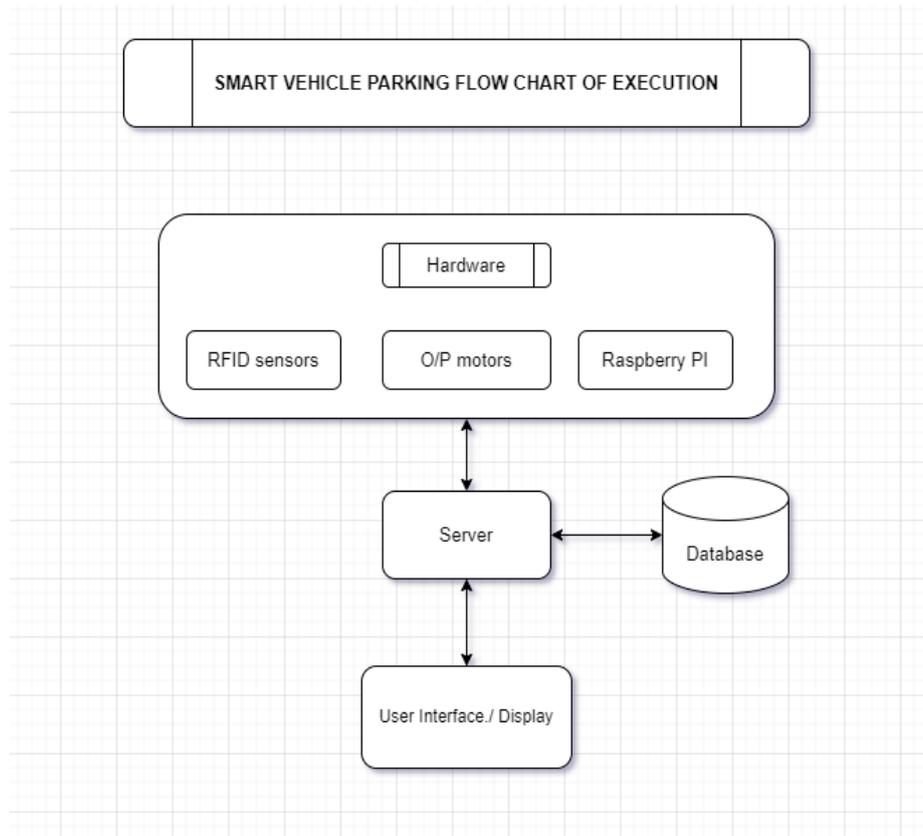
Furthermore, not all RFID uses low-frequency electromagnetic waves. For read-write tags, there are read-only tags and tags.

• OVERALL DESIGN AND WORKING

The equipment consists of a Raspberry Pi with RFID Reader sensors that interface with the server and render data from the database. The full functioning mechanism of the efficient vehicle parking model with numerous customizable characteristics is explained in depth in this thorough architecture. The RFID Sensors were utilised in this project to read the tags. The Raspberry Pi sends the data of these sensors to the database.

When the database is updated, the result is shown on the UI at the parking level's entrances via RFID. Every car will be equipped with an RFID tag. The RFID Reader scans the tag and obtains the Unique ID as quickly as the vehicle goes through the entrance gate, if it already have enough balance. system allows to enter. if not throw to further options to recharge. Then records an enter further into database, and upon leaving, other RFID Reader scans the tag and subtract payment from the users account. Hence the automated process completes.

The execution is well described in the flow chart 1.0



Flow chart 1.0

• HARDWARE DESIGN AND COMPONENTS

1. RFID Reader Module

This RFID reader Module is used to identify and track objects. Radio Frequency Identification sensor is its acronym. It is mainly used for monitoring and identifying objects. Radio Frequency Identification Module is its acronym. Its primary mode of operation is wireless and employs electromagnetic fields.

For mass manufacture, this module may be immediately installed in portable devices. The module operates on a 3.3V power source and can interface directly with any Pc board via the SPI protocol, ensuring dependable operation and a long reading distance.

