

IMPLEMENTING A PARKING GUIDANCE SYSTEM IN SINGAPORE

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ABSTRACT. The paper discusses the implementation of a Parking Guidance System (PGS) for the Marina Centre area. The PGS informs motorists in advance on the availability of car park spaces in major buildings before they reach their destinations. This will shorten the time spent by motorists in searching for car park lots and in turn reduce circulating traffic on our roads. The information is displayed on electronic signboards erected along the main approach roads to these major buildings. The implementation approach adopted and the use of PGS to optimize the road usage would be presented.

1 BACKGROUND

Circulating traffic searching for parking lots in the city area is mostly contributed by motorists who do not have regular parking lots i.e. those who drive there for shopping and/or dining. These motorists usually head for parking facilities closest to their destinations or familiar to them, unaware of other vacant parking spaces in the vicinity. As traffic in the vicinity of popular shopping developments in the city area is usually heavy on weekday evenings, weekends and during the festive seasons, motorists may spend more time circulating on the roads searching for available parking spaces or queuing outside the car park entrances.

As a result, many cars form long lines to get into parking lots, or roam the roads in search of parking. Traffic congestion resulting from parking shortage, therefore, has become a serious problem and requires corrective measures. As part of a solution to this problem, a parking guidance system designed to contribute to efficient use of existing parking facilities has been introduced. The PGS is designed to aid motorists in the search for vacant parking spaces by directing motorists to car parks where parking spaces are available. The objective is to reduce search time, which in turn reduces congestion on the surrounding roads for other traffic with related benefits of reducing air pollution with the ultimate aim of enhancement of the urban area. It also shortens the queue of car waiting to get into popular car parks and thus minimize its impact on the road network.

With the PGS, information on the locations and availability of parking spaces would be available to motorists driving to the area. Motorists therefore, no longer need to search for vacant parking spaces. Instead, they are guided to the next nearest

available parking spaces and, hence, the amount of parking search or circulating traffic will be reduced.

A PGS aims to:

- a. Reduce the number of vehicles circulating on the roads;
- b. Better distribute the parking demand to car park lots that are available;
- c. Help visitors to the shopping developments find parking spaces more easily; and
- d. Enhance the travelling experience of motorists, hence improving the image of the city.

