

# Automatic VLP'S Recognition For Smart Parking System

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## ABSTRACT

The system is designed as the authorized automatic vehicle identifier with respect to vehicle owner identification, for the security of the highly restricted areas like housing areas, defence military areas, parliament areas etc. Both of the number plate recognition and the vehicle owner recognition use the image identification technology. The image of the vehicle plate number and the vehicle owner are captured by using a camera and processed with MATLAB. The system contains an embedded section which controls the opening of the security gate and the communication purpose. The user interface provided at the entry/exit gate gives visual assistance to the driver, whether he/she is not permitted at this area or permitted. The entry of the unauthorized vehicle is restricted and the message is sent to the actual vehicle owner which is preregistered in the systems" database. The technology adopted in this research can be utilized not only for the security but also in other fields such as parking fee collection, automatic speed control, tracking stolen cars, automatic toll management and access control to limited areas, etc.



## KEYWORDS

Parking  
RFID  
Mikrokontroler



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## 1. Introduction

Parking is a temporary immovable condition of a vehicle because the driver is left behind. According to Hobbs , [1] parking is defined as an activity to place or store a vehicle in a certain place depending on the completion of the driving requirements. According to PP. 43 of 1993 parking is defined as a vehicle that stops at certain places which are stated either with a sign or not, and are not alone to raise or unload people and goods. Meanwhile, another definition of parking is a condition where a vehicle stops for a while (unloads) or stops for a long time.

If you visit Sukabumi, don't forget to stop at Citimall first. This shopping tour began operating around 1997 until now.[11] So far, the parking system there is still not well organized and controlled, the absence of an adequate parking system has caused many vehicles to queue up to park. In addition to the inadequate parking system, the security system that has been implemented is still not maximal so that the security officer (security) becomes somewhat difficult to regulate the vehicles that go in and out, and therefore even vehicles that go in and out cannot be identified anymore, which causes the opportunity for vehicle theft crimes to increase. high up in the City Mall neighborhood. Besides that, with the current system, visitors find it difficult to know the availability of the pakir land whether it is still empty or full.

Technology that also continues to develop over time, especially in the field of microcontrollers.

Microcontroller technology that is often used in industry is programmed in such a way that it can control automatic equipment or machines to provide time and energy, the problem of parking problems can be created by designing a simple parking system. by using the Raspberry pi model b as a microcontroller or processor, a web camera to take pictures of vehicle license plates, an LCD to display information on the availability of parking lots and a number plate image taken with a web camera. This parking system also uses a servo motor as a driving force for the parking bar after the web camera takes a picture of the vehicle's license plate.[2]

With this parking system, there is no need for parking guards so that they can protect human resources. Because with this parking system everything is controlled by the camera from entering to

exiting. When the vehicle enters the web the web camera will automatically take a picture of the vehicle plate number and open the parking bar automatically. When the vehicle exits, the web camera will automatically take a picture and the system will adjust it to the first image taken. If the license plate number is the same as the one taken when you first entered the LCD will display the price to be paid. Payment is done using a special card by sticking it in the space provided.

The research conducted by Ahmad Hidayat and Faisal with the research title is "Design a Web Gis Web-Based Parking Parking Rental Information System". The purpose of this research is to create a parker information system, to facilitate vehicle owners in finding parking spaces, and to provide information on the availability of parking spaces. System development techniques in this writing use the model waterfall method. Waterfall model has the characteristic that the workmanship of each phase in the waterfall must be completed first before proceeding to the following phase. The conclusion of this study is that in this area has been implemented a system that is computer and stakeholders are easier to get information for its users. There is information about land leases that have been rented, so that land owners are easier to manage and control parking lots and transactions that occur. There is information on the availability of parking lots and information on the location of the parking lot nearest from the owner of the vehicle. Suggestions for other researchers can be developed again into an android-based system so that it can be accessed on mobile software or smartphones, so that users are easier to access this system.[3]

