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Smart Parking System

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***Abstract*—**In the development of traffic management systems, an intelligent parking system was created to reduce the cost of hiring people and for optimal use of resources for car-park owners. Currently, the common method of finding a parking space is manual where the driver usually finds a space in the street through luck and experience. This process takes time and effort and may lead to the worst case of failing to find any parking space if the driver is driving in a city with high vehicle density. The alternative is to find a predefined car park with high capacity. However, this is not an optimal solution because the car park could usually be far away from the user destination. The smart parking system can provide information about nearby parking spaces for the driver, based on Internet of Things (IOT) and to make a reservation minutes earlier using supported devices such as smart phones or tablet PCs. This services use the ID of each vehicle in booking a parking space. The smart parking system (SPS) constructs each car park as an IoT network, and the data that include the vehicle GPS location, distance between car parking areas and number of free slots in car park areas will be transferred to the data center. The SPS is based on several innovative technologies and can automatically monitor and manage car parks. Furthermore, in the proposed system, each car park can function independently as a traditional car park.

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I. INTRODUCTION

The increase in vehicle traffic in city centers, is one of the effects of the recent rapid population growth in urban areas. In addition to the negative impact on the environment, the increase in city traffic has multiple other consequences which as expected, include the increasing demand on parking infrastructures accessible to the general public. As a result, finding a vacant parking spot during peak hours is in many cases impossible. Drivers keep circling around wasting time and fuel while hoping that a spot will be vacated as they drive by; this creates further traffic delays and aggravation for other drivers. Recognizing the need to resolve the above issues and at the same time satisfy demand for parking spots and better services, parking management organizations are striving to implement solutions that work towards a more streamlined parking experience. Recent technological advances are bringing forward major changes in the traditional parking model. The fact that parking availability is monitored in real time, opens up an opportunity for the provision of smart parking solutions that facilitate advance parking spot reservation and dynamic pricing. By making such services available to the drivers, the operators offer an enhanced level of service to their customers while at the same time have the opportunity to increase their revenues. In this paper we present the latest developments in public parking infrastructures.

II. CURRENT SCENARIO

In India, there is an ever-growing population of motor vehicles, which is comparatively much faster in the rate of increase on our economic and population growth. The betterment in the world of technology, by enhancing the mobility while challenging the very existing system, the changes on the expansion of road networks has been eventually brought forward with it.

More than half of the world's people are living in the cities. So the cities have reached full of its occupancy. As people uses vehicles for transportation so there is large number of vehicles exists for people convenience. Most of the time people spend their precise time on searching parking lots to park their vehicles. Thus congestion occurs in the traffic it leads to a hectic job to find the parking space to park their vehicle. The most traffic occurs only because of vehicle congestion in the urban areas thus people are wasting time in searching the parking area abnormally to park their vehicles. Currently, the common method of finding a parking space is manual where the driver usually finds a space in the street through luck and experience. This process takes time and effort and may lead to the worst case of failing to find any parking space if the driver is driving in a city with high vehicle density. The alternative is to find a predefined car park with high capacity. However, this is not an optimal solution because the car park could usually be far away from the user destination.

III. NEED FOR SMART PARKING SYSTEM

In the information sphere domain, a filter is a system that can be used to modify, reshape, or manipulate the frequency spectrum of a signal according to some prescribed system level requirements. Filters are normally used for signal restoration and signal separation. Signal separation is used when a signal has been contaminated with interference, noise or other signals. Signal separation is used when a signal has been distorted in some way. It is widely used in the fields of communication, image and signal processing applications etc. Basically there are two types of filters- digital and analog. A digital filter is the major building block in any Digital Signal
Processing System (DSP). In fact, digital filter's extra ordinary performance makes the DSP so popular. A digital filter is a system that performs mathematical operations on a sampled, discrete time signal to reduce or enhances certain aspects of the signal [2]

IV.SYSTEM ARCHITECTURE

A. Cloud-based server

This is a Web entity that stores the resource information provided by local units located at each car park. The system allows a driver to search and find information on parking spaces from each car park without the need to directly access the local server node by directly accessing the cloud-based server. Cloud acts as a data base to store all the records related to parking areas and end users that have access to the system. It keeps a track of every user connected to the system and maintains information such as distance between car parking areas, parking fees and number of free slots in car park areas. It is due to the flexible nature of cloud which permits the system to add any number of users at any time of the day. The data will frequently updated and are accessible any time by the vehicles in the network. This is aimed to provide information about nearby parking spaces for the driver and would also enable users to reserve parking lot earlier from remote locations using supported devices such as smart phones or tablet PCs [1].

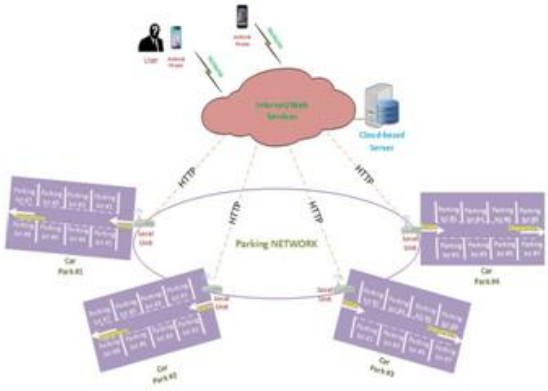

Fig 1. Architecture of the proposed system [1]