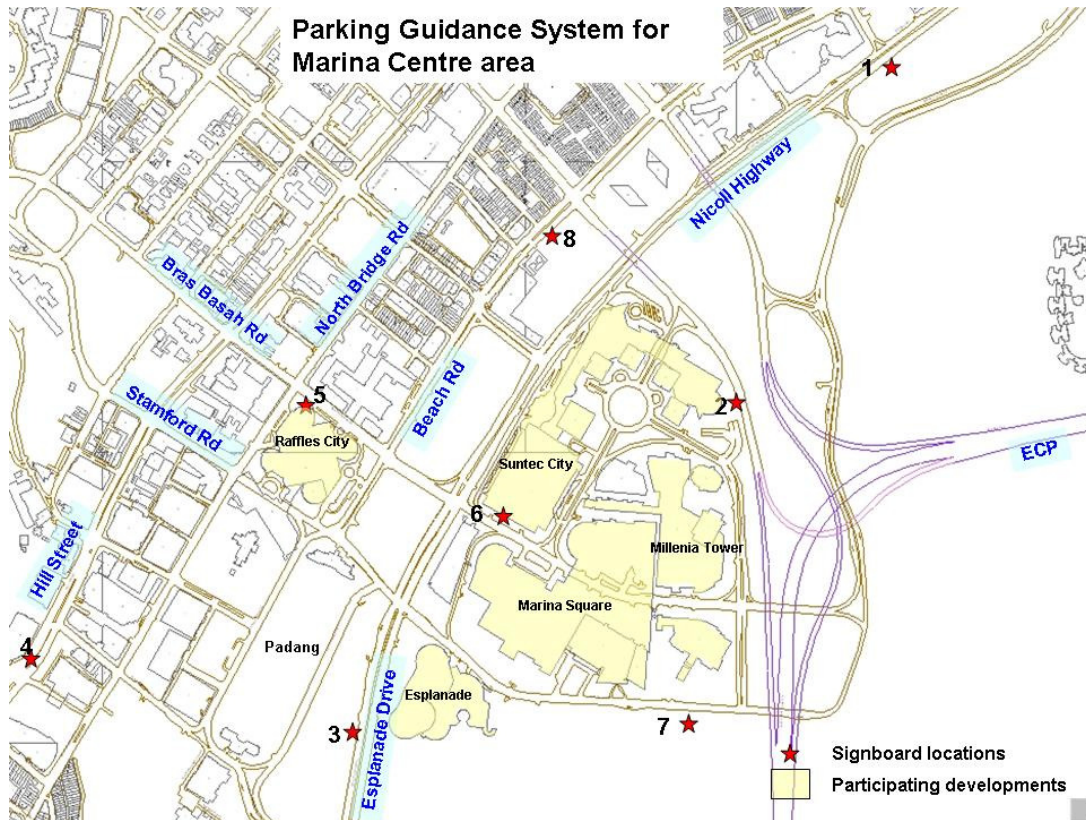
2. IMPLEMENTATION APPROACH

A popular shopping area in the city, i.e. Marina Centre, was considered for the pilot implementation of PGS.

To inform motorists of the parking situation in the Marina Centre areas, parking lot availability are made available on Variable Message Signboards (VMS) located on major approaches to the area. The main approaches to the Marina Centre area are from Nicoll Highway, Bras Basah Road, Esplanade Drive, Eu Tong Sen Street and River Valley Road.

The PGS for Marina Centre area was commissioned on 15 Apr 2008. The total cost of installing the PGS with 8 signboards is approximately S\$700,000.

The 8 signboards are strategically located to allow all drivers, including those already inside the Marina Centre area, sufficient information to plan in advance which car park to use (see map below for the location of the signboards). During a typical evening peak, i.e. from 6pm to 8pm on a Friday or Saturday, the parking information provided by the signboards will be able to adequately advise drivers on the availability of parking lots at the developments.



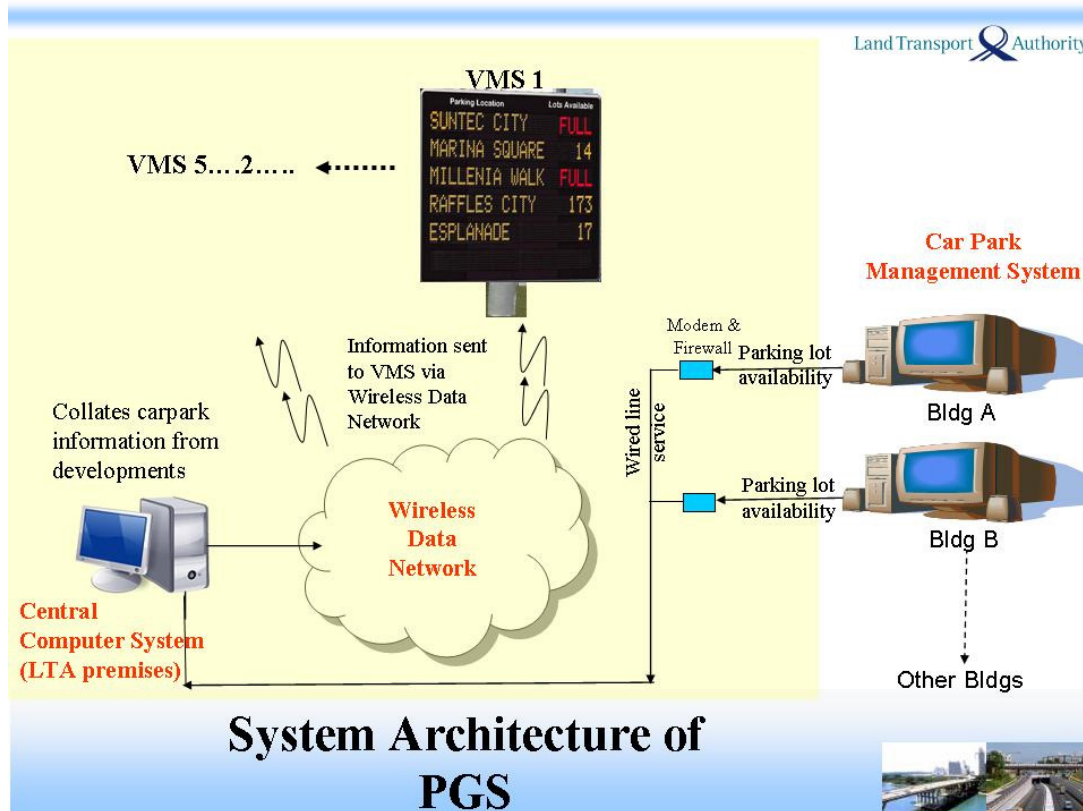
3. DETAILS OF THE PARKING GUIDANCE SYSTEM IMPLEMENTED

