Car Park Monitoring System (CPMoS)

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Abstract
Car Park Monitoring System (CPMoS) is a new technology-driven solution to manage and optimize parking spaces in each area. The technology applies considers as smart parking system. One of the main advantages of this system is its ability to eliminate the use of paper tickets, which helps reduce waste and improve environmental sustainability. Instead of physical access, the system uses sensors and other advanced technologies to track and manage parking availability in real-time.Another advantage of the Car Park Monitoring System (CPMoS) is the LCD display, which can provide users with real-time information about parking spaces and directions to the nearest available space. This can help drivers reduce congestion and driver frustration, as they do not have to spend time looking for a parking space.Overall, a Car Park Monitoring System (CPMoS) can make parking management easier and more efficient. It can also help reduce waste and protect the environment.

Introduction

It is difficult for drivers to find an unoccupied parking space in a larger parking lot. It is because the number of cars on the road grows every year, particularly in cities (Idris et.al, 2009; Moon & Ha, 2013). The increasing number of automobiles has resulted in severe parking problems in the city. Moreover, it is difficult to find a parking space during peak hours and holidays because this is the time people want to release their stress and spend time with family. Few existing solutions are attempting to address the problem. Thus, the demand for smart parking system or any technical solutions that can provide information on parking space occupancy grows rapidly. An efficient parking monitoring system must be designed to overcome the problem.

During the last four decades, numerous parking search models have been developed. However, the models are still unable to solve the parking issue. In many decision-making situations in transportation (modal split, choice of air carrier, choice of airport, etc.), the competitive alternatives and their characteristics are well known in advance to the decision maker (passenger, driver). On the other hand, drivers usually discover different parking alternatives one by one in a temporal sequence. This temporal sequence has a powerful influence on the driver's final decision about the parking place. The title of this project is "CPMoS (Car Park Monitoring System)". This project is designed to overcome the problem of car parking spaces at supermarkets, workplaces, and so on. It is because parking at these places is trickyThe CPMoS

(Car Park Monitoring System) is a project designed to address the problem of drivers having difficulty finding unoccupied parking spaces in larger parking lots, especially during peak hours and holidays. The increasing number of cars on the road in cities exacerbates this problem, resulting in wasted time, frustration, and missed appointments or other important events.

In addition to this main problem, the CPMoS project also aims to address several other issues with the current payment system for parking lots, including payment tickets that the system cannot scan, a payment process that delays the entry and exit of cars, the requirement for cash payment only, and the potential for payment tickets to be lost. This smart parking system is considered beneficial for the car park operators and patrons as well as in environment conservation (Shaheen et al., 2005: Chinrungrueng et al., 2007). The CPMoS project aims to make a parking monitoring system that can tell drivers in real-time how many parking spaces are taken and help them find an open one. System CPMos will also fix these problems in the payment system to make things easier and more enjoyable for everyone.

The scope of the CPMoS (Car Park Monitoring System) project is to design a parking monitoring system that can provide real-time information on parking space occupancy and assist drivers in easily locating an available parking space in all places with parking, with a focus on larger parking lots such as those found at supermarkets and workplaces. The project will also fix problems with the current payment system for parking lots, such as payment tickets that the system cannot scan, a payment process that makes it take longer for cars to enter and leave, the need to pay only in cash, and the chance that payment tickets will get lost. There are several limitations to the CPMoS project. Firstly, the system will rely on the availability and reliability of technology, such as sensors, which may limit its effectiveness in certain situations. Secondly, the system will only be able to provide information on parking space occupancy and traffic congestion and assist with locating available spaces. Finally, the project will focus on larger parking lots, but it may not apply to smaller parking facilities. Overall, the scope of the CPMoS project is to design a parking monitoring system that can provide real-time information on parking space occupancy and assist drivers in easily locating an available parking space in all places with parking, focusing on larger parking lots (Kurogo et al., 1995, Sakai et al., 1995; Shaheen et al., 2005; Mouskos et al., 2007). However, the system's effectiveness will depend on the technology's availability and reliability and the driver's willingness to use the system to locate available parking spaces.

