

Name: JOANY ANAK JORES

Course: DESIGN VI

HW2 02/03/2012

I pledge my honor that I have abided by the Stevens Honor System

SMART PARKING SYSTEM (S.P.S)

Observed problem:

When you drive into a parking lot, you will never know if there is exactly an empty space for you or how many spaces are there left. Even worse, you will never know on which floor of the parking complex where there is availability to park your car. You just wander around the parking lot looking for an empty space and hoping that you will be lucky enough to find one. Well, you can search the entire lot for an empty space but then that would cost you time. It would not be time efficient but certainly can be frustrating. That is when Smart Parking System comes.

General idea:

The fundamental idea for this system is to solve the common problems raised by the previous parking system. The purpose of the system is to provide the user with accurate information about the parking lot. The information will include the availability of any empty parking spaces, on which floor do the spaces exist, the number of car inside the entire space or on the entire floor and the status of the empty space. For special purposes, the user can make reservation on specific allocated parking space for special use (beta stage). The information gathered is in real time.

Suggested implementation:

The system is quite universal. The system can be implemented both indoor and outdoor parking lot.

- i. For indoor as inside residential building, offices, companies, or shopping complex, the system will have different working components. Sensors will be used at any in or out doors. The sensor will count how many cars drive in or out the parking lot continuously through time. The system will compute how many cars and how many empty spaces in the parking lot. Apart from that, visual indicator will be used to help user to locate any empty space and to inform how many empty spaces are there in the entire complex or on each specific floor. GPS can be used to locate the user on which building is available.
- ii. For outdoor use, commonly in public parking lot, the system will have different working components. Parking booth can be equipped with GPS to locate the nearby user looking for an empty space in a busy street. The GPS can only turn on when there is availability in the lot. The parking booth will keep track the parking time for each car parked or whether the user has paid or not.

Potential impact:

The system will have a direct impact to any vehicle user, commonly car drivers. It can be implemented on both indoor and outdoor premises to manage parking more efficiently. For example, employers can save more time on parking lot and this should help them to be punctual. Other than that, residents could manage their time more efficiently on a daily basis or in case of an emergency. The greatest impact when the system is commercialized user would be more organized and more productive. They will be care free and more confident. The saved time can be used for highest priority work. The implementation would ease the fast growing society in their hectic lifestyle.

Product sales:

The system is a medium scale product which means that it is only available for services and not for individual user. The system would be on market as packet which contains several module and sensors. Collaboration with GPS company, Android development company and parking management company would be established so that the information gathered by the system are able to reach the user in more intuitive way. Android software program can be created for the widespread android platform users. Several add-ons can also be added to the existing GPS module which includes several menus for the parking lot locator.

Stakeholders' analysis:

To develop and to implement the system publicly, several stakeholders will be involved directly and indirectly. There are three different stakeholders namely the user, client and the designer.

i. Client

Client is an organization who is interested in funding the project: its research and its development. Organizations which will be directly involved in this project are the GPS, parking management, automobile and sensor system. These companies could all be the investor in this project. Potential investors could be the GPS Company such as GARMIN and the parking management such as Hoboken Department of Transportation. These investors are crucial for the project since it involve the implementation of their idea, parts or perhaps patents for this system. In addition, their objectives and their concerns can be the key components for the system. Indirect clients could be from the department of safety or the state administrator. To implement newly created system in an existing community, consultation form the department of safety is needed. If the system possess more danger which compromise the safety of others, the system has to be terminated. In addition to that, if the performance for such system in public space but yet very costly, state administrator could call off the project for they have to prioritize their state budgets. Other indirect client can also be the organization who will run and maintain the system once it has been implemented. These clients have to be considered in the development of

the project because the market value, the safety, the challenge, the estimated time for completion or the physical of the system can easily be pointed out and improved.

ii. Designer

Designer is a group of people responsible for the development of the design project which includes problems solving and ideas generations. For this project, designer with wireless communication as well as electrical engineering backgrounds are needed. Nevertheless, engineering management specialty is also needed so that the design is pre-examined. Other designer involved in this project could also be from the automotive side since we want to implement the system to a car and so on.

iii. User

The user is a group of people who will be using the system and gain benefits from the implemented system. The targeted user for the system will be the car driver. The system helps the user to park their car more efficiently and time saving. The brief descriptions regarding the operation of the system is discussed in the earlier section.