Research conducted by Arthur Daniel Limantara, Yosef Cahyo Setianto Purnomo, Sri Wiwoho Mudjanarko with the research title "Ultrasonic sensors and internet of things will be used in conveying information on the position of empty parking lots to parking lot users used to detect the absence of vehicles on the lot that will be combined with the internet of things, an object that can emit signals over a network both wired and wireless. The model used is an ultrasonic sensor (distance sensor) and internet of things (IoT) in this case is a chip that is programmed and placed on each parking lot so that it can transmit digital information signals both to the server and to the user's parking gadget (with special software). The hope is that this solution will be useful for parking management management and parker users.[4]

The research was made by Stevano's son Frima Yudha and Ridwan Abdullah Sani with the research title "Implementation of Ultrasonic Sensor Hc-Sr04 as Arduino-Based Car Parking Sensor". The aim of the study is to characterize the hc-sr04 ultrasonic sensor, as well as create and test prototypes of car parking aids based on hc-sr04 ultrasonic sensors and arduino nano. This research method is carried out in three stages: sensor characterization, prototyping of car parking aids and testing of car parker assist prototypes. The results showed that the ultrasonic sensor transfer function hc-sr04 is  $t = 210556340.5 + 58.3 S$  with a correlation factor of  $r = 1$ ; sensitivity of  $58.3 \mu s/cm$ ; 99.97%. Meanwhile, the accuracy and precision of car parking tool prototypes by 99% and 97%. The hc-sr04 ultrasonic sensor emits waves in the form of ultrasonic waves through a transmitter when the hc-sr04 ultrasonic sensor is given a source voltage of 5 volts. Ultrasonic waves emitted through the air medium quickly propagate sound in the air by 343 m/s. The wave hits a solid object with a distance of  $S$ , then bounces back and is received by the hc-sr04 ultrasonic sensor receiver. The output of this car park aid is the distance with centimeter units.[5]

The research was made by Eko Didik Widiyanto, Herrizal Muhammad Wijaya and Ike Pertiwi Windasari with the research title "RFID-Based Parking System and Vehicle License Plate Image Recognition". The long time when manually recording vehicle license plates in the parker system causes queues. The study developed an RFID-based automated parking system and vehicle license plate image processing. Authentication uses the camera for number plate image takers and arduino uno as controller for RFID readers, feedback givers and gate openers. The system will compare image and RFID characters on the database to determine vehicle usage permits. Image processing uses contour analysis methods and has an accuracy of 91% at a distance of 60 cm and a read speed of 131.89 milliseconds. The system has been able to work to automatically open and close gates based on the suitability of RFID cards and vehicle plates.[6]

Furthermore, the research was made by Rendy Bagus Pratama with the research title "Application of Eigenface Methods on Image Processing Based Parking Systems". Convenience in a world that is all

electronic is now tried to be applied in a parking system, where the parking system will make it easier for users to determine parking locations, and with this system the next development will be easier, can be



developed in the parking location booking system and parking payment system using electronic money. In the creation of this system researchers are supported by the eigenface method, which in the process of this system will calculate between the initial input with new data that will be captured in real time by the system. By using the eigenface method researchers are supported by matlab applications to create prototypes to test the system whether it is really feasible to be a problem solver or even add to a problem. In the system tests were conducted using 90 data that were all different objects and also different time regions. All objects are retrieved directly from the parking lot.[7]

The research was conducted by Tjut Ulfa Anastasia, Alfatiirta Mufti and Aulia Rahman with the research title "Design Automatic and Informative Parking System Based on Microcontroller ATmega2560". The parking system is designed to open and close the portal automatically and provide parking slot information that must be addressed by the parking service user on a monitor screen placed before the portal enters. The system is also capable of displaying the number of parking slots still available. The indicator light on the parking slot serves to give an indication of turning on if the slot is already charged and not on if the parking slot is not filled. This indication becomes a parameter for the display of parking slot information to be addressed. The prototype uses a pressure switch pad to activate portals and counters, servo motors as entry portal and exit portal drivers, LDR sensors to detect the presence of cars on parking slots, LEDs as indicator lights, LCDs as monitor screens, and seven segments as counters and display the number of parking slots still available. The number on the seven segments decreases if the car enters and increases if the car exits. The prototype is able to provide information that the parking is full by displaying the number 0 (zero) on seven segments and full parking slot information on the LCD. The sign-in portal cannot open if all parking slots have been filled.[8]

