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Vehicle Accessibility Using RFID Technology

***Abstract**. RFID technology provides a high number of applications for smart cities using small affordable devices. These small devices, not only will make the traffic smooth, it can also reduce the amount of energy used on streets. RFID can facilitate different value-added services via wireless to the car. As the multiple medium access control (mMAC) protocol will be responsible for coordinating among the car smart cards. In this paper, we investigate the advantages, innovation features, and limitations of different techniques of RFID on the new design of vehicle electronic systems.*

***Streszczenie.** . Popularnym rozwiązaniem dla inteligentnych miast, inteligentnego rolnictwa, inteligentnych budynków, inteligentnych sieci, e-opieki zdrowotnej i handlu elektronicznego jest Internet rzeczy (IoT), który składa się z ogromnej liczby małych, niedrogich urządzeń. Popularnym rozwiązaniem dla inteligentnych miast, inteligentnego rolnictwa, inteligentnych budynków, inteligentnych sieci, e-opieki zdrowotnej i handlu elektronicznego jest Internet rzeczy (IoT), który składa się z ogromnej liczby małych, niedrogich urządzeń. RFID może ułatwić różne usługi o wartości dodanej za pośrednictwem komunikacji bezprzewodowej z samochodem. Ponieważ protokół kontroli dostępu do wielu nośników (mMAC) będzie odpowiedzialny za koordynację między samochodowymi kartami inteligentnymi. W tym artykule badamy zalety, cechy innowacyjne i ograniczenia różnych technik RFID w nowym projekcie systemów elektronicznych pojazdów. (**Dostępność pojazdu za pomocą technologii RFID**)*

Keywords: vehicle access, IoT, RFID, location.
Słowa kluczowe: dostęp do pojazdu, IoT, RFID, lokalizacja.

Introduction

Radiofrequency identifier RFID is a technology that enables many connected devices in the information age. The internet is utilized in all places, from simple mobile devices to sophisticated data servers. IoT enables access to a variety of devices, including smart TVs, smart speakers, toys, cars, and smart appliances [1-3]. The Internet of Things has sparked a revolution and has become a fascinating part of daily life [2, 5]. The Internet of Things has applications for connected homes, smart cities, industries, trains, agriculture, and cars [3-5].

The user can control the vehicle in a natural, unrestricted manner thanks to an intelligent vehicle security framework. Modern vehicles are equipped with a variety of security systems, some basic and some with cutting-edge technology, to thwart vehicle break-ins. Four-wheel vehicle keys, for instance, were created as the standard security measure [4-6]. The authors of [2] combined global positioning systems and IoT terminology using an Arduino module. In [4], tracking systems with a few sensors were designed to create security frameworks for vehicles, and in [5], a security framework to track missing vehicles was developed using the global system of mobile networks and SMS. Additionally, SMS and a variety of other technologies can be used to deliver the alert feature [8-10].

In this paper, using the NodeMCU microcontroller details the creation of a vehicle ventilation system. The objective is to develop a framework for Internet of Things applications that connects to a cloud server via a wireless connection. The framework contains an alert messaging system that enables real time monitoring and control of the vehicle's sensor devices. This essay's remaining sections are organized as follows: In Section II, the framework's scope for vehicle ventilation systems is defined, along with a literature review for several related IoT applications. In following Section, the hardware implementation employed by this IoT platform is described. In Section IV, the findings regarding the monitoring and navigation system for the vehicle connection system are discussed, followed by concluding remarks.

Literature review: different systems

In order to guarantee the safety of the Internet of Things, the entire system needs to possess certain qualities, including privacy, availability, authenticity, authorization, and confidentiality [9, 10]. The main challenges to improving IoT environment security are shown in Figure 1. The security features used in two Internet of Things applications, namely home and vehicle security systems, are examined in this section.

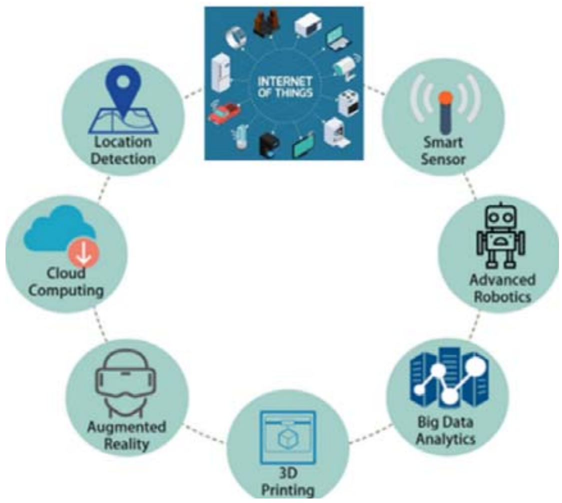

Fig. 1 the IoT systems.