The PGS aims to encourage a more efficient use of existing parking facilities and reduce the amount of parking search traffic through the provision of information to drivers concerning the locations and availability of parking spaces.

The PGS essentially comprises:

- a. A backend data-collection systems at the car parks
- b. A Central Computer System
- c. Electronic signboards positioned at strategic locations
- d. Telecommunication medium linking all the 3 components above together.

The system architecture of the PGS is as below:



How the PGS works

The equipment at the car parks consists of an industrial PC. Information from the individual car parks is sent to the Central Computer System (CCS) at LTA's Intelligent Transport Systems (ITS) Centre, River Valley Road using a wired ADSL line service.

The CCS, then disseminate the information to the respective electronic signboards via a GPRS data network (see system architecture of PGS above). Besides collating the information received, the CCS will also monitor the connection status, monitor the LED display, control the transmission or reception of the car park information and monitor the health status of all PGS equipment.

The signboard installed is designed for performance, ease of access, maintenance and installation, and also reliable operation in outdoor environment. The signs comprised of small modular LED cluster panels with other devices such as power supply and other driver circuit boards housed in a metal case.

Due to the bright conditions and hot weather during sunny days, the LEDs used are able to provide sufficient brightness and also able to operate at high temperatures. The Red and Amber LED lamps are made of the latest solid-state LED materials – AlInGaP, and Green LED lamps are InGaN.

The signboards are also used to display predefined messages such as “**HEAVY TRAFFIC ALONG RAFFLES BLVD**” and road conditions for planned events in the vicinity. Operators at the ITS Centre can use the PGS to display free format text or pre-defined text for unexpected/special event.

Linking the 3 components of the PGS (backend data-collection systems at the car parks, CCS and signboards) are the telecommunication lines. A 64Kbps ADSL provides the connection to the CCS while a GPRS wireless network provides the connectivity from the CCS to individual signboards.

4. BENEFITS OF THE PGS

The benefits that can be expected are:

a. Efficiency

During periods of peak demand and congested driving conditions, drivers will, by driving directly to a car park containing available car spaces, reduce travel time. On average, over the whole network, this will have the effect of reducing the volume of vehicles using the road network. This fall in traffic demand will reduce congestion for those not seeking parking spaces.

b. Environment Impact

A fall in vehicle emissions and noise can be expected due to reduction in congestion and distance traveled.

c. Safety

Safety will be improved due to reduced congestion and distance traveled.

d. Quality of Service

Parking information for drivers can be seen as a significant improvement in service quality. With parking information readily available, the frustration of motorists looking for available parking spaces would be reduced, thus saving them precious time.

e. Reduction of Illegal Parking

With the systematic display of parking availability, motorists will be less likely to park illegally because of better knowledge on where the available parking spaces are.