Furthermore, the research was taken by Andy Kristanto with the research title "Design An Automatic Parking System On Campus Ii Itn Malang Using a Minimum Arduino System With Sabagai Media Reporting Website". To design and build a parking system that runs automatically requires several devices such as arduino uno version 3 which serves as a control center of connected peripheral devices. These peripheral devices include Radio Frequency and Identification (RFID), servo motors, liquid crystal displays (LCDs), infrared sensors and buzzers. All of these devices are connected to each other and perform their respective functions so that the parking system can run automatically. The result of this study is a model that describes how the system works for real. From the testing process that has been done on the model, several conclusions were obtained where the RFID reader module was able to read the ID with the position of the tag at a slope between 0 degrees to 80 degrees. While when it reaches a slope of 90 degrees, the reader can no longer read the ID on the tag. Esp8266 module is able to send data to a web server with an average time of 2 ms on a local network.[9]

Research made by Ananto Bilowo, Sumardi and Budi Setiyono with the research title "Design a Plc-Based Smart Parking System (Programmable Logic Controller)". Parking buildings found in the area of population activity centers such as shopping centers, squares, and other city centers are also considered less effective in accommodating cars. By using miniature buildings that implement intelligent parking system that can park the car automatically into an empty parking lot, making it easier for drivers to paint the available parker places. The system uses a multi-storey parking model so that it can maximize the number of cars that enter and only requires narrow land. The system uses RFID as the identity of a parked car and a PLC (Programmable Logic Controller) as its primary control and uses trial and error as its control method. This research resulted in a smart parking system that has been exposed to miniature parking buildings. Intelligent parking systems have been implemented in miniature parking buildings using RFID tags as car identities with a success rate of 90%.[10]

Automatic face and VLP's recognition for smart parking system, In this study, we proposed a security system on Smart Parking based on face recognition and VLP's (Vehicle License Plates) identification. In this research, SSIM (Structural Similarity) method as part of IQA has been applied due to its reliability and simple computation for face detection and recognition process. From the test results of 30 data, obtained the highest SSIM value 0.83 with the highest accuracy rate of 76.67%. That level of accuracy still has not reached the implementation standard of 99.9%. So that it still needs to be improved in the future studies, especially in the filtering noise section.[12]

**Vehicle License Plate Detection for Parking Offenders Using Automatic License-Plate Recognition** Illicitly stopped vehicles on the interstate can diminish street space and cause activity clog.

Illicit stopping, as a result, must be observed and controlled. A model framework based on picture preparing was built in this consider to distinguish the permit plates of stopping violators. The primary arrange of this strategy is to recognize the permit plate, after which each character is sectioned into its possess picture. The character is at that point changed over from picture to content representation, a handle known as programmed license-plate acknowledgment. The reason is to report that found plate permit to the authorities' database so that they may figure out who the stopping wrongdoer is and issue sanctions. A few procurement settings and adjustments of edge discovery calculations were inspected in this examination. Based [13]

### **Smart Parking System using Automatic Number Plate Recognition (ANPR) and the Internet of Things (IoT)**

(VLP) and parking system that can be utilized in Nepal for traffic, parking, and border crossing. The paper blends hardware and software capabilities into a single automated system. We employed digital image processing software to find the license plate in a photo taken for the car at the parking lot's entry with a camera. The plate number is the image processing's output, and it is this number that is utilized to determine whether or not the car is allowed to enter the parking lot. The system sends and receives information from a variety of sensors, which are then processed to determine the main issues, as well as any gaps or open problems found by the SPS. The findings of this study could have a wide range of implications. [14]

**Smart parking systems: comprehensive review based on various aspects** , This paper aims to provide comprehensive study, comparison and extensive analysis of SPSs in terms of technological approach, sensors utilized, networking technologies, user interface, computational approaches, and service provided. Moreover, the paper fills up the research gap by providing a clear insight into the suitability of SPSs in various environmental conditions and highlights their advantages/disadvantages. The extensive comparison among multiple aspects of SPSs would enable researchers, designers, and policymakers to identify the best suited SPS and understand the current trends in this sector. [15]

