New Design for Intelligent Parking System Using the Principles of Management Information System and Image Detection System

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Abstract. Management Information System (MIS) is the design and management of IT (Information Technology) for an organization. It focuses on the best way to enable the organization to meet its goals and business challenges. In this paper we review the techniques used in parking systems. In particular we describe how the principles of MIS is used o improve the system used in car park environment; thus proposing a new design for intelligent parking system to overcome the current parking problems. This paper focuses on the Malaysian parking system as the research case study. Image processing is involved in the texture analysis. It is important to quantitatively evaluate differences of system used using texture features. This paper also discusses how image detection system is used to improve the parking system.
(Keyword): intelligent parking system, image detection system, management information system, plate recognition, CCTV

Introduction

For over thirty years, traffic information has been provided to help motorists make en-route decisions. The development of Intelligent Transportation Systems (ITS) and Advanced Traffic Management Systems (ATMS) have begun to improve transportation through the use of technology reference. Along the same lines system like Intelligent Vehicle Highway Systems (IVHS), acquire, analyze, communicate, and present information to assist surface transportation travelers in moving from a starting location (origin) to their desired destination. Data from IVHS can now be utilized as information for en-route assistance as well as collection of traffic data. Information Technology is beginning to recognize the importance of post-trip information dissemination by providing information on the location and availability of parking. Real-time information can be accurately provided to motorists through Intelligent Parking Systems (IPS) to reduce congestion in or near parking areas, insufficient utilization of the available parking space stock, road congestion caused by space-searching traffic, access problems and safety hazards caused by illegal parking and environmental strains(Teodorović. 2006), (Chen,1990), (Michelle, 2003). In more recent years people find it easy when using the parking systems because the system is fully automatic (Lübbe 2007), (Teodorović. 2006). The complexity calls for better management of the parking system which involves technical improvement in the system used. Additionally, users of the parking system commented that bigger parking space means they have to spent more time to find parking area (Gowan 2006).

DESIGNA Company, one of the largest providers for parking system management in Malaysia. DESIGNA develops, produces, installs and services various sizes of parking management systems. There are two main type of parking system: fully automatic parking system and manual parking system. Figure 1 showing the parking classification (Trizinias ,2004) (Crowder, 2003).
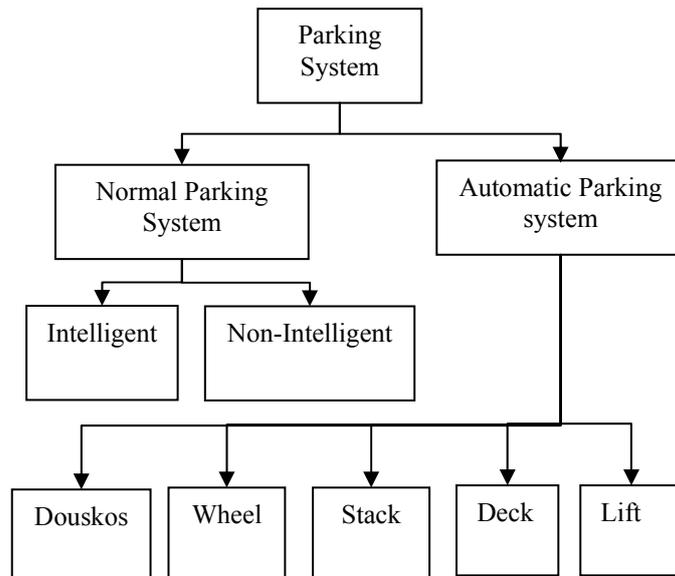
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                        ┌─────────────┐
                        │   Parking   │
                        │   System    │
                        └─────────────┘
              ┌──────────────┴──────────────┐
      ┌───────────────┐            ┌──────────────────┐
      │ Normal Parking│            │ Automatic Parking│
      │    System     │            │     system       │
      └───────────────┘            └──────────────────┘
        ┌──────┴──────┐
 ┌────────────┐ ┌──────────────┐
 │ Intelligent│ │Non-Intelligent│
 └────────────┘ └──────────────┘

 ┌────────┐ ┌───────┐ ┌───────┐ ┌───────┐ ┌───────┐
 │ Douskos│ │ Wheel │ │ Stack │ │ Deck  │ │ Lift  │
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Fig 1: Parking systems classification

From the literature review, automatic parking system is more efficient in term of time management; however, the system involves technicality such having too many systems' features making the system extremely costly to develop or buy.

1. Background

The case study was done in a one of the largest parking area in Malaysia. The parking system handles up to 30,000 visitor vehicles in adjacent car parks daily as it is situated in a large shopping malls, cinemas and offices. The management of too many cars in the locality makes the parking system complex.

The objective of the case study is to investigate the utilization of parking system and the problems faced by the people using the parking system.

2. Methodology

The study involves a quantitative approach to capture the current problem with the management of parking system, system development to develop the new parking system using intelligent approach, and tested using simulation techniques.