B. Local unit

This unit is located in each car park and stores the information of each parking space, as shown in Figure 4.2.And Figure 4.3 shows the block diagram of a local unit of a parking station [2]. The local unit includes the following:

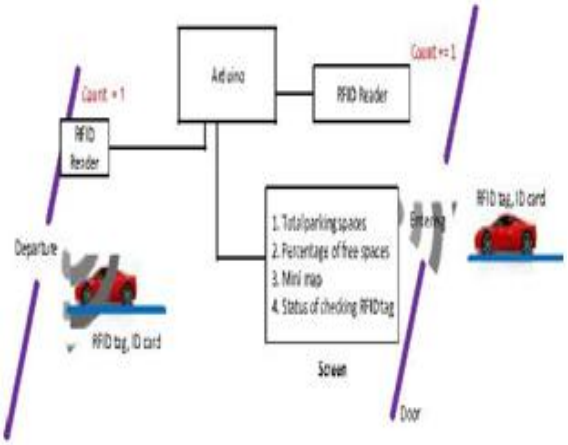

Fig 2.Local unit[1]

1. *Parking sensors*
   For our parking system we have made use of IR sensors to sense the parking area and determine whether a parking slot is vacant or not. These are connected to Arduino module.

2. *Processing unit*
   It comprises of Arduino module which is a processor on chip. The processing unit acts like an intermediate between the sensors and cloud. Different sensors can be connected to it. An RFID reader is connected to Arduino module. The card reader authenticates the user information and then displays this information on the screen. If the

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information of the RFID tag or card is correct, the Arduino module will control the opening of the door for the vehicle to enter. The Arduino module connects with the cloud server through an Internet connection to transfer data from the local car park to the cloud server database [7].

3. *RFID tag or ID card*
   This is used to check and authenticate user information [7]

4. *Real time clock(RTC)*
   It is a computer clock (most often in the form of an integrated circuit) that keeps track of the current time. It is used for parking time calculation of the user.

5. *LCD display*
   This displays information on the capacity of park, the total current percentage of free spaces, the status of the RFID tag check, the user card when entering, and a mini map of the local car park[6].

6. *Centralized monitoring section*
   A centralized monitoring section is provided for monitor and control the smart parking system [3].It includes a RF data modem, Arduino module, and PC/Android phone. User can access the smart parking system through his PC/Android phone. In this system Internet serves as the interface between user and the smart parking system.

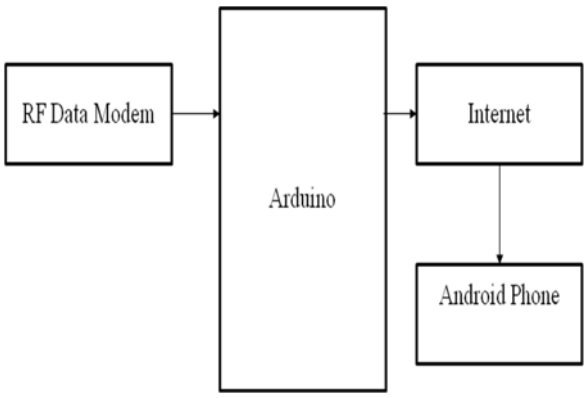

Fig 3.Block diagram of centralized monitoring section[4]

Figure 3 shows the block diagram of centralized monitoring section [7].

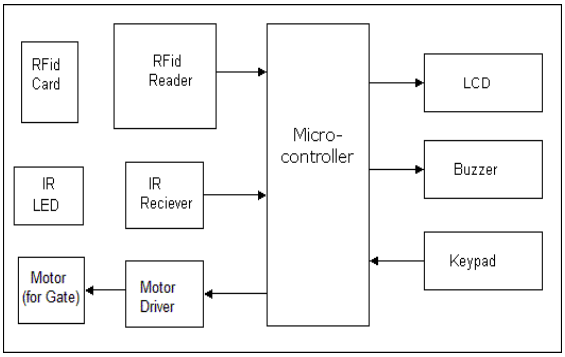

Fig 4.Block diagram of parking station[4]

III. IMPLEMENTATION

The parking system is designed in such a way that it is applicable for covered parks, open parks and street side parking. The fig.1 shows the cloud based IOT architecture for smart parking system which contains cloud service provider which provides cloud storage to store information about status of parking slots in a parking area and etc..The centralized server which manages to store entire smart parking systems information such as number of slots, availability of vehicles etc. And these information will be accessed through some secured gateways through network. When the availability of parking slots changes, immediately the information is updated to the central server. Then user can access this stored information using internet from any location. And this information is used by parking users to determine free parking areas and statistics can be measured at different times in a day on each parking space. The fig.3 shows the communication between two or more clients and SPS with server. Such that single client can access the information of many parking areas in the city. So by observing the availability of parking slots the user can choose their convenient parking area. Thus particular parking area is navigated from client's current position [3].

IV.FUTURE WORKS

The future scope for this Smart Parking System will involve displaying the availability of spaces over any smart devices through the implementation of Virtual Reality, that would periodically notify all the drivers on the incoming lane by making them aware of whether free spaces are available or not. Real-time info will be displayed on vehicle HUD (Head- up Display) to ease-up the time and navigational complexity.

V.CONCLUSION

A technique for synthesising sharp linear phase digital filter with lesser complexity in terms of number of adders and multipliers is presented. Sharp transition band is achieved and this helps in reducing the inter-channel interference, which finds application in Software Defined Radio. Computational complexity of the whole system is same for the entire range of operating bandwidth.

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