Using the Concept of Management Information System to Improve an Effusive Intelligent Parking System

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Abstract. MIS is interchangeably known as management information system or management information service. MIS refers broadly to a computer-based system that provides users with the tools for organizing, evaluating and efficiently running their organizations.
In this paper we review the techniques used in parking systems. In particular we describe how the principles of MIS are used to 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 and also discus of involving the sensor and having an efficient design overcome the current problems at the parking system at Malaysia

(Keyword): intelligent parking systems, sensor, management information system

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).

Type of parking system

There are two main type of parking system as a title on the parking systems classifications full automatic parking system and normal parking system and there are to many sub type from each one figure 1 showing the parking classification

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                        ┌──────────────┐
                        │    Park      │
                        │   System     │
                        └──────┬───────┘
              ┌────────────────┴────────────────┐
     ┌────────▼─────────┐              ┌─────────▼────────┐
     │  Normal Parking  │              │ Automatic Parking│
     │     System       │              │     system       │
     └────────┬─────────┘              └─────────┬────────┘
        ┌─────┴──────┐                           │
  ┌─────▼─────┐ ┌────▼──────────┐                │
  │Intelligent│ │Nun Intelligent│                │
  └───────────┘ └───────────────┘                │
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 │Douskos │ │ Wheel │ │ Stack │ │ Deck  │ │ Lift  │
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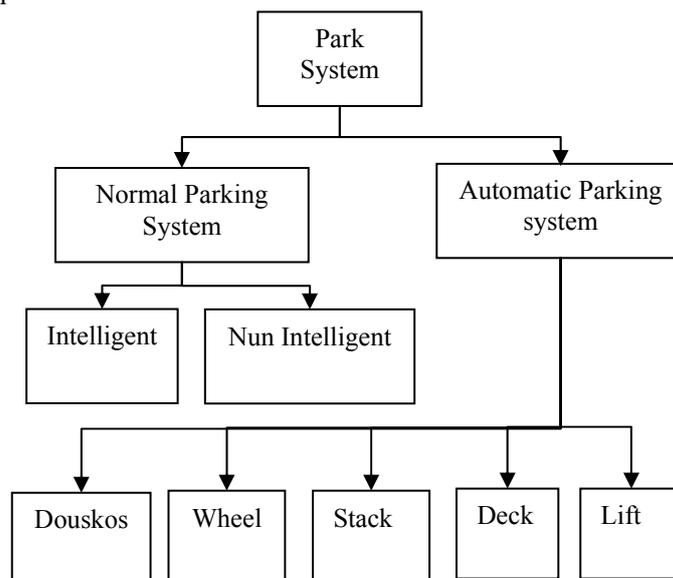
Fig: 1 parking systems classification

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 (Lübbe ,2007).

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 requirements include 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 Hence this research uses sensor notification and intelligent system to direct the driver to specific Empty Park.

A *sensor* is a device, which responds to an input quantity by generating a functionally related output usually in the form of an electrical or optical signal. During the past two decades, there has been an unprecedented growth in the number of products and services, which utilize information gained by monitoring and measuring using different types of sensors. The development of sensors to meet the need is referred to as sensor technology and is applicable in a very broad domain including the environment, medicine, commerce and industry. Governments and policy makers throughout the work are realizing the potential benefits of encouraging the growth in sensor technology not only as a result of new technological trends, and hence new products, for the indigenous industry to in fact improved product quality and efficiency by broadening the level of control over their processes, but also in support of the implementation and enforcement of government legislation on environmental and safety issues (Hovanessian 2007) (Tang 2006)
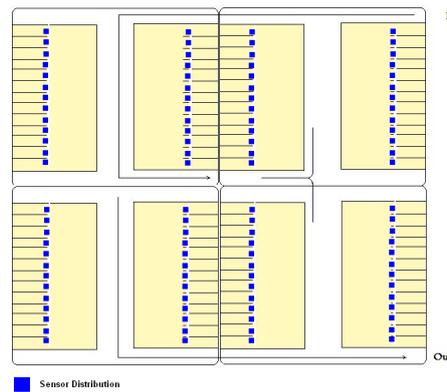

Fig: 2 Sensor Distributions

Sensors are located in all parking spaces to notify the system status of the park whether the space is empty or occupied.