**Survey of smart parking System** Smart Parking (SP) is one of many technologies to be implemented in order to enhance the infrastructure of Information and Communication Technology (ICT). All objects and devices at the parking lot will become entities. They are integrated and embedded into electronic devices that will form the Internet of Things (IoT). Smart Parking (SP) will be able to make parking arrangements and management in real time. The academic community will be able to find an empty parking space (slot) because of the parking location with intelligent systems, cameras and sensor devices in front of the gate or in the parking lot. Using this technology, the academic community may request the services as well as Smart Parking System Survey, This study attempts to identify the many types of smart parking systems (SPS) that are currently available, as well as investigate the different types of vehicle detection techniques (VDT) and algorithms or other approaches they use, in order to assess where these systems are in their development. A study of 274 publications was done from January 2012 to December 2019. SPS types mentioned in the literature, the types of VDT employed in these SPS, the algorithms or procedures they implement, and the level of development at which they are at were all taken into account in the survey. This is based on a process for searching and extracting results.[17]

**Review Paper on Smart Parking System** Clients are having a extreme time finding stopping spaces due to the fast development in car thickness, especially amid top hours of the day. A keen stopping framework based on Arduino components and a portable application is proposed in this ponder. The proposed keen stopping framework involves the establishment of a space module on-site, which is utilized to screen and inform the accessibility of each person stopping space. A versatile application is additionally accessible, which permits clients to check the accessibility of stopping spaces and save one in like manner. Shrewd stopping in metropolitan regions can boost the economy by bringing down fuel utilize and contamination. [Issues with the SPS have been recognized. The discoveries of this think about might have a wide run of suggestions.[18]

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**Lot smart parking system based on the visual-aided smart vehicle presence sensor:**To improve mobility in cities with a larger and larger vehicle fleet, a novel sensing solution that is the cornerstone of



a smart parking system, the smart vehicular presence sensor (SPIN-V, in its Spanish abbreviation), is presented. The SPIN-V is composed of a small single-board computer, distance sensor, camera, LED indicator, buzzer, and battery and devoted to obtain the status of a parking space. This smart mobility project involves three main elements, namely the SPIN-V, a mobile application, and a monitoring center, working together to monitor, control, process, and display the parking space information in real-time to the drivers. In addition, the design and implementation of the three elements of the complete architecture are presented.[19]

**MSmart Parking System with Privacy Preservation and Reputation Management Using Blockchain** The larger part of show keen stopping frameworks jeopardize drivers' protection by unveiling information around their gone by spots. Besides, since they are centralized, they are subject to a single point of disappointment and attack, posturing a risk to the stopping service's accessibility. They moreover endure from a need of straightforwardness, since the centralized benefit organizer may favor a few stopping parts over others by booking their spaces to begin with. To address these issues, we propose a blockchain-based shrewd stopping framework that jam protection and oversees notoriety. In our arrangement, a few stopping parcels frame a consortium blockchain to manage the stopping framework safely and straightforwardly, with stopping offers recorded on a shared and immutable record. Amid the method, we apply a commitment technique..[20]

**Designing and managing a smart parking system using wireless sensor networks** In this ponder, we propose the plan and advancement of a savvy stopping framework based on remote sensor systems utilizing cutting-edge innovation (WSN). Our framework employments an versatile and half breed self-organization calculation for remote sensor systems that adjusts to all sorts of car parks within the city (direct and mass stopping) and gives superior vitality management during remote communication to extend the sensor nodes' lifetime and the WSN's life span. This framework moreover gives unused administrations that make it easier for drivers to discover accessible stopping spaces within the city close their goal in a opportune and viable way from a particular stopping parcel. We too survey the prescient model's execution..[21]

