Faculty of Computer Science & Information Technology

CAR PARKING SYSTEM USING FACE AND CAR PLATE RECOGNITION FOCUSING ON GATED RESIDENTIAL AREAS

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CAR PARKING SYSTEM USING FACE AND CAR PLATE RECOGNITION FOCUSING ON GATED RESIDENTIAL AREAS

FOO VOON YOONG

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Abstract

According to Bukit Aman CID D4 (operation/intelligence) principal assistant director (2019), stolen vehicles reported in 2018 has dropped 14.7% compared to 2017. The propose of the vehicle security system is to ensure the safety of the vehicles by avoiding the means of theft. As to further enhance the vehicle access control system in the gated residential area, Car Parking System Using Face and Car Plate Recognition with IoT Technology is proposed. The IoT platform for this system is Raspberry Pi. Moreover, the use of the Raspberry Pi camera is used to capture car plate image and driver image. The proximity sensor is used as a sensor to detect the presence of a vehicle at the entrance and exit of the residential area. This proposed system is a combinate recognition system (Facial Recognition and License Plate Recognition) and can recognize the drivers' face and car plate number with data registered in the database. It was able to increase the security of the residential area by preventing someone stolen other cars from parking and reducing the probability of access card loss.

Abstrak

Menurut penolong pengarah utama CID D4 (operasi / risikan) (2019), laporan kenderaan yang dicuri pada tahun 2018 telah menurun sebanyak 14.7% berbanding dengan tahun 2017. Cadangan sistem keselamatan kenderaan adalah untuk memastikan keselamatan kenderaan dengan mengelakkan kecurian. Bagi mempertingkatkan lagi sistem kawalan akses kenderaan di kawasan kediaman berpagar, Sistem Penempatam Kereta menggunakan menggunakan plat kereta dan muka pemandu identifikasi dengan Teknologi IoT dicadangkan. Platform IoT untuk sistem ini adalah Raspberry Pi. Tambahan lagi, penggunaan kamera Raspberry Pi adalah digunakan untuk menangkap imej plat kereta dan imej pemandu. Sensor kedekatan digunakan sebagai sensor untuk mengesan kehadiran kenderaan di pintu masuk dan keluar dari kawasan kediaman. Sistem ini merupakan sistem pengenalan gabungan (Muka dan Pengenalan Plat Lesen Identifikasi) dan dapat mengenal pasti nombor plat muka dan kereta pemandu dengan data yang didaftarkan dalam pangkalan data. Ia dapat meningkatkan keselamatan kawasan kediaman dengan menghalang seseorang mencuri kereta lain dari tempat letak kereta dan mengurangkan kebarangkalian kehilangan kad akses.

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1.1 Project Title

Car Parking System Using Face and Car Plate Recognition Focusing on Gated Residential Areas

1.2 Introduction / Background

A gated community is commonly defined as a residential area surrounded by fences, walls, or other natural barriers that further limit public access (Atkinson, R., & Blandy, S, 2006). Gated communities with car parking becoming increasingly common across Malaysia because of the existence of walls, fences, gates, and the security guard in the entrance of residential areas as it can make the residents feel safer and more secure with their vehicles. According to Bukit Aman CID D4 (operation/intelligence) principal assistant director (2019), stolen vehicles reported in 2018 have dropped 14.7% compared to 2017. Although the vehicle theft case has decreased, it still contributes to 40% of the nation's crime index annually. This phenomenon will continue to be in everyone's mind when purchasing a property to live in because vehicle owners will worry about their vehicles' security (Shanker, S, 2018).

The propose of the vehicle security system is to ensure the safety of the vehicles by avoiding the means of theft (C. Nandakumar, G. Muralidaran, and N. Tharani., 2014). There are several types of Vehicle Access Control systems (VACs) already used by the gated communities to control the flow of vehicles in the main entrance and card reader system has become more common over time (Houlis, P., 2018). For example, VACs with smart cards, proximity card readers are widely used in the entrance of the gated residential area. By using this system, every vehicle owner needs to gain access to the residence's parking by using a unique "access card".

However, there will be a probability of losing the access card and the thief can gain access by using lost access card and car.

As to further enhance the vehicle access control system in the gated residential area, Car Parking System Using Face and Car Plate Recognition with IoT Technology is proposed. With the rapid growth of Computer science technology, new technological solutions are gradually being implemented which is biometric technology. Biometric technologies identify a person to gain access by scanning physical or behavioral human characteristics (Kizza, J.M., 2018). Facial recognition is one of the common types of these biometric identifiers and it uses biometrics to map facial features like mouth, nose, eyes, and so on from video or photograph (Symanovich, S., n.d.). This proposed system is a combinate recognition system (Facial Recognition and License Plate Recognition) and can recognize the drivers' face and car plate number with data registered in the database. If the system identifies the face of the driver or car plate number is not match with registered data, it will block the car from entering and exiting the residential area as well as notify the security guard. It was able to increase the security of the residential area by preventing someone stolen other cars from parking and reducing the probability of access card loss.