Vehicle alert system

Many technologies such as global positioning system (GPS) , wireless mobile devices, zigbee, RFID, technologies are utilized in the vehicle alert system with tracking functionality and identification of car theft [6, 8]. The system was a framework for enhancing vehicle security because it could locate a misplaced vehicle and provide authorities. To prove that a stolen car has been tested to be found using GPS. The project utilized 2nd generation of mobile phone and GPS technology, and its essential components included a Raspberry Pi, an Android phone, a wireless local area networking WiFi module, as well as cameras and sensors. The vehicle's owner was notified via a WiFi module that was connected to the Raspberry Pi kit that was stored within the vehicle whenever the vehicle was moved while it was in the car lock mode. In addition, a Raspberry Pi camera that can take photographs when the car is locked or unlocked and a gyro sensor that can measure or maintain orientation have been incorporated. As a means of tracking and identifying the vehicle, the system displayed on a web page a face recognition alert. The figure number 2 depicts the system diagram for the vehicle authentication system with GPS and 2nd generation of mobile phone tracking.

The main contribution of [8] was to study the impact of text messages embedded in smart cars, but that encounter the security issue in the wireless system If the door of the vehicle was accidentally opened or the vehicle vibrated, an alert flag was suggested and a text message was immediately sent to the owner's cellphone. The system was implemented using an Arduino Uno R3 microcontroller, an RFID reader, RFID label data, and the 2ND generation of mobile phone modem as its hardware components. When the satellite got close to the GPS receiver, it sent data in NMEA format, which is the format used by marine electronics, to determine the GPS fix or accuracy. The Arduino Uno R3 was then used to process the data. The output subsystem is made up of the minimum output, relay action, and 2nd generation of mobile phone communication subsystems.

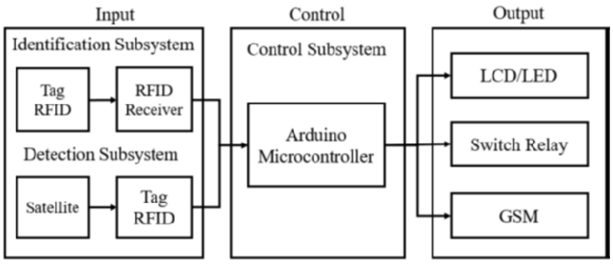

Fig. 2. Intelligent vehicle security system's schematic.

Map the best route finder

This study investigated the use of Open Street Map for multiple data mapping especiall so called navigation-spatial data to optimize the way for wlking and for driving for driver or driverless vehaciles to find the best rout to achieve distinations.

Geographical data and participatory mapping, allow anyone, anywhere, to add or update map features. Additionally, data from various sources can be combined to create powerful, adaptable, and updated mapping services. While most commercial route planning software, including Google Maps, generates the shortest or fastest routes for seeing pedestrians, this is not the case for blind pedestrians, whose ideal path must be the safest and most accessible path. There is currently no solution that makes it possible to combine open street map data with the best-weighted network graphs, which are based on spatial criteria that are particularly important to blind pedestrians.

In this study, we developed a novel route-planning algorithm specifically designed to meet the needs of blind pedestrians and built a weighted network graph based on open source map data

The method has conducted an investigation to find a better way for pedestrians, especially blind ones. The research also conducts observation of the real difficulty of these methods to find a better way. We developed a criteria system of challenges, preferences, and strategies based on the information we had gathered, which we then used to materialize into workable computerized solutions.

To achieve a satisfying level of safety and access of road wireless networks, a method of security through a weight network has been created. This way will insure the driver will obtain his destination safely.

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Model implementation

This device is a chip made of silicon and an antenna It can receive and send data and wait in line via radio waves, and the electronic circuit will be implemented based on a signal reader of the type MFRC522 , where the set of codes for the RFID tags card will be stored within the microprogram and compared with those Card baseboard jumper wires LEDs.

In case of convergence, are awarded to the door and send the name of the cardholder to a mobile application through the Blynk application a green LED will be on and the buzzer will be heard by the single tone in case of mismatch, the door does not open, Blynk sends a notification to mobile, red LED will be on and the buzzer will be heard by double tone.

The application will be built from an integrated development environment (IDE) platform whose main architecture is C / C ++ and may be assistive programming languages

The vehicle ventilation system's NodeMCU ESP8266-based microcontroller was connected to sensors and other automotive accessories. The relay and motor were connected as the 12V-powered actuators for the vehicle's power window and fan, respectively. Figure 5 depicts the actual configuration.

