

# RFID based vehicle access control and tracking with IoT

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## Abstract:

This paper proposes a system for vehicle access control and tracking with IoT using RFID and Automatic license plate recognition (ALPR) technologies. RFID system is proven that it is a worthy enough system to track and identify the objects. License plate identification is combining with RFID system so that the particular vehicle is authenticated vehicle. In the process of tracking vehicle, license plate number is registered in Internet of Things (IoT). At bottleneck areas, it is difficult for traffic scrutinizes and it is a delay process. For that predefined RFID tags are appended to the automobiles. RFID reader glance the data in the tag and license plate number is identified. If both are mated then vehicle ascertained as authenticated and allows. Connecting with Internet of Things (IoT) gives the result that the number of vehicles moved per day and it is beneficial to track the vehicle.

**Keywords** — Access controlling; tracking; Automatic license plate identification (ALPR); RFID system; Internet of Things (IoT).

## I. INTRODUCTION

In these modern days, at bottleneck areas, it is difficult for traffic scrutinizes and it is a time-consuming process. At crowd areas, supervision a large number of vehicles is the big sticky situation. Manual checking is in progress but it is a time-consuming process. Some systems are out to resolve these problems like vehicle access control using RFID and ALPR technologies. But it resolute some part of the problem. However, if theft vehicle has arrived, it is not possible to recognize such vehicle. So, RFID system with Automatic license plate identification (ALPR) technologies and Internet of Things are using to overcome the above crisis.

Vehicle location and tracking are widely used for safe transportation [1]. RFID system is proven that it is a worthy enough system to track and identify the objects [2]. This technology existed for the number of years. It was first used for friend-foe identification by the British army during Second World War [3] to identify the craft whichever friend or foe. The tag is placed on the aircraft to

detect the signal from the radar systems and respond with a specific signal [4].

So many advanced technologies are out, still, RFID technology is using, because it has some advantages. They are

- Low cost
- Easy to attach to the objects
- Simple system

This technology is used in many areas; some of them are logistics & supply chain visibility, item level inventory tracking, attendance monitoring, race timing, library systems, real time locating systems etc. [5]. RFID (radio frequency identification) technology is established to supply an efficient resolution to completely different chase and localization issues. However, the technology has its shortcomings in chase objects/users while not a tag. RFID has 3 components: Tag, Reader, and server. Radio frequency identification technology (RFID) is employed to speak and determine a specific target & read/write the connected knowledge through radio radiation while not physical contact. The complete system consists of the tag, reader associated an antenna. The tag is to store the knowledge just like the details of auto and reader interpret the knowledge that is held on in the tag.

Tags are the unit of 3 kinds: Passive, semi-passive and active. A value effective straight forward resolution is predicated on the utilization of RFID technology with passive RFID tags. Radio frequency Identification (RFID) may be a communication technology that may determine a particular target and read/write the relevant knowledge through the radio radiation while not mechanical or optical contact.

A RFID tag consists of microchips, antennas, cases, and batteries (for active tags only). Some RFID tags receive power from the magnetic attraction field made by a RFID reader. Some RFID tags have power sources. These RFID tags are unit ready to send radio waves imitatively and so manufacture associated magnetic attraction field. Once the reader is within the range of this magnetic attraction field, it's ready to scan the info hold on within the RFID tag.

RFID was fictitious in the forties. Since then, the technology has continued to develop. Now, it's been widely applied to several majors like supplying, toll system, ticket, health care, identification, etc.

The uses of RFID technology will be seen in current areas wherever the technology is employed. One in every of the utilization of associated RFID electrical device is that no line-of-sight is needed and, a lot of significantly, no human intervention is needed. This enables for higher time management and higher human resource utilization. What is more, the utilization of a novel ID permits for the identification of people or individual objects? Recent advances within the power consumption of electronic devices have allowed for the creation of tiny sensors employed in medical applications, like aldohexose sensors.

The advances within the power consumption of devices additionally profit to the RFID arena. The creation of tiny transponders, with the associate operational distance of a couple of centimeters, will be used as medical implants for the aim of storing associated individual's personal info. It is; thus, clear that RFID technology, although associate emerging technology already includes a vital impact on multiple fields. By incorporating this technology into the sphere of intelligent transport, a whole system will be created that permits for

correct chase and observance in a very wide range of applications.

RFID will be used with sort of frequency bands that range from 10cm to 200m.