- Features
 - a) MF RC522 13.56MHz touchless communication card chip included.
 - b) The non-contact card chip's low-voltage, low-cost, and tiny size make it easy to read and write.
 - c) Smart meters and portable hand - held devices are compatible.



RFID Reader Module

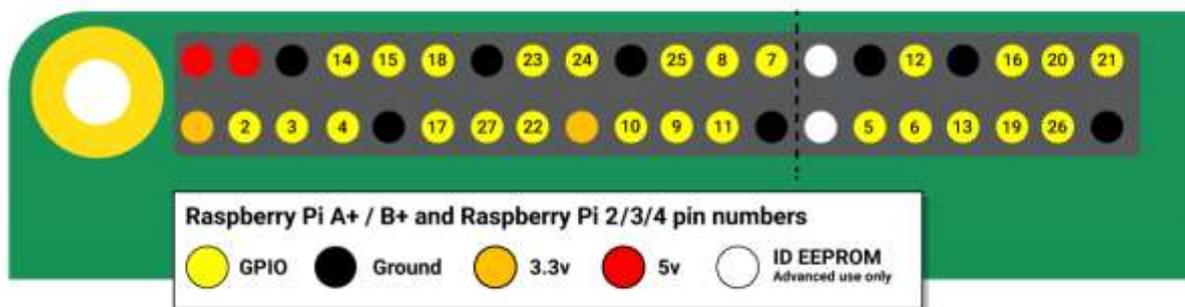
2 Raspberry Pi

A Raspberry Pi is a small credit card sized computer that connects to a display or television and uses a conventional keyboard and mouse. It's a powerful small gadget that allows individuals. Learn about computers and programming languages like R and Python. and can be use for different purposes.

The Raspberry Pi runs Linux (a number of versions), and its primary supported operating system, Pi Operating systems, is open - source software and supports a bundle of open source software.

- What we are doing with the Raspberry Pi in this model?

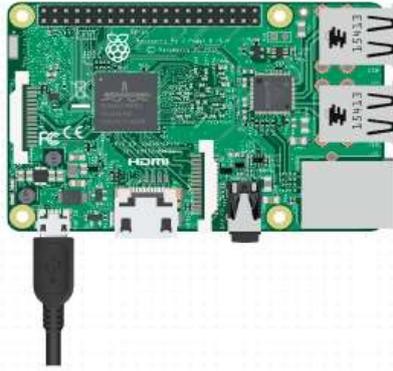
As mentioned it is small computer in itself. Our moto was to keep a affordable approach since start only. Using raspberry pi is the best way to make the model cheap as well as worth it. The GPIO pins setup on raspberry pi makes it more convenient for other spare parts to connect with ease.



GPIO Pins configuration

All of the other GPIO pins can indeed be set up as such an inputs and output pin in software and utilised for a variety of things.

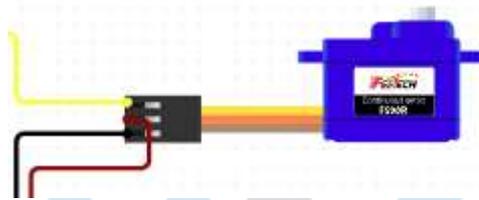
- Features
 1. Single 2.0 USB connector
 2. Linux Operating system
 3. HDMI (rev 1.3 & 1.4) Composite RCA (PAL and NTSC) Video Out
 4. Dual Core Video Core IV Multimedia coprocessor
 5. 3.5 MM Jack, HDMI, Audio Out
 6. SD, MMC, SDIO Card slot on board storage



Raspberry Pi

2 Motor for gate (motor driver)

Because they could be supplied by existing direct-current light power distribution networks, DC motors were the first type of motor to become widely employed. The speed of a DC motor can be varied across a large range by varying the supply voltage or adjusting the current intensity in the field windings. Tools, toys, and utilities all employ small DC motors. The universal motor is a small brush motors that can run on direct current and is used in mobile power tools and devices. Bigger Motors are being employed in electric vehicle propulsion, elevator and hoist drives, and steel rolling mill drives. With the introduction of power electronics, it is now possible to replace Electric motor with Ac induction motors in a variety of applications.