3. Discussing

Based on the findings of the case study conducted, there is a need for a better management of the parking system. This system focuses on how to direct the car driver to a specific car park. In this study, the researcher uses sensor notification system to detect availability of car park spaces.
The system developed based on simulation technique. The details of the system are discussed below. Refer figure 2 for the flowchart of the system.

   a)   Entering the car park
When a car wants to enter a parking area, the car will approach an entry barrier. The presence of the car is detected by a sensor under the road surface, and a 'Press Button' display is flashed on the control pillar. The customer must press the parking ticket button on the control pillar and a ticket is printed and issued. The ticket must be printed within five seconds. A 'Take Ticket' display is flashed on the control pillar and the specific available parking space is displayed on a monitor for the customer. The information of the specific parking space is given in terms of floor (level) area and car park number (for e.g. floor / level 2, parking space 10). If the car park is full, no ticket is issued, and a 'Full' display is flashed on the control pillar.
The ticket issued to each ordinary customer has a bar code on it. The bar code has a number on it and level, area and number of park the system send the driver to it and the date (ddmmyyyy) and time (hhmmss) of entry to the car park. The number, date and time of entry are also printed on the ticket in human readable form. The details of the ticket are stored: ticket number, issue date, issue time, issuing machine.
The number of vehicles in the car park is incremented by 1 and a check is made against the capacity of the car park. If the car park is full, then a display near the entrance is switched on to say 'Car Park Full', and no further tickets are issued until a vehicle leaves the car park.
Once getting the parking ticket and once the specific parking space has been displayed to the car driver, the driver can go direct to the park space. This resolved the issue raised by respondents in the survey where they spent too much time searching for parking space. However, there may be a situation where the driver fails to park at the specific parking space displayed to him; for example, he finds a nearer car park space number (for e.g. floor / level 2, parking space 2).
In this situation, the sensor at where the driver parks the car will detect that the space has been occupied and information will be sent to the computer at the main car park entrance. The computer will update itself by indicating

that parking space number (floor / level 2, parking space 2) as full. The initial car park information displayed to the car driver number (floor / level 2, parking space 10) is also updated as available space.

In situation where the driver entered the parking space but do not want to park, a ticket is still issued at the parking entry point and the available parking space is displayed but as long as he exits from the car park within 15 minutes, then no parking charges is imposed.

    b)   Exit from the car park

If a car is leaving the car park, the parking fees need to be paid at any of the parking payment kiosk. The parking fee is depending on the hours used of the parking space. One payment has been made, the ticket will be printed with the time used and parking amount paid. The car driver needs to insert this ticket at the going-out pillar. Once inserted into the ticket machine at the going-out pillar, the ticket will be retained in the ticket machine and the parking barrier is raised allowing the car to leave the parking lot.

 A sensor on the other side of the barrier detects when the out-going car has passed and the barrier is lowered. When the car exit from the car park, the number of car park in the parking lot is decreased by 1 as updated into the computer as available space.

A feedback survey conducted by the researcher concluded that the new parking system is more efficient in managing the car park and it solve their problem in searching for car park spaces. This gives advantage in terms of cost and time saving.
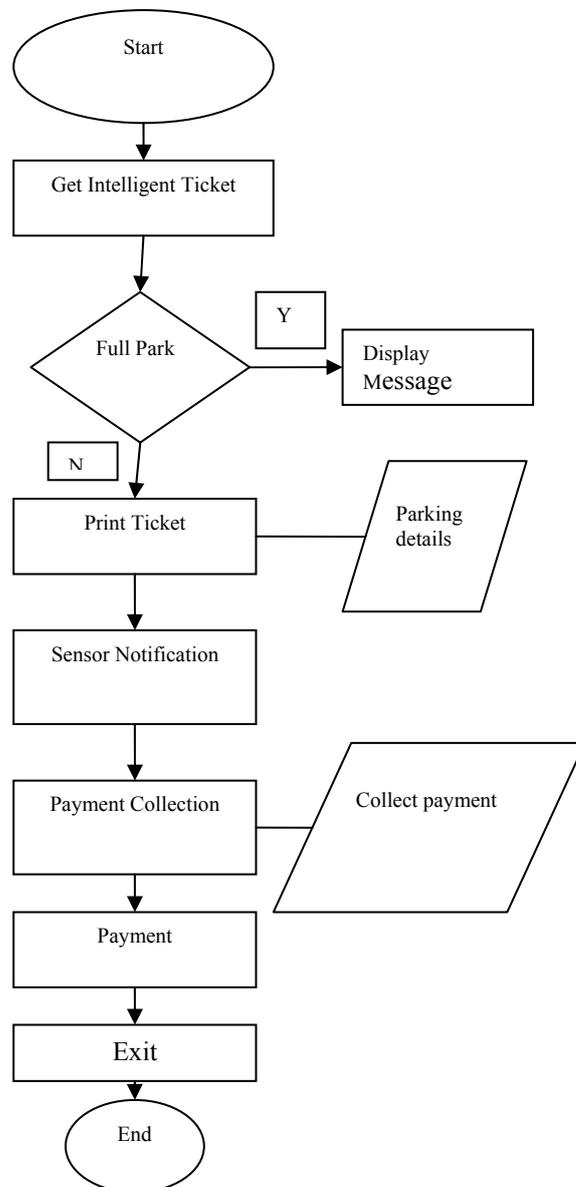

Fig : 3 Flowchart for the intelligent parking system

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 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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