Methodology

Based on Figure 1, the block diagram has summarised the process flow for the project system. The system consists of two main part which is hardware and software, for the hardware they are divided into three more part such as input devices, main controller, and output devices. The input for this project is infrared sensor. The function of the infrared sensors is to detect the presence of car at the entrance and exit of the parking lot. They are also used to detect the presence of car at the empty parking lot. Infrared sensors interfaced with ESP32 is a main role for this project, it utilises all the other component with the program coding burn in the ESP32. When the infrared sensors detecting car, ESP32 will process the code that has been

program and send the data of the infrared sensors to the output devices. Servo motors and LCD displays are the output for this project. They will receive data interpret by the ESP32. Servo motor act as barrier gate at the entrance and exit of the parking lot. It will open and close after received data from ESP32 (Mohd Sofian & Tiron,2013). The LCD displays is used to display the total number of empty parking lot and to show the way to the empty parking lot.
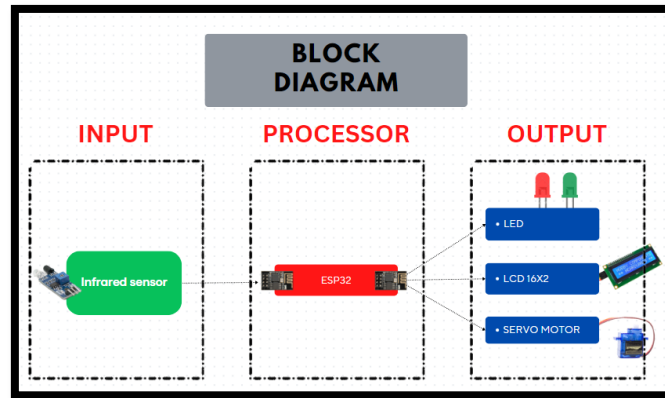

Figure 1: The block diagram for the development of the notification
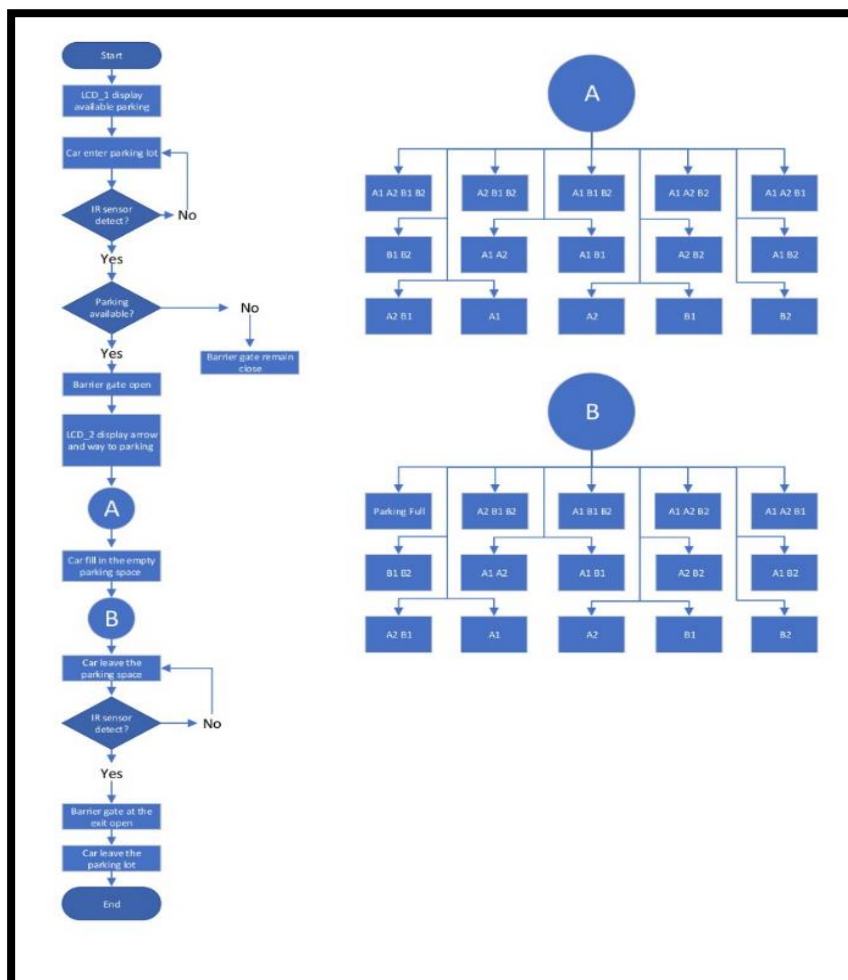

Figure 2: The flowchart of car park monitoring system

According to the flow chart in Figure 2, the car enter the parking lot. The first LCD display the available parking and if the if any parking available then the infrared sensor at the entrance detect the presence of car. The barrier gate open and the second LCD display way and available parking space. The car fill in the available parking space and the first and second LCD will display decrease in available parking. When the car leave the parking space, so the first and second LCD display increase in available parking.