Examples on use of PGS to optimise road usage

Example 1

When an event or exhibition takes place in Marina Centre, car parks in the area are usually full. Vehicle queues and congestion are commonly seen outside the car park entrances. Along Nicoll Highway, motorists would be informed of the car park availability at the shopping developments in the Marina Centre area through the signboard at that location (refer to location plan). If the display indicates that there are no parking spaces available in the Marina Centre area, motorists could then make an informed decision on whether to still proceed to the Marina Centre area or to divert to an alternative location to park.

Example 2

Coming from Eu Tong Sen Street and River Valley Road, motorists would travel along St Andrew's Road via High Street / Parliament Place to get to the Marina Centre area. If signboard 4, located along Hill Street, shows that there are no available car park lots in one of the developments, motorists heading to the Marina Centre area could avoid going there, hence reducing the traffic volume on the road leading to it.

5. OTHER USES OF PGS

An important strategy in traffic management is keeping motorists informed of adverse traffic conditions in the areas they are heading to. The PGS' VMS could also be used to inform motorists of adverse traffic conditions in the area due to incidents or accidents.

Moreover, the VMS could be used to disseminate information on planned events in the vicinity of the shopping developments, advising motorists to avoid the area or use alternative routes.

6. EVALUATION ON THE EFFECTIVENESS OF PGS

To evaluate whether the PGS is successful in achieving its aims, a "before" and "after" study of the system would be conducted after operating for a period of three months. During this period, various data collection would be carried out. Collection of data for the "before" phase will be carried out prior to the commissioning of the PGS. The "before" and "after" data will be used to evaluate whether the trial is successful at the end of the 3-month trial.

The evaluation would cover 2 broad areas, namely, the system aspect and the traffic aspect. The evaluation is in progress at the time of submission of the paper and the following is to give a perspective of what each evaluation will cover.

System Evaluation

Accuracy of parking availability information

The PGS displays the number of available parking spaces at the participating developments. It is important that the information displayed on the VMS is accurate and up-to-date so that motorists can act confidently on the information. To assess the accuracy of the information, the number of available parking spaces displayed at the VMS and the actual number of available parking spaces at the participating developments will be compared.

System reliability

It is important that the PGS works reliably at all time. To assess its reliability, the number and duration of equipment failures will be recorded and compared against our total system availability requirement of 99.5%.

Traffic Evaluation

The traffic evaluation would cover the following areas:

Car park occupancy rate

PGS aims to better distribute the parking demand to car parks that are available. A comparison of the “before” and “after” occupancy rates of the car parks would be conducted. An increase in the average occupancy rate in the participating car parks where it is normally lower may indicate that PGS has been successful.

Volume count

PGS aims to reduce the amount of traffic searching for a parking space in the Marina Centre area. However, as it is difficult to accurately measure the amount of circulating search parking traffic in an area, the number of vehicles queuing outside car park entrances “before” and “after” PGS implementation will be measured instead. A reduction in the queue length outside the car park entrance may indicate that some motorists may have gone to nearby developments with more car park lots available.

Together with the average occupancy of the participating car park, the results will indicate the effectiveness of the PGS.

Traffic speeds

With a reduction in circulating traffic, traffic speeds along the roads leading to and within the Marina Centre area is expected to increase. The “before” and “after” speed information would be compared to determine if there is a noticeable difference.

Feedback from participating developments and motorists

One of the main concerns shopping developments have in participating in the PGS is the loss of business when their car parks are full. Feedback from the participating developments and motorists will therefore be gathered to assess its usefulness and impact. The feedback gathered could also be used to fine-tune the system. The feedback gathered will prove whether the concerns of the participating developments are valid. This could be useful when we persuade developments to participate in new PGS in other areas.

7. CONCLUSION

The PGS is expected to shorten the time spent by motorists in searching for car park lots and in turn reduce circulating traffic on our roads. Traffic along roads leading to the shopping developments is expected to be smoother with corresponding improvement in the environments. By minimizing queues for parking and spreading the parking demand to other areas, it would increase the road capacity and also helps reduce illegal parking.