**Smart parking system for commercial stretch in cities** ,This paper introduces the concept of using smart technology in car parking services in particular commercial area in cities. People nowadays face problem while parking their vehicles in parking lots in a city. In order to overcome this, we have developed a Smart Parking System design which enables the user to find the nearest parking area and gives the availability of parking lots in that respective parking area. This design makes the traditional concept of parking system smarter by leveraging the power of IoT and embedding it with the latest innovation of electronic sensors & computers. It mainly focuses on reducing the time involved in finding parking lots and also on avoiding unnecessary travel through filled parking lots in a parking area. Many software applications and mobile apps have been proposed to provide a good parking experience to the users but there are many limitations like proper time usage in pre-booking through apps, traffic clearance, valet parking and allocation of slots near to the user required area. We have proposed a smart parking system for commercial stretch in cities (SPSCSC) which can be implemented using different database storage systems like Cloud, MySQL, Python wherein the vehicle is guided to the parking lot using the data, which is collected by sensors and image detectors, which is then processed and the necessary instructions are sent to the mobile of the user.[22]

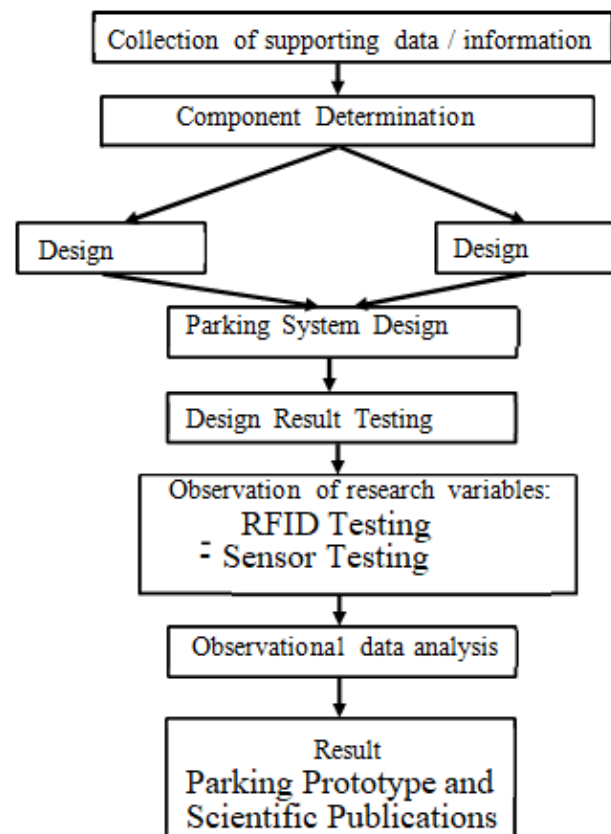
**Smart parking in IoT-enabled cities: A survey, Sustainable Cities and Society** This article explores the idea of integrating smart technology in car parking services in a specific business district of a city. Nowadays, people have difficulties parking their cars in city parking lots. To address this, we created a Smart Parking System that allows users to locate the nearest parking place and determine the number of parking spaces available in that location. By utilizing the power of IoT and combining it with the latest innovation of electronic sensors and computers, this design improves on the old notion of parking system. It primarily focuses on lowering the amount of time spent looking for parking spaces and avoiding unnecessary drive through congested parking lots. There are numerous software programs available.[23]

In comparison to current sensor-based smart parking systems, crowdsensing technologies can increase the performance of smart parking systems due to the low cost of installation and the lack of limits imposed by sensor placement. A huge amount of sensing data is necessary to predict parking lot saturation in real time. In the real world, however, acquiring the required amount of sensing data is

tough. To develop a saturation prediction, we integrate a time-based prediction model with a sensing data-based prediction model in this study. The time-based model predicts saturation in terms of parking lot location and time. The saturation information in the sensor data-based model predicts the degree of saturation of the parking lot based on the degree of saturation predicted by the first model.[24]

**e-parking: Multi-agent smart parking platform for dynamic pricing and reservation sharing service** Clients are having a intense time finding stopping spaces due to the fast development in car thickness, especially amid crest hours of the day. A shrewd stopping framework based on Arduino components and a portable application is proposed in this ponder. The recommended savvy stopping framework involves the establishment of a opening module on-site, which is utilized to screen and inform the accessibility of each person stopping space. A versatile application is additionally accessible, which permits clients to check the accessibility of stopping spaces and save one appropriately. Keen stopping in metropolitan zones can boost the economy by bringing down fuel utilize and contamination. [Issues with the SPS have been recognized. The discoveries of this consider seem have a wide extend of suggestions. [25]