Regarding the map finder, we first needed to comprehend what makes a route safe and accessible for this particular population, especially in urban settings, in order to develop an algorithm for planning optimized walking routes for blind pedestrians. To achieve this, methodical, mobile centered interviews with blind pedestrians and open source map were conducted. The majority of the instructors came from a company called magedalOOR, a nonprofit in Iraq that offers rehabilitation services to those who are visually impaired. The many blind people they assist each year benefit greatly from the knowledge and experience of these highly qualified instructors. We also participated in training sessions with blind pedestrians, where users practiced their routes under the direction of the mobility instruction, and we observed the participants navigating in an urban setting. Understanding what makes traveling along a particular route difficult or accessible, as well as which strategies most effectively assist blind pedestrians in enhancing their navigation and wayfinding skills, were our main research focuses.

The key takeaways from these observations and interviews were then translated into seven key spatial and environmental factors that affect how blind pedestrians find their way around. These factors include personal preferences, complexity of the environment, landmarks, accessible aids, roads, obstacles, and intersections.

1) Complexity: For blind people walking, straight, linear paths are preferred routes, especially those close to a road or with clear, distinguishable borders such as grass or a walk way, as opposed to routes with complicated geometry that include bends and turns.

2) Landmarks: Consistent, stationary landmarks, such as cafes, traffic lights, trees, and bus stops, can be useful when a pedestrian is blind and trying to find their way.

3) Accessible tools: To assist blind pedestrians, these tools use non-visual formats to communicate information about the pass /do not pass intervals at signalized intersections. However, while tactile paving near street crossings and accessible car signals are generally useful tools for road finding, the interviews revealed that low sight can function without them. ctivities.

4) Intersections: From one intersection to the next, blind pedestrian safety and accessibility levels vary. Intersections with obstructions that might make it difficult for car drivers to see a blind pedestrian and those with more roads intersecting are less advised because they result in more complicated geometric and spatial intersections. Crosswalks, people walking traffic signals, and roundabouts

are examples of traffic control devices that can either increase or decrease the safe crossing of blind pedestrians. Blind pedestrians frequently choose to stay away from unattended crossings, even if it requires them to travel further to cross at a safer, more accessible intersection. Blind pedestrians prefer intersections because they allow them to pay closer attention to all oncoming traffic coming from all directions.

Weight calculation

XGBoost was used as a classifier to build robust detectors by a linear combination of weighted weak detectors [4, 5]. This was accomplished by using linear combination. Each one of these simple classifiers is made up of a binary decision tree with two levels and an output value of 2 . If one weak classifier has already been learnt, the next step changes the weight of each piece of learning data based on the outcome of the step before it's learning, and then it trains the next weak detector in the same way. It is possible to get at a robust detector by practicing the acquisition of weaker detectors and merging them. The reliable detector is denoted by the number 2 in the following.

By default, we can assume that the weights of the four criteria length, complexity, landmarks, and way type are equal. As a result, the value of aj where j=1-4 is the same is also equal. A higher aj value expresses criteria that are more important to the process as a whole.

Empirical circuit

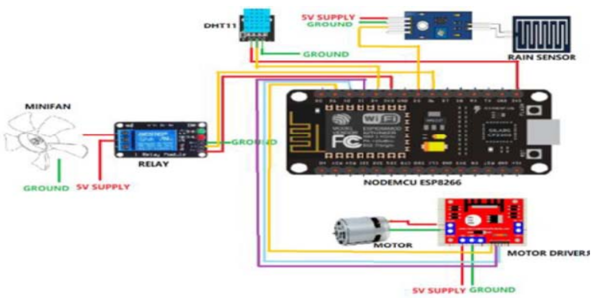

Fig. 3 The link between the automobile's ventilation system.

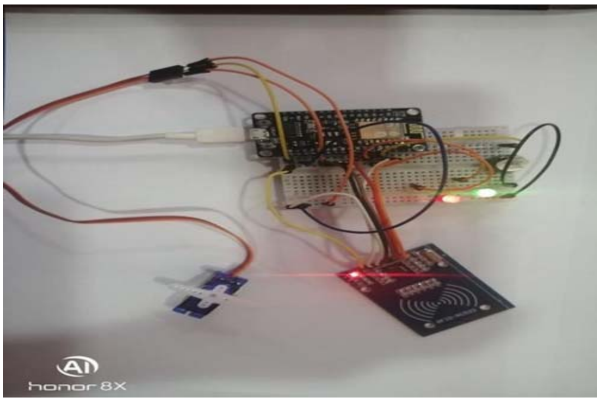

Fig. 4 Hardware construction and testing.

