Intelligent Parking System Using Cloud

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Abstract - **Cloud computing is one of the most popular technology in recent time which has dynamically changed the nature of an organization. Application of cloud computing extends in real time scenarios also. Internet of Things is another technology which has touched the day to day of human being. Advancement in Cloud computing and Internet of things can be combined and applied for solving real time problem. Allocation of parking slot for vehicles in metro cities is one the real time problem, which has been chosen as the problem statement of our research work. In our research work, we have combined the Internt of Things technology and cloud computing to develop an enhanced intelligent parking system. Overview for developing an Intelligent parking system has been narrated in this paper with an architecuture diagram.**
Keywords: **Cloud Computing, Clustering, Intelligent Transportation System, Internet of Things, Vehicular Adhoc Networks and Web Services.**

I. INTRODUCTION

Cloud computing is one of the hot buzz in Information and Technology sector, which has made the organizations to move much forward from the current scenario. Cloud computing can also be defined as Internet computing, as all the computing services are provided over Internet. In simple terms Cloud computing can be defined as the model through which the computing resources are provided as services to the user via Internet. Since all the services are provided over Internet, cloud computing has two major issues such as security issue and performance issue[11].The services of cloud computing can be classied as platform, software and infrastructure as service.

Internet of things is one of the important technology which has been used in recent times to solve the real time problems. Any object in this world can be connected to Internet using sensors or processor. This is the base for Internet of Things technology. Pervasive Computing is one of the IOT technology which has been popularly used to solve the real time problems.

Managing the major metro cities is a tedious process in recent times. As the number of vehicles has increased in recent times, it is essential any organization to manage the parking facilty for the vehicles. Using the Cloud computing technology and IOT technology the problem of parking can be easily solved. In our research work we have developed an Intelligent parking system, using which particular user can find the free slots available for parking via Mobile device. The overview for developing the Intelligent parking system has been narrated the following sections of the paper.

II RELATED WORKS

In recent time almost every vehicle is now equipped with sensors and smart devices, which has made the inter vehicular communication much easier. The network of communication between the vehicles is defined as Vehicular Adoc Network, which is shortly called as VANET. VANET is one of the application of Internet of Things. Using VANET almost all the vehicles are connected to Internet, therby through which the activities related to the vehicle are easily managed.

Wu He et al [12] has addressed the problem of parking slot using cloud computing and Iot environment. Authors has widely discussed and proposed a model, which is not that much user friendly and easy to develop by an organization. Author has not discussed any alogorithm for developing such application are the major drawbacks of the exisiting system which has been identified from our knowledge. From the exisiting system it is very clear, that a simple and user friendly parking slot application has to be developed. In our research work, we have developed an simple and user friendly parking slot application which can be viewed in mobile device. The overview of the application has been discussed in the following section of our research article.

III. PROPOSED SYSTEM

The following are the steps involved in developing an Intelligent parking system

A. Intelligent Parking Cloud Service

The four important phases in the intelligent parking cloud services are,

- Background subtraction
- Decision Process
- Web server process
- Android application service

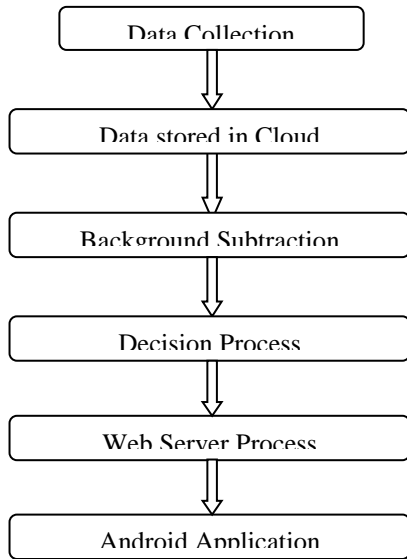Before these processes the data are collected and are stored in the cloud.

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        ┌─────────────────────┐
        │  Data Collection    │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │ Data stored in Cloud │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │ Background Subtraction │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │  Decision Process   │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │  Web Server Process │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │ Android Application │
        └─────────────────────┘
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Fig.1 Flow Diagram

1.Background subtraction

Background Subtraction is a computational vision process of extracting foreground objects in a scene. A foreground object described as an object of attention which helps in reducing the amount of data to be processed as well as provide important information to the task under consideration. The foreground object can be a coherently object moving in a scene.

2.Decision Process

Car Parking Area, parked by cars, means it is defined as "Occupancy", that is the space is fully occupied by some other object. If the car parking area has a free space then means that there is empty space for parking the car, it is defined as "Vacancy". This decision gets updated to the server part.