Drawback: Power is restricted just in case of passive and semi passive tags. The passive tag will not do any computations and semi-passive can do the very little computation. The size of the active tag is larger than the passive tag. RFID tag may be a universal symbol to supply a novel identity for any object anyplace at any time.

RFID tags are unit fabricated from a semiconductor device associated an antenna, that uses radio waves for quicker and a lot of economical scan of product info compared to the standard bar codes.

Their several applications vary across numerous trade sectors, together traceability and food safety in retail, increased patient safety and provide chain efficiencies in health care, and improved potency and accumulated visibility of the flow of shipments, a lot of economical handling and inventory management, and accumulated security of distribution and speed of operations in transport and supplying.

Radio Frequency Identification (RFID) technology shows never-ending growth in numerous application fields, like supplying, life science, security, access management etc. The RFID system may be a 3 element system consisting of the tag, reader, and information. The access management, specifically, is the detection of IDs entry to or exit from the various space of the RFID reader. Transponders (Tags) should have the electronic equipment required to reap power from the magnetic attraction fields generated by the queries, the required memory parts, further because of the completely different management circuits.

RFID systems have infiltrated the market in uses for lifestyle, like access management, mass transit ticketing, offer chain management, and baggage tagging, to call a couple of during this approach RFID technology is turning into the part of in our day to day life, due to such huge amount of benefits and low cost.

Radio frequency identification technology (RFID) is used to communicate and identify a

particular target & read/write the related data through radio signal without physical contact. The entire system consists of tag, reader and an antenna [6]. The tag is to store the information like the details of vehicle and reader interpret the information which is stored in tag [7]. To be vehicle authenticated instinctive license plate identification is combining with RFID.

For our particular application to prevent the theft vehicles Internet of Things (IoT), hypothesis, where all the substances approximating objects, people, and so on in the region of us, can globally and dynamically recognize, intelligence, bond, and manipulate substances remotely itself [8].

In our day to day life IoT playing a major role [9], some of the applications of Internet of Things are:

1. Intelligent transportation system.
2. Personal communications.
3. Consumer electronics.
4. Health care.
5. Organizational services.
6. Securities and monitoring.
7. Industries [9].

## II. PROPOSED METHODOLOGY

The main aim of this paper is to provide vehicle access control and tracking in the combination of RFID system with instinctive license plate identification and Internet of Things (IoT) at crowd areas, and stopping the theft vehicle. It is very difficult to check the traffic manually and hard to find theft vehicles. So this system is proposed, some of the specifications are explained below.

- Vehicle is attached with pre defined RFID tag.
- The entire system is connected with Internet of Things.
- When the vehicle is entering IR sensor activated.
- And the entire system get activates.
- Entering at the checking point, RFID reader reads the information from the tag.
- To be authorized, the license number is extracted.

- If both are matched then to allow the vehicle gate opens.
- Unauthorized vehicles are forced to stop and issue some fine and/or allowed.
- Registering in IoT will help to count the number of vehicles are entering and numbers of vehicles are leaving.
- And prevent from the theft vehicles.

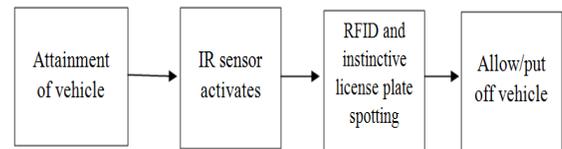


Fig: 1 overview of the system

They are three stages of the system. At first stage, vehicle owners are warned by the hoardings that unauthorized vehicles are forced to stop. So that some of the overcrowding may reduce. The system contains the entire equipment is operated physically or mechanically whenever needed. Fig1 shows the overview of the system.

The entire collected information is stored in near base stations and whenever needed, it will be retrieved. The images captured and videos from the camera of violating vehicles are stored, so that an appropriate action should be taken like assigning fine.

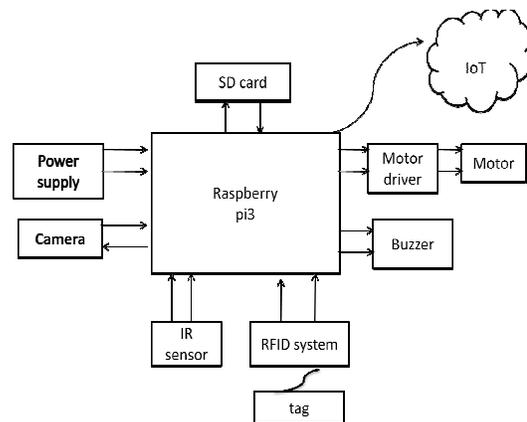


Fig2: Block diagram of proposed system

They are so many components used. Fig2 shows the block diagram of proposed system. They are so many models in raspberry pi. They are Pi3 model B, Pi2 model B, Pi zero, Pi1 model B+ & A+. Our requirements to develop system are:

- Need inbuilt Wi-Fi
- Camera interface
- USB ports
- SD card slot.

