**Creating Smart Parking Solutions for a Better Environment**

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**State of Art in Various papers**

The building of smart cities rely heavily on the availability of data from various different divisions of the administration. With the advent of the big data a lot of decisions are made to provide better services to the citizens. Further with a lot of attention given to the climate change we have need to ensure proper decisions needs to be made. A Smart city is one where all the major developments assets of city is brought under one system to monitor and secure and safe functioning of the department. With the advent of the smart functioning systems monitoring and streaming real time data is very easy. This coupled with the invention of smart phones it makes it easier for the administration to connect with the citizens. This also enables the authorities to manage the systems in an affective and proper way.

Transportation system is the life line of the cities. With the efficient transport management systems will be essential for effective monitoring of the traffic and pollution monitoring of the system. With booming economy of the world, increase in the millennial population the consumer base for the automobile industry is at its peak. This is also raises a number of concerns with the increase in traffic congestion and also the pollution levels in a city. The increase in pollution levels are causing a considerable damage to the environment. Hence if a considerable amount of interest and planning is given to the transport management systems and the parking management which will in turn be helpful in controlling pollution and will also be time saving for the citizens which one of most priced commodity.

Parking and Transport system are third largest revenue generating the medium in any economy. If this is managed properly we can not only create a lot of revenue but also if managed properly will ensure lesser pollution. There are a number of projects which are carried out in various parts of the world where people where people are working on systems which are helping citizens and cities plan their transport systems in a better way.

They have been a number data scientists and analysts who have worked on the concept of effective parking and transport management systems. The scientist have worked in various cities to identify the needs of these systems. And each time this was introduced in different city there have a number of the drawbacks and in the process of designing a system.

In the first instance there were a researchers who worked on the cities which are well connected. For instance the city considered was San Francisco. In this cities some research was to ensure we are working on a parking spot detection. The first contribution of that paper was to help identify the systems which will give us the answers for the spot detection in parking management systems.

The other contribution of this paper is that this provides a proper the a good strategy to for training on street vacant parking spots detection based on the external vehicle images which will help in accommodating the parking spots.

The limitation of this paper was the city such big San Francisco identifying that the parking spots and sensor was not feasible in many places where parking was available.

Further the data scientist ventured into one of the smart cities of the world. The city was Aarhus in Netherlands. In this analysis the people of the transport management system analyzed the parking space for bicycles. In this case a chip was inserted in the bicycles which helped help them identify the parking spot using the parking detection which was synchronized with the parking management systems.

This experiment was later on expanded to motor vehicles which were able to find the parking with the given parking code. The limitation of this paper was there was they were not able to accurately design the parking management systems for the heavy motor vehicle like trucks, lorry, etc. This later formed a baseline for creating well informed systems which were useful in reducing the traffic and systems which also help also monitor the pollution levels of the city.

The next set of research was based on included allowing the citizen driving around use their smart phones to reserve parking at the near by parking slots which gives them the information and also gives them the direction of the reserved parking system. However this model couldn’t be allowed be employed for cities with a larger populations. Secondly the system was not efficient enough to impart rejection services and also load sharing services which impacted many systems in the integrated parking management system. Hence the next set of the research of was done on implementing cloud based computing purely for the scale of the vehicles we have in the current state of affairs. Which was later was synched to the sensors to help the in hassle free parking. Using the cloud computing environment it was easy to that distribute the quantity of work can be handled in a better way in generating the parking tickets and computing the cost of parking and the monitoring the parking availability on real time basis. And with the implementation of the cloud computing the load sharing is very accurately modelled and the systems are well informed. It was based on this cloud computing model an algorithm was developed to identify the near by vacant parking spot and ensure it assess the situations to give an accurate parking direction to the driver. This paper contributed in minimizing the parking search time and also ensured that accurate parking of the vehicles are done in the required locations.