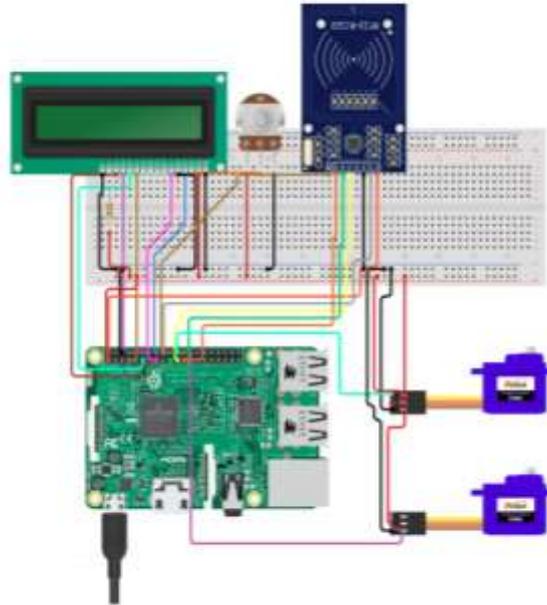
DC Motor

- Features
Speed - 6400 RPM
Voltage - 12 Volts
Material – Metal

- Used in numerous applications: this 12v to 24V torque gear motor perfectly fits for toys DIY, massage device, game device, game controller, cellphone etc
- With metal material torque DC motor, lightweight, resistant abrasion and tough features, durable and reliable even you use it for long time
- Light and compact 12v to 24V DC motor, as good replacement for old or damaged gear motor
- With low noise, high speed, high efficiency, low resistance features for this 6400PRM DC motor

The combined hardware Circuit diagram is well described in circuit diagram 1.

Assembled design



Circuit Diagram

- **FLASK AND PYHTON**

Flask is an open-source web framework. This implies that flask gives you the tools, frameworks, and techniques you need to create a web application. This online application can take the form of web sites, a weblog, a wiki, a web-based calendar, or a professional website. Flask is a Python-based web application framework that relies on the WSGI tools as well as the Jinja2 templates engine. Python is one of the most widely used programming languages. Guido van Rossum created it, and it was published in 1991. It's utilized in Website designing, server advancement, arithmetic, and computer scripting, among other things. In smart car parking system the particular terms are used to build the user interface to have interaction with user.

If you're writing a web service in Py, you're probably using a framework. A framework is a code module that provides efficient code or enhancements for common tasks to make a developer's life simpler while designing dependable, scalable, and accessible online applications. Flask is one of the many Python frameworks available.