## 2. Method



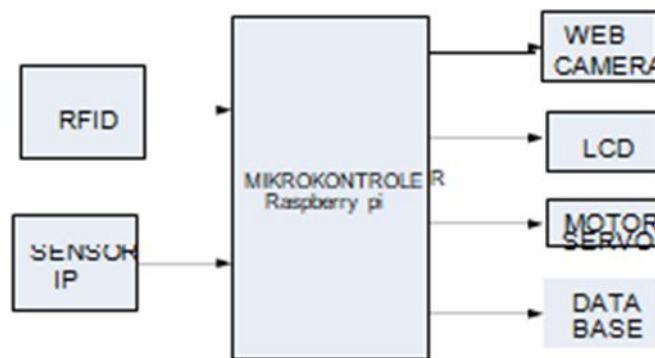
**Fig. 1.**Research Methodology

- Data collection, carried out by observation, field studies, and literature studies through books or articles from the internet. Through the literature, it is hoped that a framework will be obtained in solving problems or problems, so

- 
- that research will be more focused and the results can be scientifically justified. Component determination and design.



- In designing this automatic parking system, software and hardware components are needed. The software used is a programming algorithm using the Python programming language, while the hardware components required are the Raspberry pi microcontroller, RFID, IP sensors, LCD, servo motors, Web cameras and other equipment.
- Testing of design results and data observations. The design results are tested and followed by data collection / research variables which include testing all components, such as sensors, microcontrollers and testing programs. Analisis data pengamatan. The data from the trial results are processed and analyzed, then the results are set forth in the form of scientific writing.
- Result, the results of this research are expected that there will be a prototype of an automatic parking system along with the software, as in the title / topic of this research that can work properly. In addition, brief documentation starting from the design to the results of the analysis is written in the form of a scientific paper.



**Fig. 2.**Auto parking system block diagram

From the block diagram in Figure 2 is the design of the door control system and the parking area, there are 3 devices that will be used as input devices and output process devices. The first device is used as input, namely Infrared Proximity and RFID sensors, which function to collect data on the input for the microcontroller.

In the process device, namely the Raspberry pi as the main control and process in this tool, where its function is to make a parking area monitoring tool. And then the output, at this output there is a servo motor that functions to open and close the parking gate. And there is also an LCD that functions to display text in the form of the number of parking slots that are still empty or the number of parking slot is still there as can be seen in figure 3.

### 3. Results and Discussion

After going through the design stage, the market is obtained as below:

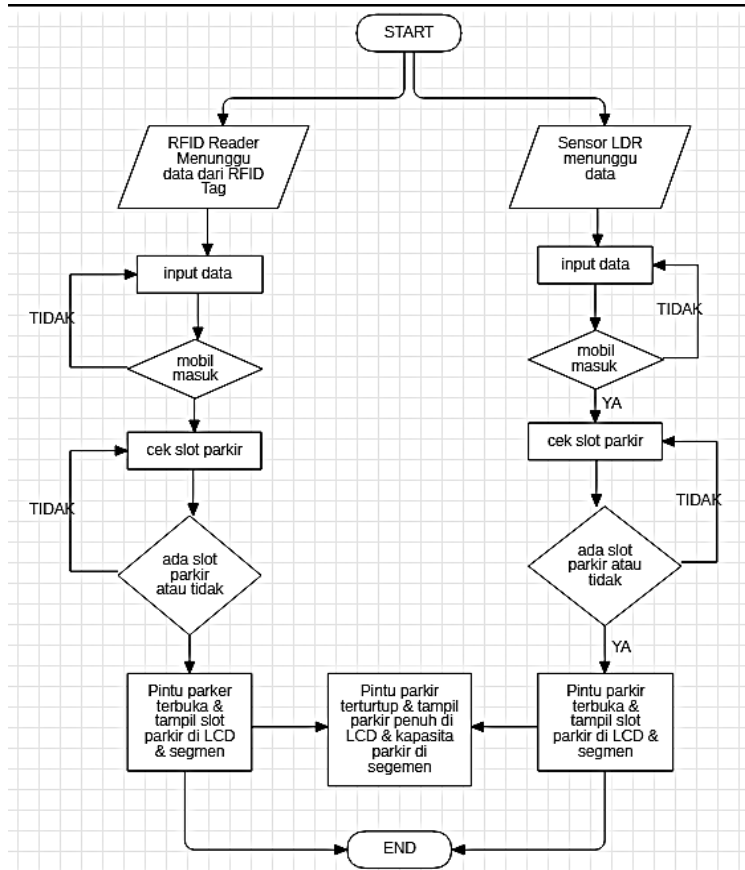


Fig. 3.Flowchart system

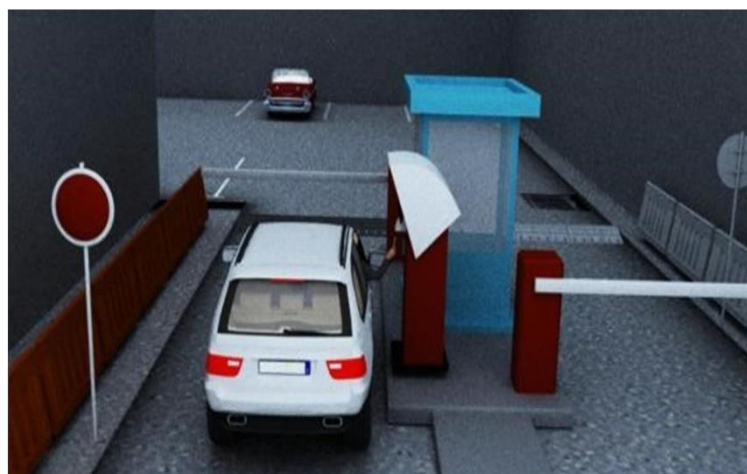
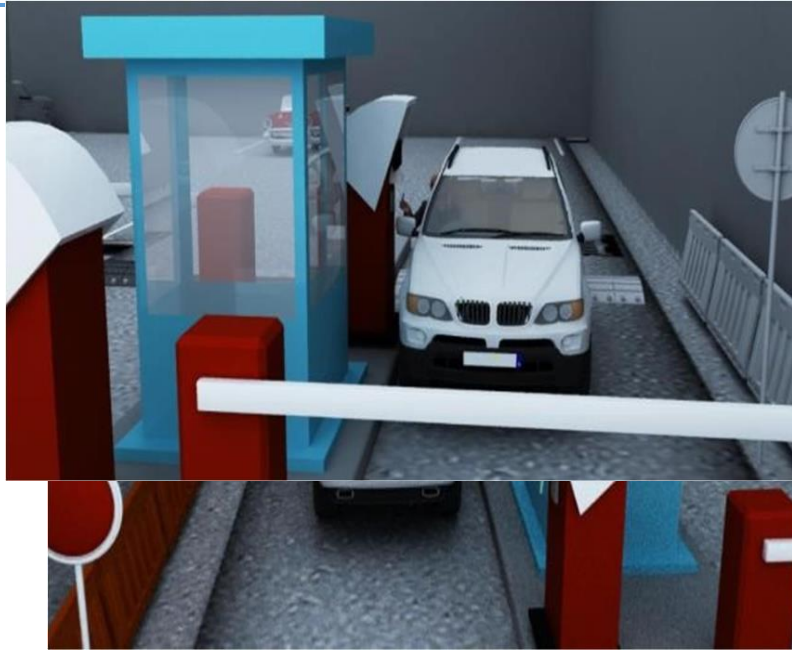
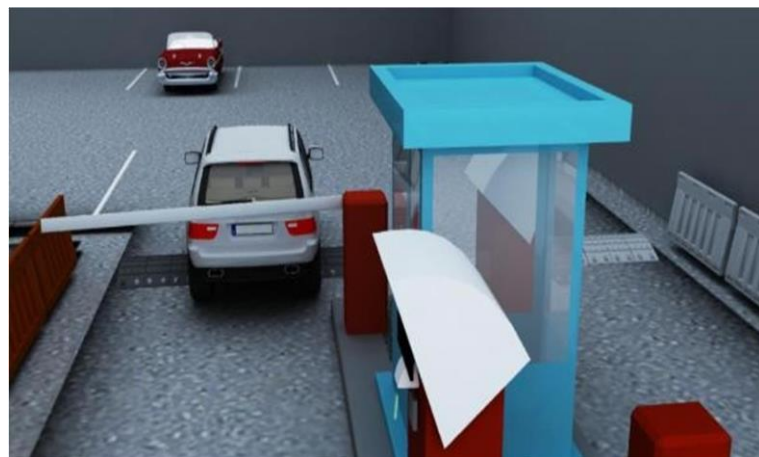