Vehicle detection via Machine learning

Figure 5 displays the system configuration diagram for the real-time vehicle detection algorithm utilized in this paper.

The vehicle detection step classifies candidates as either vehicles or non-vehicles. In actual driving conditions, the length of the vehicle's bottom shadow depends on the sun's altitude. This issue was resolved using a sliding window scan of a larger area than the candidate.

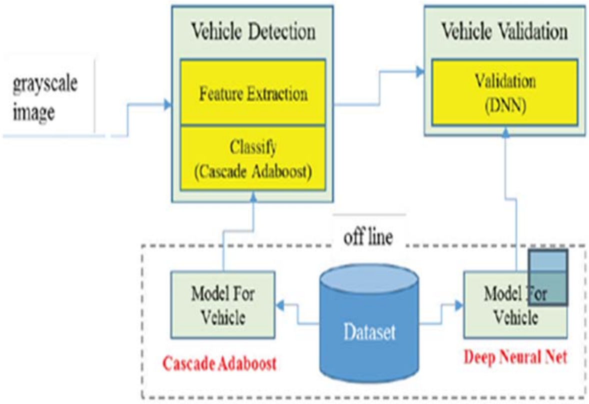

Fig. 5 we can see the assembly of vehicle detection using machine learning.

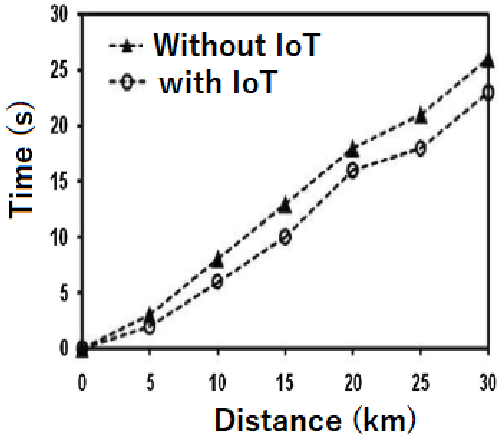

Fig. 6 the time speed of crossing a specific distance with and without RFID.

As depicted in Figure 5, the vehicle detection feature was a modification of the existing Integral Channel Feature. LUV of the existing ICF is inefficient in terms of processing time because it processes three color image channels. Therefore, we designed the configuration options for grayscale images. To reduce the size of the feature, the average of four values is applied to the value of each channel. Consequently, the proposed feature space for the 32x32 image has dimensions of 450 while the ICF has dimensions of 640.

XGBoost was used as a classifier to build robust detectors by a linear combination of weighted weak detectors [4, 5]. This was accomplished by using linear combination. Each one of these simple classifiers is made up of a binary decision tree with two levels and an output value of (2). If one weak classifier has already been learnt, the next step changes the weight of each piece of learning data based on the outcome of the step before it's learning, and then it trains the next weak detector in the same way. It is possible to get at a robust detector by practicing the acquisition of weaker detectors and merging them. The reliable detector is denoted by the number (2) in the following.

(1) $$h_j(t) = \begin{cases} 1 & t \text{ classified a car} \\ 0 & \text{otherwise} \end{cases},$$

(2) $$h(t) = \sum_{j=1}^{N} wj \;\; h_j(t)\,,$$

where *wj* is the weak classifier weight, and *N* I is the total number of weight classifiers. For this study, 50 positive images and 100 negative car images have been employed to produce the model.

Figure 6 shows the impact of RFID techniques on the speed difference of the vehicle in a city. This can be implemented in UAV and other moving facilities.

Conclusion

The design and implementation of a vehicle ventilation system that can track the interior temperature and give users control over the car's accessories are discussed in this paper. Temperature and precipitation sensors, along with a NodeMCU ESP8266 microcontroller, were used to construct the system testbed. Additionally, the vehicle's power windows could be controlled remotely by the microcontroller. The testbed was integrated with the network module to enable communication with the Firebase cloud service, and this was accomplished. To enable user monitoring and control of the vehicle ventilation system, a mobile IoT platform was created. Rather than relying on manual control by users, which is prone to security breaches, this paper suggests improving the vehicle ventilation system in the future by adding an analytics module to act on the temperature readings from the sensors. Additionally, it is recommended that more security features be included. Assembling the automotive smart cards will be coordinated by the multiple medium access control (mMAC) protocol. In this article, we examine the benefits, cutting-edge characteristics, and restrictions of various RFID approaches on the updated design of vehicle electronic systems.

Authors

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