IV. RESULTS AND OUTPUT

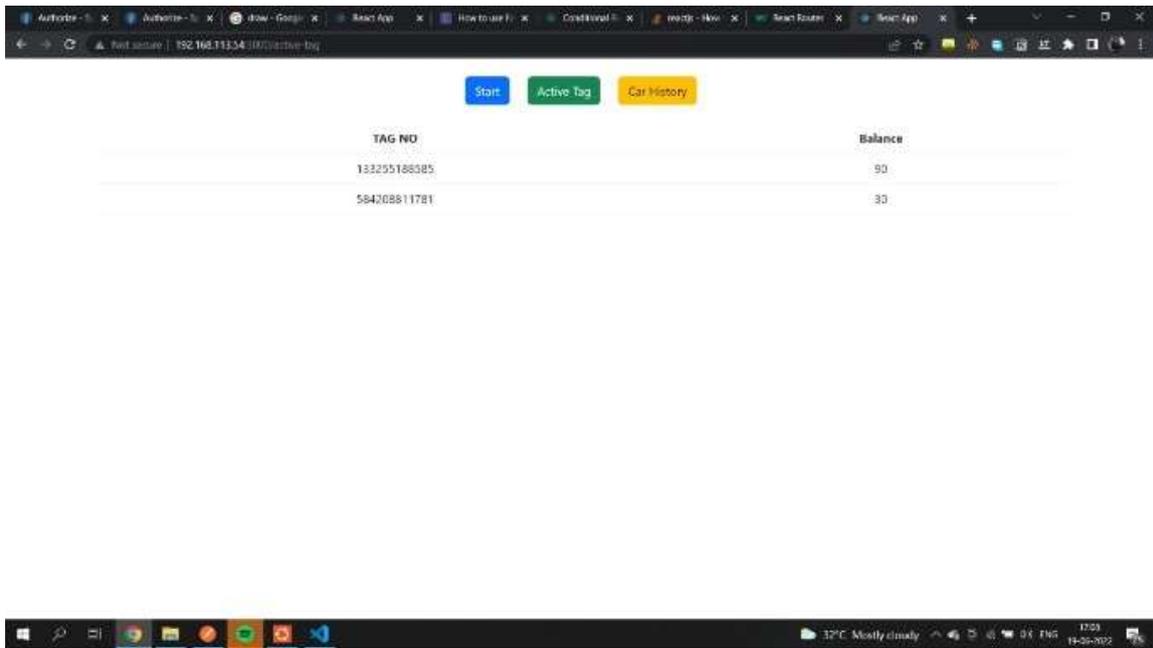
- **Stepwise explanation / Output :**

1. Once vehicle arrives at the entrance, The RFID gets scanned and the servers starts fetching data if its already existing user it checks with balance if its enough. Otherwise throws to the recharge panel. The UI shows system started message on screen as its for parking staff only.



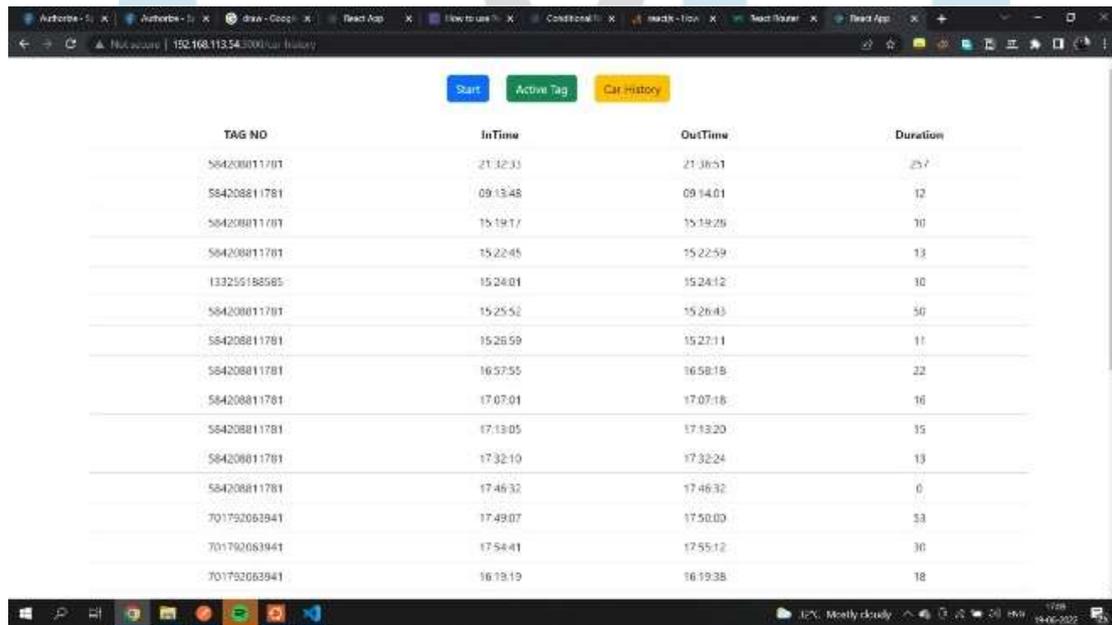
System start screen

2 The Fetched data from database shows on the screen with the elements TAG NO. and BALANCE. The balance shown is associated with TAG NO. and the same it kept as a primary key in the table.