A quantitative study employing survey questions as the research instrument was used in the case study. The surveys were distributed to people using the parking system to park their cars. There were 32 respondents, consisting of multi ethnic group and aged between 18 to 30 years. Most of the respondents highlighted one common issue: time taken to find space to park their cars.

The result that came out from the survey as fallow:

1. All the people faced problem using the current parking system.
2. The age between18-30 signifies the group of people who like to do shopping and see movies.
3. Different races its mean that the foreigners' were also involve with the parking problem.
4. Analysis of the responses indicated that 63% of the respondents have problem in finding the parking space. This indicates there is a serious problem with the management of the current parking system.

As a summary, the analysis of the surveys' data shows that many people are not happy with the current management of the parking system and the flexibility of finding empty space to park their cars.

The design of the intelligent parking system is developed based on the analysis of the survey. The design focuses on showing the specific available parking space for car park users at the entry point of the parking system; that is at the point they take the parking ticket. Hence the system requirement include

(a) To implement a system to indicate the available parking spaces for the car owners. This current management of the parking system has been improved by saving the need to search for available car parking spaces. The new system will indicate the available car park spaces using a monitor at the entry point of the car park.

However, there can be a problem in ensuring the car driver goes to the indicated available parking space. This calls for the need of the image detection system. Hence this research uses image processing and CCTV'S to detect the car movement in the parking system via the car registration number.

- Image Detection System

Many of image detection systems have been implemented and its restriction has offered, these restrictions are sometimes overcome through expensive and complex systems. The need on this research is a versatile (licenses plate recognition) LPR system that yields good results running on a low-cost platform in a controlled environments. Based on

some principles of neural networks, that is fast enough to be applicable in camera-in-motion, the system embed the use of plate recognition in, with the specific parking ticket the system will be optimum (Jeong 2006).

- CCTV'S

CCTV (Closed Circuit Television) is a visual surveillance technology designed for monitoring a variety of environments and activities. CCTV systems typically involve a fixed (or "dedicated") communications link between cameras and monitors, in our work CCTV involve as shown in the flow chart somehow it will make the system complement by adding level of management on the parking system
The CCTV'S in this system will be distributed as two CCTV in each area, next Figure showing how the CCTV'S distributed in the park areas (Tang 2006)
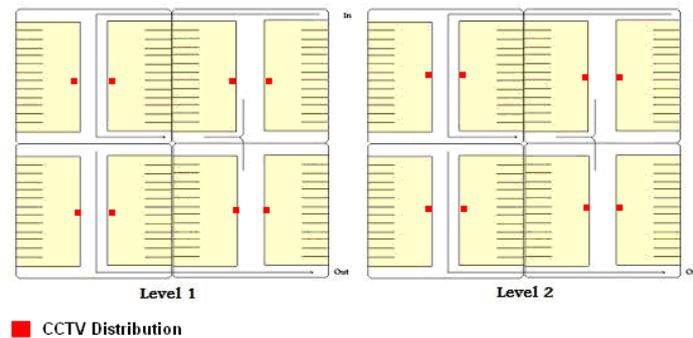

Fig 2: CCTV'S Distribution

There is another CCTV'S in barrier to take the pictures for the car's plate come in, However this park cover by many CCTV'S   but still its not that cost comparing to automatic car park, the goal of this research is to reach high level of management with the lowest cost, figure 3 showing the CCTV on the barrier (Lopez 2007)
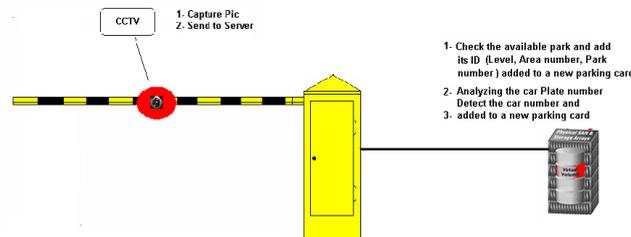

Fig 3: CCTV on the barrier

Next section will review how the new design work with some experiment scenario which may present the most problems in the parking system and how is going to be solve

3. Discussing

There are different scenarios when people use this improved parking system. Below is the discussion of two scenarios:
- First scenario

The guest come to the reader request for ticket , before this guest go to the barrier he / she may see the signboard out which connected to the system , it shown whether there is available park or its already full
If its full then they may go to the another barrier , perhaps they go to the barrier already and request for ticket , in this case the car park is full , therefore the reader will give them a ticket without park ID and allow them to leave within ten minute from the exit barrier
If the car park is not full then the guest will request a ticket from the reader
Ticket generation require two processing
- Check an available park and add its ID to the ticket
- The CCTV on the barrier take a picture for the car plate and send it to server

The server will use the plate recognition system to extract the car number and added to the ticket.
Later on we will discuss the use of this number on the managing the car park, after that the ticket will be generate involve the car plate number and the specific park ID

Then the barrier will be open and the driver will go through barrier to his/her own park and mission have been completed
- Second scenario

If the guest go to his own park and find someone who park there , in this case the guest will go to the nearest reader fine reader and put his ticket in the reader