3.Web server process

All the processes are updated to the web server which receives the value from the Data base (DB) via MATLAB. The delayed car duration (12 hours and above) information are passed through SMS and MAIL (1 per day) to monitor based on the Validated information.

4.Android Application Service

Android application collects all information from server through web server, and it calculates total number of slots engaged and free slots. That is parking slots that are occupied and slots that are vacant are calculated. It shows graphical view for engaged and free slots via apps. It validates information continuously to the web server.

B. Communication from VANETS to cloud

In this section a registration form for driver is created, where the driver has to register in the cloud environment. Registration of diver is compulsory so that only the registered driver can take car from networking side. Once the registration process is done and updated to the cloud, the diver will provide his details for verification process. Once the verification process is successful then the driver is allowed to choose the car brand, model and current location. After selecting the above mentioned attributes the system automatically detects whether the driver is wearing seat belt or not and whether the driver consumed alcohol or not. For every few seconds the car will be kept on moving to some other places. Meanwhile on motion the jerk level of the road and other details will be updated to the cloud. The data or information that is to be updated to the cloud will be in the binary format. The raw data is transformed into binary format using the formula,

$$P\{X(T+H)= I+1|X(t)=I\} = G(H)+o(H)$$

Again while retrieving those data from cloud the binary data is transformed to raw data.

C. Vehicular Data Mining Cloud Service

The vechicular information which have been stored in the cloud has been mined using data mining in order to conclude and predict the future request which has been raised by the user. The following fig.2 which has been refered from [12] has been chosen as the base for developing the Intelligent parking system using cloud and IoT Technology.
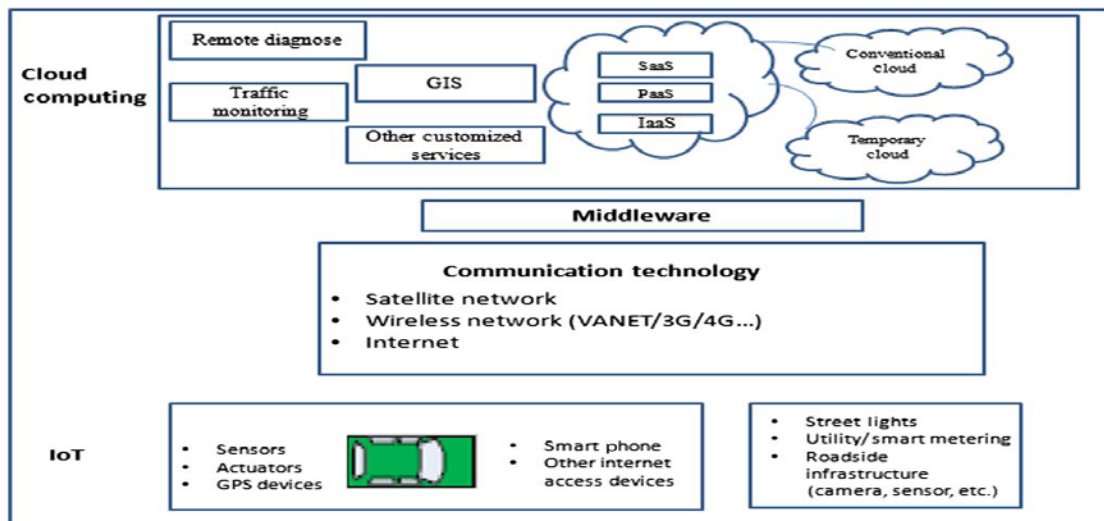
Fig.2 Vehicular Data Mining Cloud Service

IV. RESULTS AND DISSCUSSION

As a result of above explained steps, the details of the car are stored the cloud. Details such as User name, mail id, password, address, license number, phone number etc are stored in the cloud and the details are registered in the cloud and the details are monitored from the cloud using IoT technology. After storing the information, the source and destination of the travel has been given as an input. Using the shortest path algorithm, the shorestest path between the source and the destination has been found. The parking slot available in the destination has been found and displayed in the mobile device of the user. From which user can predict the available parking slot in the destination given by the user.

V. CONCLUSIONS AND FUTURE WORK

The main aim of resolving the challenges caused by the increasing transportation issues has been met using the novel intelligent parking system which combines the cloud technology and Internet of Things technology. Using the android apps we are projecting the vacancy space and position.In this paper work VANET architecture is implemented virtually to update data in cloud. In future this work can be extended by real time implementation of VANET architecture with the use of hardware to update data in cloud. Using the above architecture, the intelligent system has been developed and the result of the experiement has been narrated in the future work of our research.

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