The other area where the researchers have worked was done in California. The research conducted was the various Bay Area Rapid Transit stations in the east San Francisco bay area. The smart parking system is implemented where the traffic sensors are loaded at the parking lot. The sensors will be recording the number of vehicles entering the parking lot. Further a reservation system is in place which will be displayed on variable message signs (VMS) to alert the drivers of parking space availability. Later before and after survey analysis was used to evaluate travel effects, economic potential, and system technology for the field test. Implementations of these systems are useful in many aspects for the data analysts. The design of the parking systems will help in improving the following aspects in the transport system:

* Increase usage of transit services by the common public.
* Reduce vehicle travel in freeways.
* Lesser use of fuel
* Reduction in air pollution
* Increase in the revenue of transit

With the increase in the usage of transit services of the common public the state can generate a lot of revenues on the transit services which can be used for various other passes. With the effective monitoring of these systems real time updates about the traffic can be given to the citizen to can take an alternate route. With lesser use of the vehicles will lead to the reduction of air pollution in the city which will give way to cleaner air. With the efficient parking system in place it is also helpful for the police department to issue the parking tickets which will in turn to maintain the traffic discipline of the citizen. The most important feature of this parking reservation system is to identify the parking patterns and behaviors of the citizens which will help us plan our infrastructure better. It will give us a clear idea about how much parking slots are required at different part of the days.

In the fourth level of the system the research came up with some realistic models which will help us ensure that we have a proper understanding of the parking behavior of the citizens. The system developed was used to help the citizens identify the parking available within the closer to the driving radius. This will help the driver book the parking slot with a two mile radius and also give him the shortest route to reach the destination. This system is helpful in two ways in generating parking tickets and also ensures that the parking behavior are identified. Once the system is identified a prices for the parking can be regularized across the city.

The next level of research concentrated on developing the system which was integrated the parking systems with traffic updates and effective use of transport systems. When an effective parking system is the researchers were able to get a detailed behavior of the parking pattern. This detailed behavior pattern allowed the administration staff predict the bottle necks for the traffic congestion and ensure there were additional infrastructure was in place to ensure the smooth functioning traffic at one particular junction. This also ensured that the person who in charge of the security administration helped in the deploying the personnel at the places where the citizens need their help the most. Further in some cities the smart parking systems are used to ensure a standard pricing system is in place to and also ensure that there is transparency in the systems which needs to be used. The transparency in the system was one of the highlights of the system in this paper.

The next article was emphasized on ensuring the parking systems are built in a way in which the administration is able to control the traffic and parking issues over the weekend. There were research done in this aspect as much of the problems caused in parking happens mostly over the weekend. The research came up with an idea of image capturing of the vehicles over the weekend to understand those areas in the neighborhood where the public visits the most. Based on the analysis and parking patterns studied in the past and the real time streaming of the information the administration was able to plan the infrastructure and parking prices in the areas where the parking patterns were high during the weekend . This implementation was a huge success in a city of Netherlands where the administration ensured there were parking infrastructure available in those areas where the business were high. This in turn gave a huge profit not only to the parking administration but also boosted the profits of the business in and around that area.

The next level of research was to identify the reasons for the huge amount of time spent by the drivers to search the parking in a particular place. The next set of researched work close with the city government offices to understand the lack of infrastructure at the places where the traffic bottle necks were found. The researchers inserted a sensor in the parking slots to identify the time at which the parking was high and also inserted CCTV cameras in the parking lot of there were any outsiders who using the public office parking space for their personal parking . Post that there was an analysis done to understand the deficit of the parking spaces. After the analysis the administration came up with the plan which ensure a proper implementation of the rules and also ensure that price regulations were in place for the public and private which was profitable to both the parties. This emerged to be a good business plan where the problems of the parking were solved for the public administration office and also ensured that the parking slots were used when needed for other event purposes.

From the research work done so far it is evident that there is minimal work has been done to predict the poor parking arrangement on the environment. Hence we propose to work on identifying the parameters which affect the parking infrastructure and its effects on the environment, which every impact in today’s day and age. Hence we propose to analyze the data set given in collaboration with the pollution information given to understand the affects the parking has on the pollution and atmosphere in total.

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