The reader will make two actions as follow:
- The first action that the reader make it is to order to the CCTV for the specific park , take a picture for the plate of the violation car , the plate recognition and analysis plate and charge fine on the ticket that has the same car plate number
- Issue a new car park ID hence he / she may space be able to have a new car park for parking
  The guest will go to his own park and the mission has been completed.
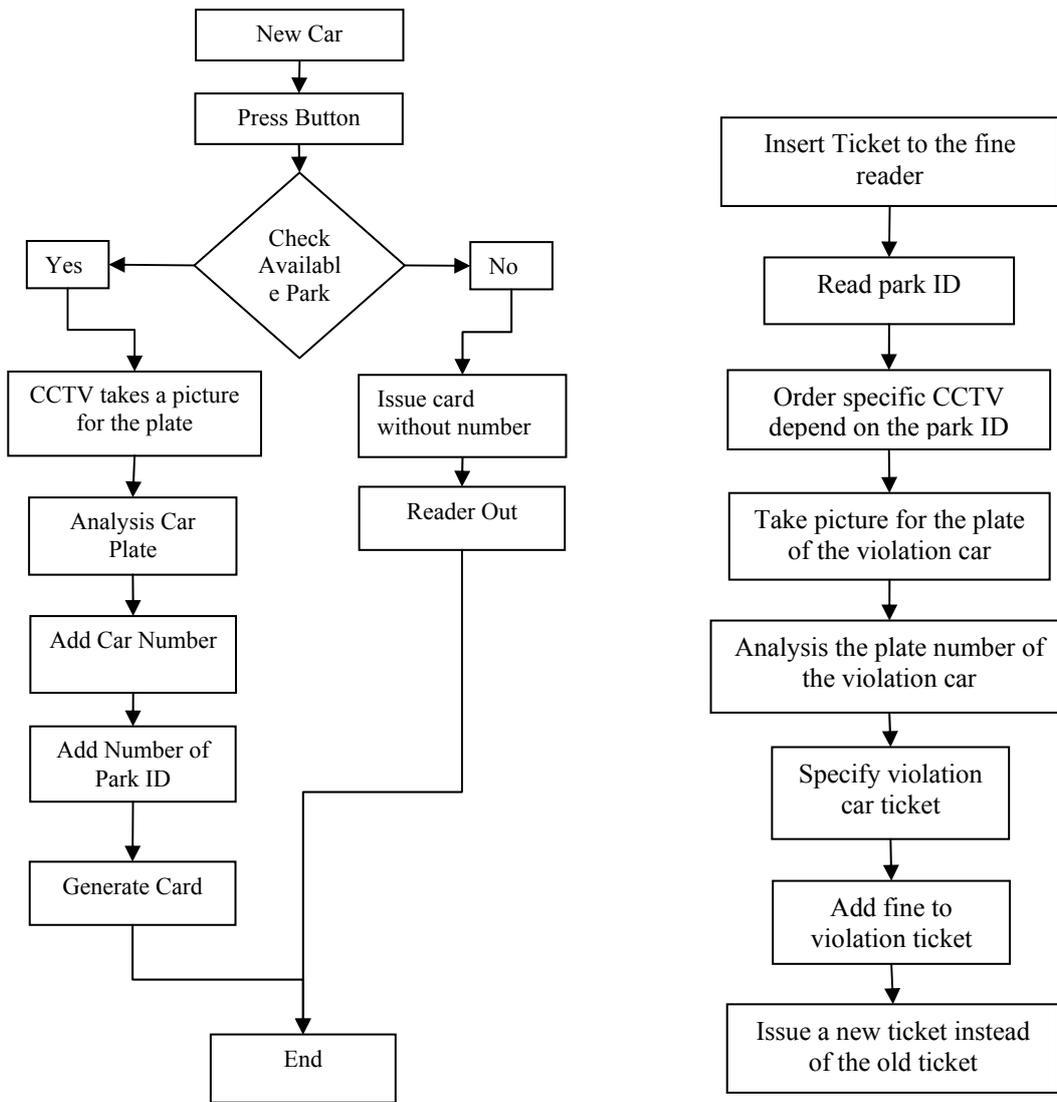
(a)   (b)
Fig 4: (a)(b)Flowchart for the intelligent parking system

- Third scenario

If the car park full, then the reader will issue a new ticket without number and the gusset will be able with 20 minute to leave the park

4. Conclusion

Currently, management information system Play an important role in the life, however many of systems are poor and need to be progress.

With all these growth in the Malaysian building, sophisticate economy and these entire enlargements, Malaysia parking system still under the low Ingredients to fit with this nice city.

This research have been focus on improving the Malaysian parking system to be suitable for the life style , this paper also discuss how to use the information technologies and image processing to implement a high management parking system to reduce the problems and the weak that already appointed in the Malaysian parking system.

The paper also define and appoint the problems by making survey and proposed a system which already tested by offering the problems scenario and how the system deal with it.

5. Acknowledgements

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