Need of the requirements Raspberry Pi3 is used. It was launched in February 2016. Specifications are:

- 1.2GHz 64-bit quad core ARM cortex-a53 processor
- 1GB RAM, 4 USB ports, 40 GPIO pins
  - Integrated 802.11n wireless LAN and Bluetooth (4.1)

**IR sensors:**

When the vehicle arrives at the IR sensor then the system gets activated. An infrared sensor is an electronic utensil which senses particular features of its environs by either emitting and/or detecting infrared radiation.

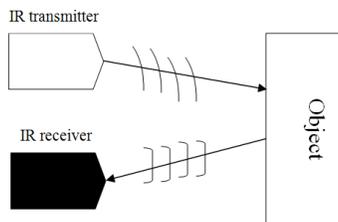


Fig 4: working of an IR sensor

**RFID system:**

It consists of tag and reader. The tag is filled with the information of the vehicle. Reader glance the information from the tag.

RFID (radio frequency identification) may be a technology that includes the utilization of magnetic force of electrical coupling within the radio frequencies portion of the spectrum to unambiguously establish associate in the nursing object, animal, or person.



Fig: 5 RFID tags



Fig: 6 RFID readers

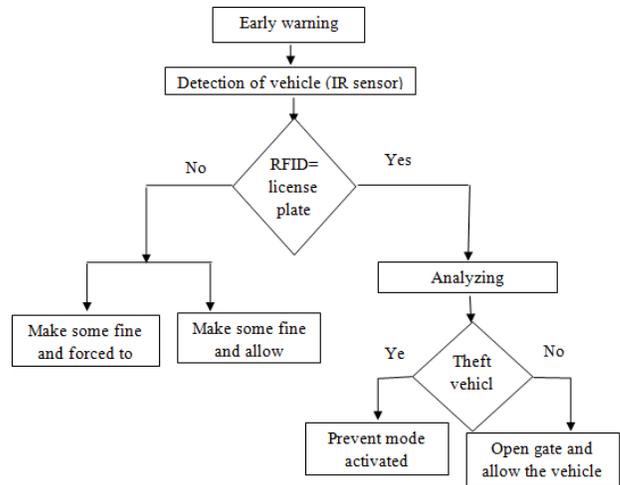


Fig7: flow chart of the system.

**System design and operation:**

At crowd areas, this system is placed. Before that predefined RFID tags are attached to the vehicle. The tags contain the information about the vehicle which we want to use. Unauthorized vehicles give the sign before the checkpoint by placing large hoardings about the instructions. So that before they reach they may exit, some crowd reduced.

When the vehicle enters to the checkpoint IR sensor triggered and entire system gets activated. RFID reader is ready to read the information from the tag. After reading the information camera activates and license plate number captures. After capturing plate number extracted and mated with RFID information. By analyzing this information there are three modes.

- If RFID is valid then enter the vehicle.

- RFID is not valid then assign fine and allow the vehicle.
- Assign fine and show another direction.

Valid Condition: The information read from the tag is mated with the license plate number then open gate automatically and allows the vehicle.

Not-valid condition: Tag information and license plate number not mated warning sign alarm start. In this again there are two conditions. One is to make some fine and allow the vehicle another makes some fine and forcibly exit and show another direction to the vehicle.

### **Finding theft vehicle:**

The system is connected to the Internet of Things. There are free registering sites on the internet. One of them is “AllThings Talk Maker”. First, we need to register on this site. Entering the theft vehicle number in IoT then it sends the information to the system. If any such type of vehicle entered then prevention mode activates and warning sign alarm starts ringing.

### **Software:**

In raspberry pi default language is “python”. OS used in this is Jessie version. It is introduced on Jan 2017. Jessie is the name of the character in cow boy. Connect memory card to the computer to copy the software. Open win 32 disk manager. Copy Jessie image. Remove memory card and insert in raspberry pi. And update the library.

