International Journal of Applied Engineering Research
ISSN 0973-4562 Volume 10, Number 3 (2015) pp. 7311-7317

http://www.ripublication.com

Intelligent Parking System Using Cloud

Kaudilyar.R [1] and Kavitha Esther Rajakumari [2]

[1] Student, Department of Computer Science, Sathyabama University,
Chennai, Tamil Nadu, India
Email: kaudi10@gmail.com
[2] Asst. Professor, Faculty of Computing, Sathyabama University
Chennai, Tamil Nadu, India
Email: kavithaesther@rediffmail.com

Abstract

The advancement in cloud computing and Internet of Things (IoT) have provided a promising opportunity to further address the increasing transportation issues, such as heavy traffic, congestion, and vehicle safety. Internet of Things has received a lot of attention and is expected to bring benefits to numerous application areas including health care, manufacturing, and transportation. In this paper, the main aim is to resolve the challenges caused by the increasing transportation issues by providing a novel multilayered vehicular data cloud platform by using cloud computing and IoT technologies to implement an intelligent parking system. Two innovative vehicular data cloud services namely, intelligent parking cloud service and a vehicular data mining cloud service in the IoT environment are also presented over here.

Key Terms— Cloud Computing, Clustering, Intelligent Transportation System, Internet of Things, Vehicular Adhoc Networks and Web Services.

I. INTRODUCTION

Cloud computing and Internet of Things (IoT) [5] have provided a promising paths to further address the increasing issues in transportation issues, such as heavy traffic, congestion, and vehicle safety. In the past few years, few models have been proposed by researchers have that use cloud computing for implementing intelligent transportation systems (ITSs)[3][4].

For example, a new vehicular cloud architecture called ITS-Cloud was proposed to improve vehicle-to-vehicle communication and road safety [3][4] .A cloud-based urban traffic control system was proposed to optimize traffic control. Based on a service-oriented architecture (SOA) [1], this system uses a number of software services (SaaS), such as area management services, intersection control

services, cloud service discovery service, and sensor services to perform various tasks. These mentioned services also interact among each other to exchange information and it provides a solid basis for developing a collaborative traffic control and processing the system in a distributed cloud environment [2].

As an emerging technology caused by rapid advances in modern wireless telecommunication, lot of attention has been received by IoT and is expected to bring benefits to numerous application areas including health care, manufacturing, and transportation [5][8]. Currently, the use of IoT in transportation is still in its early stage and most research on ITSs has not leveraged the IoT technology as a solution or an enabling infrastructure to this end.

II RELATED WORKS

The original idea is that, the roadside infrastructure and the radio-equipped vehicles could communicate using wireless. Networking operations as routing are more effective and researchers had developed a dynamic inter-vehicle network called vehicular ad-hoc networks (VANET).

Cloud computing has been proposed to reshape vehicular software and services in the automotive domain [1]. As more and more cars are equipped with devices that can access the internet, the existing vehicular networks and various sensor devices in vehicles and cloud computing to create vehicular clouds suggests that vehicular clouds are technologically feasible. They also have a significant impact on the society. Thus, both existing automobile software and a variety of information resources are being virtualized and packaged as services to build vehicular clouds.

Different vehicular services are often combined and used for mapping, encapsulation, aggregation, and composition and allow vehicles to interact with various hosted services outside the vehicles. The integration of sensors and communication technologies provides a way for tracking the change in status of an object through the Internet[6].

Internet of Things explains variety of objects and devices around us, such as sensors, radio frequency identification (RFID) tags, GPS devices, and mobile devices, will be associated to the Internet and allows these objects and devices to connect, cooperate, and communicate within social, environmental, and user contexts to reach common goals[5][7][8].

III PROPOSED SYSTEM

By integrating various devices such as sensors, actuators, controllers, mobile phones, and Internet access equipments, and employing networking technologies (wireless sensor network, cellular network, satellite acess network, and others networks), cloud computing, Internet of Things, and middleware, this platform supports V2V and V2I communication mechanisms and is able to collect and exchange data of the drivers, vehicles, and roadside infrastructure ,cameras and street lights. The goal of this platform is to provide real-time, economic, secure, and on-demand services to customers through the associated clouds including a conventional cloud and a

temporary cloud (vehicular cloud)[1][3].

The conventional cloud is composed of virtualized computers and provides Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) to customers. Example, cloud management services and traffic administration applications can be hosted on the cloud. The temporary cloud is formed on demand and is composed of under-utilized computing, , storage facilities of vehicles and networking and is designed to expand the conventional cloud in order to increase the whole processing cloud's computing, and storing capabilities.