Cost and time analysis

The estimated time for the completion of the project is about two months. Since the project involve public user, careful observation has to be made before reaching any decision. Most of the time will be spent to carry out survey, to collect data and to analyze the data. These data are crucial because it shows the public responses to such system. If public responses is not as expected, revision or changes to the system has to be carried out to deal with any problem raised by the user. An amount of time will also be spent on the development of the project. The development phase will include problem solving before and during the implementation of the system, system model testing and simulation. Additional time must also be considered to see the performance for the first two months after the installation.

The estimated cost for the installation of the whole system might be in the order of ten thousands dollar. However, the cost for the system model is much lower, in the order of hundreds dollar. System model is prototype of the real system but scaled precisely to smaller module. In addition, cost can be reduced further when simulation tool is used. The disadvantages of using simulation are complex scenario will take more time to finish and considering the limitations of the simulation tool such as variables and parameters, the simulation will give only an approximation or prediction to the real system. Fortunately, for this project initialization step by using simulation tool is considered relevant and reasonable.

Other skills requirement

List of skills required:

- Wireless communication
- Omnet ++ programming
- Engineering management
- System theory

These skills are the pre-requisites for the development of the project. Note that Omnet++ is a simulation tool which will be used intensively during initialization phase. Little background in engineering management is also accepted.

Scopes:

i. Strength

The objective of the system is to provide information to drivers the status of the parking lot. The implementation of such system in a building for example will increase the efficiency of the parking lot by providing information such as the number of free parking spaces, the location of that parking space and the level of that building. Consider a parking complex with several parking floors. Searching for the free space on each floor is time consuming plus inconvenient for some people living on that particular floor. Another impact it has is it reduce traffic congestion. The implementation of the system in a shopping complex or office building will reduce traffic congestion during peak hours. The system will direct the user to the location of the free space including on the floor level more systematically than ever before. By reducing the amount of time spent in traffic congestion, people can save their precious time doing something more important. Besides that, by reducing traffic congestion the emission rate of harmful gas from the vehicle to the atmosphere can also be reduced significantly.

ii. Weaknesses

The expected weaknesses of the system are misleading information and system lagging. Since the system provide information to the driver where to park their car, wrong calculation by the system can cause misleading information to the driver. The expected time when this can happen is when one of the sensors is malfunction. The whole system contains interlinking modules which include peripheral such as the sensor module. If one of the modules is malfunction, the whole system would crashes. To fix this, an amount of time and money will be spent. Misleading information can cause more severe traffic congestion and cost even more time. Furthermore, system lagging can also be one of the problems during peak hours. During peak hours, the system receives more information than ever before. The input output channel will be overloaded. The system might not be able to compute more efficiently and the buffer memory might not be able to contain that information, therefore the system lags. System lag can also cause traffic congestion.

iii. Opportunities

The implementation of the system publicly provides more benefits to the people. The additional proposal is to extend this information to the user using user-friendly applications such as android apps. By doing so, android apps development is forced to work to meet this demand. At last, the evolution of more user-friendly apps would be created. User would find more versions of the apps and this would increase the probability to create a market. Other than that, market opportunity can be established physically in terms of the modules used by the system. These modules include the sensor, the processor, the monitoring devices, visual aids and the gps. Since the system is the combination of a bunch of modules, custom design might be required depending on environmental parameters and software limitations. In addition to this is the job opportunity. Such intelligent system needs maintenance on a regular basis. Therefore a qualified technician is needed that should guarantee the optimum performance of the system for a long period of time.

iv. Threats

One of the foreseen threats in the system is privacy. The objective of the system is to provide information to the user. However, the system will also require information from the user. Since the system is interconnected to the user, information leaks will compromise the user's privacy such as his current location. Log files can be accessed without permission by an unauthorized person or the connections can be jammed. Either one, the information about the user is made public. Another problem might come when the system malfunctions or crashes. During the malfunction period, the system would not be able to provide information anymore. The malfunctioning system needs an amount of time to be fixed and this will cause money and time.