Python could be a widely used high-level programming language for general programming, created by Guido van Rossum and initial discharged in 1991. Associate degree taken language, Python encompasses a style philosophy that emphasizes code readability (notably exploitation whitespace indentation to delimit code blocks instead of pre-med brackets or keywords) and a syntax that permits programmers to specific ideas in fewer lines of code that may well be utilized in languages like C++ or Java. The language provides constructs supposed to alter writing clear programs on each a little and huge scale.

Python options a dynamic kind system and automatic memory management and supports

multiple programming paradigms, as well as object-oriented, imperative, purposeful programming, and procedural designs. It's an oversized and comprehensive customary library.

Python interpreter's square measure offered for several operating systems, permitting Python code to run on a large kind of systems.

Hardware:

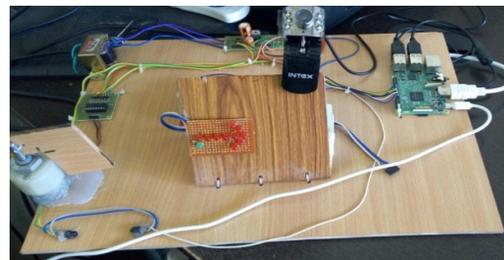
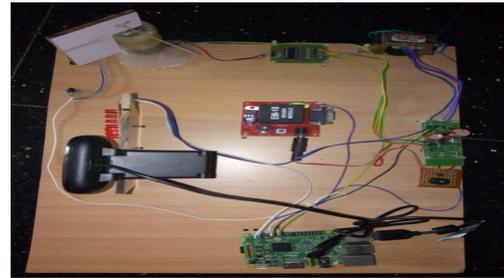


Fig9: proposed system hardware

### III. OUTPUT

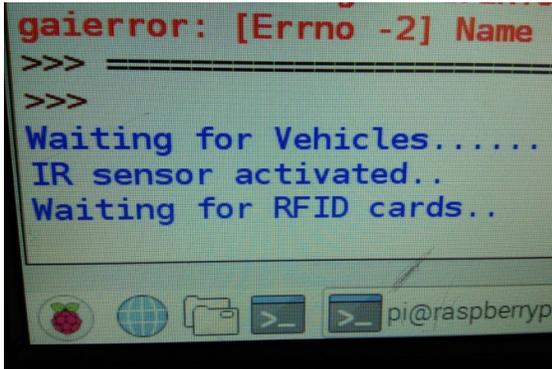


Fig: 10 when the IR sensor activated

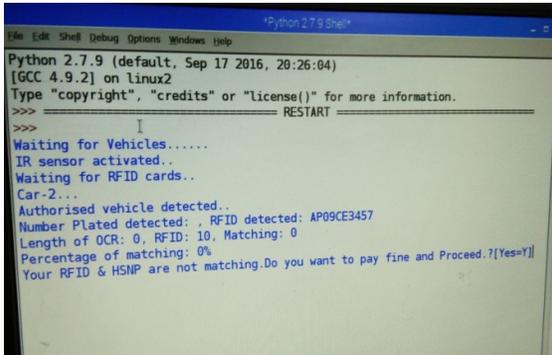


Fig: 11 unauthorized vehicles detected

When the vehicle number matched with the RFID, then it shows that matching of percentage. If the percentage is above the 70% it allows the vehicle.



Fig: 13 blinking LED to showing another direction

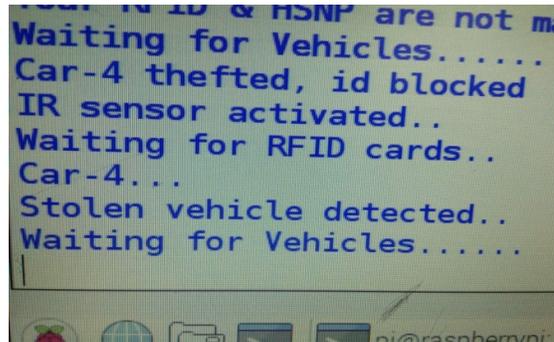


Fig: 14 when theft car detected

### Conclusion:

At crowd areas, it is difficult to maintain the traffic. A system is proposed for vehicle access controlling and tracking in the combination of RFID with Automatic license plate identification (ALPR) and the internet of things. Predefined RFID tags are attached to the vehicle. And reader reads the information from the tag. The license plate number extracted and mated with the tag information. If both are mated then gate open and allows the vehicle. If not matched forcibly stop the vehicle. The system is registered in IoT so that we can prevent the stolen vehicle and number vehicles are entering and leaving is saved in near base

stations. For further references, we can retrieve the information.

**Future scope:**

This system is prototype model. It may be developed in real time scenario with low cost.

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