The circuit diagram of Car Park Monitoring System (CPMoS) is shown in the Figure 3. The circuit diagram is consist of several component such as ESP32 as microcontroller in this project. The infrared sensors detect presence of car and the LCD will display the results of available parking and the servo motor act as barrier gate and will open and close depending on the detection of infrared sensors at the entrance and exit of the parking lot.
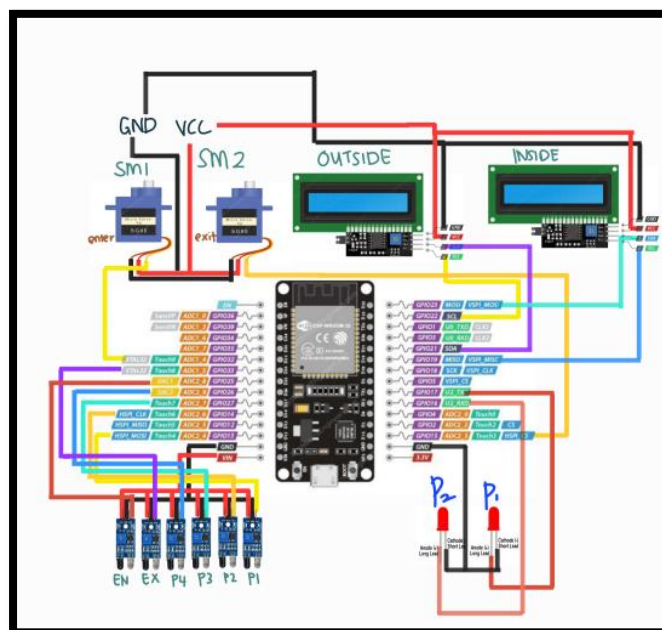

Figure. 3: Circuit diagram of the proposed system

Results and Discussion

This project is developed to ease the customer to find their parking space inside the parking lot. Also to create a project which help to reduce paper waste.In this project, the performance evaluation of the constructed proof of concept was tested on protoboard. Figure 4 shows the actual proof of concept circuit developed in this project. To start the system evaluation, the respective micropython file codes were download and run on the ESP32.
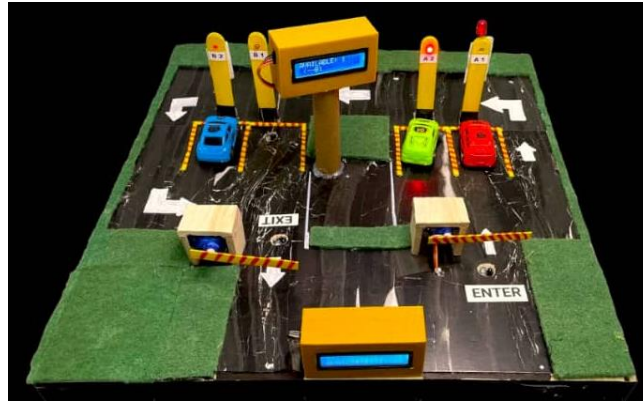
Figure 4: Prototype of car park monitoring system (CPMoS)

From the Figure 4, both LCD first and second are working fine. And also the red LED at the parking space are working.Although the project is successfully implemented, there were some challenging parts and had a lot of troubleshoot. Especially in programming, there were so many error in the first trial of developing the programming. However, we managed to overcome the problems.

Conclusion

As conclusion, this project has achieve the objective is to build prototype of car park monitoring system. It also achieve the second objective which is to test functionality of car park monitoring system prototype. And last but not least, the last objective is to develop car park monitoring system using infrared sensor system.

Acknowledgement

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