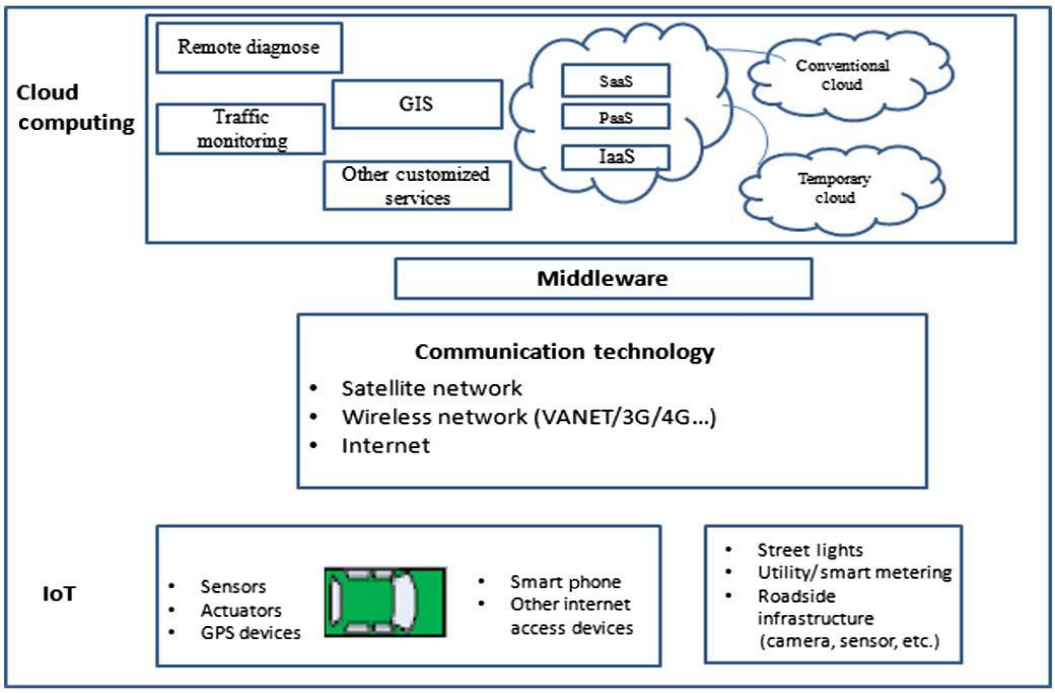

Fig 1: Layered Architecture

The cloud supports a compound of PaaS, SaaS, and IaaS and primarily highly dynamic vehicular applications which may have issues running on the conventional clouds. For example, traffic-related applications and smart parking applications are suitable for the temporary cloud. The temporary cloud often needs to communicate with the conventional clouds and there is a frequent exchange of data and services between the two clouds. Based on the layered architecture in Fig.1, showed above, heterogeneous Internet of Things -related devices, community technologies network and cloud services on different layers can be integrated to exchange information, resources, and collaborate on the clouds.

V EXPRIMENTAL SETUP

1. 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.

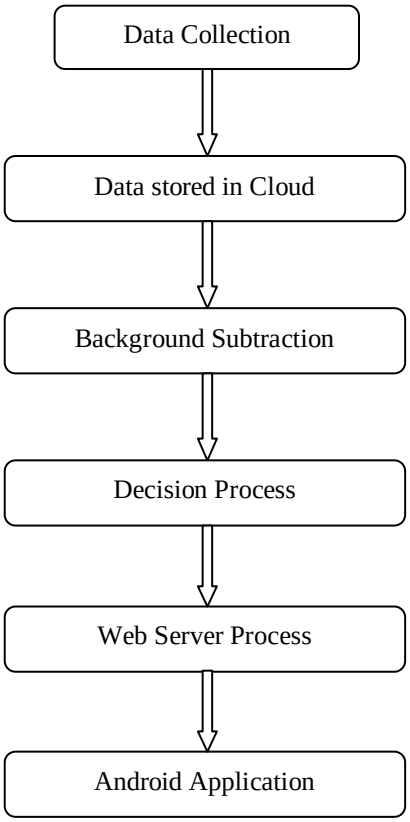

Fig.2 Flow Diagram

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.

Decision Process

The 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. Finally, in decision step, the mixed feature is compared with pre-defined threshold limit.

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.

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.

2. 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,

$$P\{X(t+h)= i+1|X(t)=i\} = \lambda(h)+o(h)$$

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

3. Vehicular Data Mining Cloud Service

As vehicular data cloud contains a variety of heterogeneous data and information

resources, and effective data mining services must be developed quickly to detect dangerous road situations, to provide early warning messages, and assist drivers to make decisions to prevent accidents. Data mining services can also be used to assess driver's behaviour or performance of vehicle to find problems well in advance.

The core of any data mining service is the data mining models. So far, few models were developed and are tested for mining vehicular data collected from vehicular networks or clouds. Data mining service of car warranty early-warning analysis. In vehicle manufacturing process, some quality issues can be hidden for a long time without identified. Due to a lack of events to correlate several potential problems cannot be investigated. To avoid accidents new techniques that reveals these hidden problems in advance. By using the two modified data mining models (Naive Bays Classifier [9] and Logistic Regression Classifier) to cluster and classify the real car warranty and maintain those data that are collected from a local automobile company. How the data mining cloud service could be used to identify potential issues that could become a problem is demonstrated. This experiment assumes a new product that is under development and has some potential but unknown issues. As a result of applying the two data mining models, it is possible to acquire some preliminary results. We found that the precision in column cross dropped dramatically.

VI RESULTS AND DISSCUSSION

How the data mining cloud service could be used to identify potential issues that could become a problem is demonstrated. This experiment assumes a new product that is under development and has some potential but unknown issues. As a result of applying the two data mining models, it is possible to acquire some preliminary results. It is founded that the precision in column cross drops dramatically

VII CONCLUSIONS AND FUTURE WORK

The main aim of resolving the challenges caused by the increasing transportation issues has been met using the novel multilayered vehicular data cloud platform by using cloud computing and IoT technologies to implement an intelligent parking system. 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.

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