Fig. 4.Webcam photographing number plate when you want to ente



**Fig. 5.**The latch opened



**Fig. 6.**The latch closed

**Fig. 7.**RFID is affixed when it wants to go out



**Fig. 8.**The latch

opened

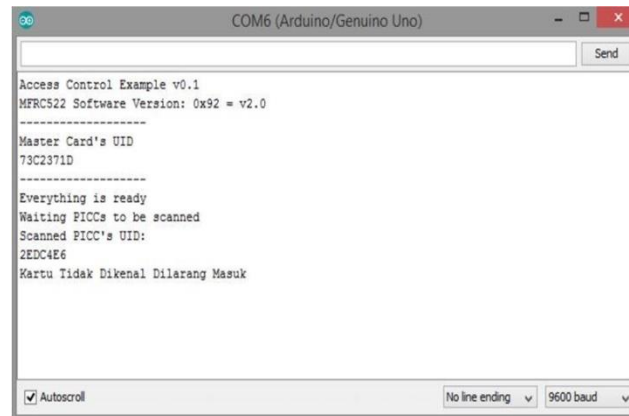


**Fig. 9.**When

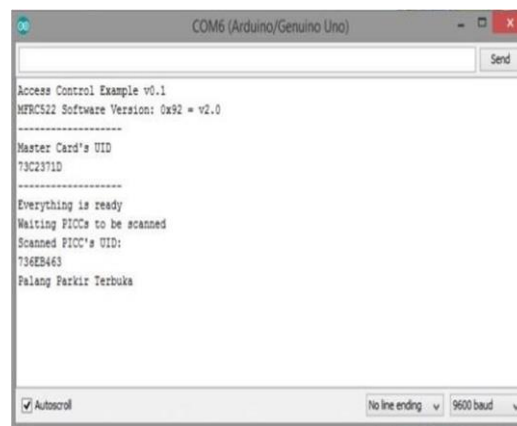
the latch closed

### 3.1. Testing on the RFID card

Testing of all components aims to determine whether all components such as sensors, microcontrollers, matlab programs, and web cameras are running optimally



**Fig. 10.** Unregistered RFID Card Monitor Serial Display



**Fig. 11.** Registered RFID Card Monitor Serial Display

**Table 1.** Test Results on the RFID Card

Trial	Inut RFID Card	LCD Condition	Servo Motor Condition	Serial monitor
In-1	Registered (736EB463)	Provides information regarding the location of parking slots	The servo motor rotates 65	736EB463

In-2	Unregistred (2EDC4E6)	Displaying Posts "Deny Access"	The servo motor rotates 65 <sup>0</sup>	2EDC Kartu
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The result of the test on the RFID card is that the servo motor condition will open if the RFID card is registered, then the LCD condition will display the number of parking slots that are still empty, the registered card id and display the words "Open Parking Bar". Meanwhile, when the RFID card is not registered, the servo motor will not open, then the LCD will display the words "Deny Access", "id card not registered" and display the words "Unknown Card Forbidden Entry".

#### 4. Conclusion

This parking area system will work when the registered RFID card does the scanner and will produce a display on the LCD "parking is filled =" and the remaining parking is empty = "" ", your id number = "" ", time of entry = " ", and the parking bar will open but if the parking area is full, the LCD will display "FULL Parking" and the parking bar will not open, then if an unregistered RFID card does the scanner it will produce a display on the LCD "Access Denied" and the parking bar does not open

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