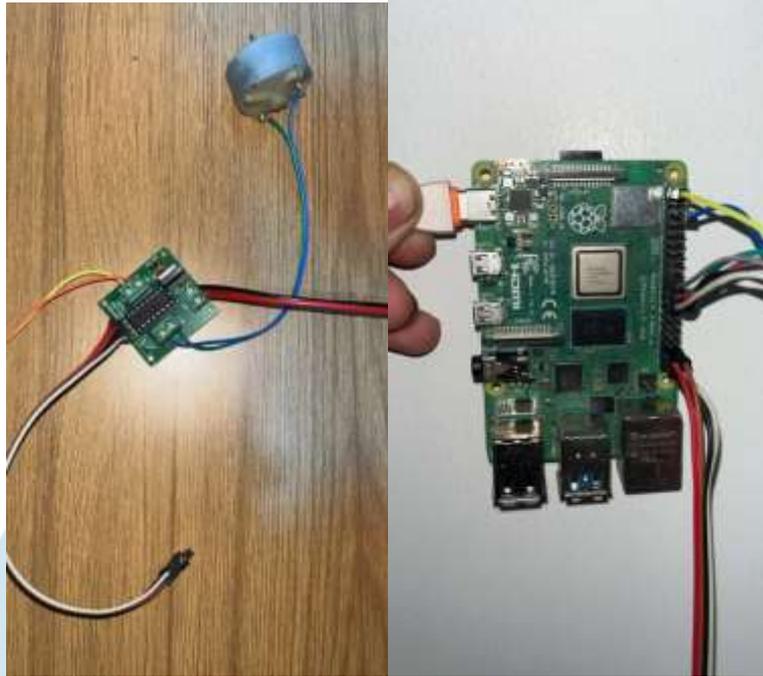
Balance sheet

3 Every entry is getting marked over database. The table below keeps the record of entries and exits as well as the duration of stay for particular vehicle with TAG NO. It appears when clicked on the Car history button.



Parking history fetched from database

Implementation photographs



Model spare photographs

1. DC motor
2. Raspberry Pi



RFID Reader Module

V. CONCLUSION

This concept uses an RFID card as a passcode, and then the automobiles are parked at a certain area. The technology will provide superior security, prevent parking-related accidents as well as avoid human errors and mistakes, and give accurate parking information. The system intends to save a significant number of man-hours due to parking-related issues, where preventive saves the human efforts. Electronic devices, hardware, real-time applications, and software knowledge may all be used to develop projects. RFID is rapidly being employed as a biometric authentication technology. The complete automated process saves human efforts as well as avoid mistakes in manual processes.

REFERENCES:

- [1] S. C. Hanche, Pooja Munot, Pranali Bagal, Kirti Sonawane & Pooja Pise, Automated Vehicle Parking System using RFID, ISSN (PRINT) : 2320 – 8945, Volume -1, Issue -2, 2013.
- [2] Lanxin Wei; Qisheng Wu; Mei Yang; Wei Ding; Bo Li: Rong Gao ,Design and Implementation of Smart Parking Management System Based on RFID and Internet, Pages: 17 - 20, Year: 2012.
- [3] Kartha, V., George, L., Tomy, A., Mathew, F., Shenoy, M. and K, A. (2017). Interfacing EM-18 RFID Reader Module with Raspberry Pi. [online] electroSome. Available at: <https://electrosome.com/em-18-rfid-reader-raspberry-pi/>.

- [4] Raspberrypi.org. (2017). Raspberry Pi Forums. <https://www.raspberrypi.org/forums/viewtopic.php?f=28&t=148244&p=975479>
- [5] Start Bootstrap. (2017). Freelancer - One Page Theme. <https://startbootstrap.com/template-overviews/freelancer/>.
- [6] Kartha, V., George, E. and George, L. (2017). Using UART on Raspberry Pi - Python - pySerial. [online] electroSome. Available at: <https://electrosome.com/uart-raspberry-pi-python/>
- [7] Raspberrypi.stackexchange.com. (2017). Raspberry Pi Stack Exchange. <https://raspberrypi.stackexchange.com>
- [8]. By Armin Ronacher, "Flask Web Development, One Drop at a Time", <http://flask.pocoo.org/>, March 20th 2015.
- [9]. By Armin Ronacher "The Templates", <http://flask.pocoo.org/docs/0.10/tutorial/templates/>, March 20th 2015
- [10] Raspberry Pi documentation, <https://www.raspberrypi.com/documentation/computers/os.html>