1.3 Problem Statement

Nowadays, most of the gated communities in Malaysia provided security guard services at the main entrance. Vehicle Access Control systems (VACs) are used by gated communities to control the access of vehicles in and out from the residential areas. Most of the VAC systems in Malaysia are using access cards as the key to enter or exit residence's parking. By using this system, the authorized driver needs to keep their access card with them whenever they need to move from the residence's parking. This makes the probability of losing the access card. The driver needs to report to the officer so that they can take action to cancel the access of the lost card. The driver also needs to pay fine and wait for a new access card. It does not help prevent car stolen because it can't recognize different drivers using someone else's car or card to gain access to/exit residence parking. Thieves just need to present the access card and exit without any recognition.

1.4 Aims and Objectives

1) To analyze requirements and design a car parking system focusing on gated residential areas.
2) To develop a car parking system using face and car plate recognition.
3) To implement a cardless parking system.

1.5 Project Scope

This scope of this project is using an existing car plate recognition libraries and face recognition libraries to implement the car parking system by using the Internet of Things (IoT) devices. The limitation of the car parking system would be the time spent of users when entering or exiting the residential area is unpredictable. However, users of this project are limited to the residents who live in a gated residential area.

1.6 Expected Outcome

The expected outcome of this project is a working prototype of the system that can recognize the face and car plate number of the driver. The proposed system will be able to register users. Management can review the monthly report of the access logs.

1.7 Significance of Project

The purpose of developing this Car Parking System Using Face and Car Plate Recognition is to increase the security of gated residential areas. This could help to identify driver and car that exit or enter a certain gated residential area by using face and car plate recognition. This system is also able to notify the security guard if the unknown driver or car is trying to enter or exit the car park.

1.8 Brief Methodology

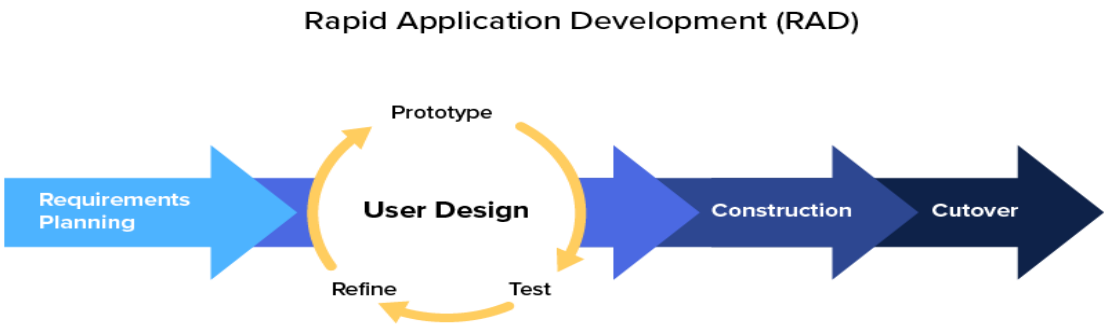

Figure 1.1: Rapid Application Development (RAD) Model, (Kissflow Inc., 2019).

Rapid Application Development (RAD) is one of the popular methods of agile software development methodology today and it is used in this project. It aimed to minimize the time of the planning stage and maximize the time of the prototype development stage. It helps to get user feedback constantly so that I can quickly implement any changes that need to be made in this project (Kissflow Inc., 2019). Furthermore, a developer can make multiple iterations and update the project continuously without restart my development schedule every time.

1.8.1 Requirements Planning

In this stage, the user's requirement is gathered. It allows the developer to understand the needs by gathering their requirements. Research for the existing system and potential issues that happen during the build will also be done in this stage.

1.8.2 User Design

In this stage, the developer developed the prototype based on the requirements and it will be demonstrated to stakeholders. Stakeholders will be given feedback to the developer as a review to enhance the system. This iteration will keep going on until the system is a requirement is fulfilled and the stakeholder is satisfied with the prototype. In this stage, developer designs prototype and stakeholders test it and they communicate with each to improve the prototype.

1.8.3 Construction

The final version of the prototype will be fully tested to ensure it can work smoothly and correctly as expected. If error detected, some of the minor changes will be carried out such as add in a new idea to solve the problem. If the system can work smoothly and correctly, then it means that the product is considered complete.

1.8.4 Cutover

After the construction stage, the product is ready to be released to stakeholders. Debugging and maintaining will be carry on for this system.

1.9 Project Schedule

This project had been classified into two parts which are Final Year Project 1 (FYP 1) and Final Year Project (FYP 2). Final year project 1 is about ideas and documentation of this project. Final year project 2 is about implementation and testing of the system in this project. Gantt chart for FYP 1 and FYP 2 will be attached in Appendix A.

1.10 Report Outline

Chapter 1: Introduction — Introduction, and background of Car Parking System Using Face and Car Plate Recognition Focusing on Gated Residential Areas.

Chapter 2: Literature review— Literature review of three existing vehicle access control systems

Chapter 3 Requirement Analysis & Design — Methodology and design for the IoT based

car parking system using Face and Car Plate Recognition will be discussed

Chapter 4: Development — The development and implementation of the proposed

the prototype will be discussed.

Chapter 5: Testing — The testing of the developed prototype will be carried out and the result will be recorded.

Chapter 6: Conclusion and Future Work — This chapter will discuss the conclusion of the whole project. Besides, the suggestion of possible improvement in the future of this project will also discuss in this chapter.

1.11 Summary

Chapter 1 introduces the car parking system using face and car plate recognition which can access vehicles in and out of the car from the residential areas. The proposed of this application is to develop IoT based car parking system to ensure the safety of the vehicles by avoiding the means of theft.