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Trip Analysis Using Modern Ticketing

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ABSTRACT: In this digital era all the traditional systems have been modernized using the current technologies. Public transport is one of the highly used medium of travel. The study in 2018 states that on an average the public bus carries 1300 passengers per day in Chennai(India). The existing system does not provide monitoring and analysing methods for these data's generated. This has paved way in proposing an efficient digital solution for monitoring and analysing the data in this field. To provide a comfortable travel experience, effective bus scheduling is essential. Traditional approaches are based on fixed timetables. The wide adoptions of QR base fare collection systems and GPS tracing systems in public transportation provide new opportunities for using the data-driven approaches to fit the demand of passengers. In this paper, we associate these two independent data sets to derive the passengers' origin and destination. As the data are real time, we build a system to forecast the passenger flow in real time. To the best, this is the paper, which implements a system utilizing QR system and GPS data to forecast the passenger flow in real time.

KEYWORDS: Digital-era, Real-time, QR fare collection, GPS tracking, estimation, prediction

I. INTRODUCTION

The Bus is one of the widely used public transport in many cities. In improving the quality of bus service, a real-time system can be formulated that can monitor and predict the passenger flow of the running bus is helpful. The passenger flow that is denoted here is the number of on-board passengers of a bus, this varies over time and space. This passenger flow can partially reflect the sum of human mobility along a particular route and the quality of bus service in terms of comfort. In the perspective of scheduling, it tells us how many people travel or want to travel on a route. These information can guide the administrator to allocate and schedule the bus route and timetable dynamically in fine granularity. Current practice in Bus Transit System (BTS)[1] operators demonstrates that manual data-collection efforts are costly and usually applicable only in small scale. The use of automated data-collection systems grow rapidly and show great potential. Automatic Fare Collection (AFC)[2] devices that can record payments of riders using QR base system, and a GPS embedded in the mobile device that can track the bus are widely deployed. With the mature of big data systems, we have the opportunity to estimate and predict the passenger flow of every bus in urban wide BTS.

II. LITERATURE REVIEW

Z. Wei, Y. Song, H. Liu, Y. Sheng, X. Wang, "The research and implementation of GPS intelligent transmission strategy based on on-board Android smartphones", *Computer Science and Network Technology (ICCSNT) 2013 3rd International Conference on*, pp. 1230-1233, 2013.[3]

Smartphones have been widely integrated with GPS receiver, which may provide accurate location information of vehicles without cost increase. Traditionally, LBS applications obtain vehicle locations then using the Hypertext Transfer Protocol (HTTP) protocol uploaded to central servers with a fixed frequency. In this paper, we exploit an intelligent strategy of GPS sensing and transmitting. Explicitly, we implemented a platform to collect real-time GPS data from vehicles. A common Android Smartphone serves as a GPS sensor in a vehicle. Client Application software is designed to generate GPS location updates with adaptive time stamps once it executed. In the final comparison, MQTT push technology is introduced into GPS transmission in order to effectively reduce mobile traffic.

J. Gong, M. Liu, S. Zhang, "Hybrid dynamic prediction model of bus arrival time based on weighted of historical and real-time GPS data", *2013 25th Chinese Control and Decision Conference (CCDC)*, pp. 972-976, 2013.[4]

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Advanced traveler information systems (ATIS) are one component of intelligent transportation systems (ITS), and a major component of ATIS is travel time information. Global positioning system-based automatic vehicle location (AVL) systems have been adopted by many transit agencies for tracking their vehicles and predicting travel time in real time. It is a very important subject to improve the precision and reliability of the prediction model which can attract additional ridership, reduce passengers' anxieties and waiting times at bus stop, and increase their satisfaction. Furthermore, it can promote the development of city public transportation. This paper presents an improved approach to predict the public bus arrival time based on historical and real-time GPS data. After analyzing the components of bus arrival time systematically, the bus arrival time and dwell time at previous stops are chosen as the main input variables of the prediction model. At first, the algorithm of data interpolation and processing is designed to get the real-time GPS data as the input variables of the prediction models. Secondly, the statistical model is obtained based on the historical data of average running time of each link and dwelling time of each stop at given time-of-day and day-of-week, respectively. Thirdly, a hybrid dynamic prediction model is proposed to predict the bus arrival time. Finally, Actual GPS data from bus route 244 located in Shenyang, CHINA are used as a test bed. The index of Mean Absolute Percentage Error (MAPE) is used to evaluate the three models. The results show that the improved model outperforms the historical data based model in terms of prediction accuracy.

L. Singla, P. Bhatia, "GPS based bus tracking system", *Computer Communication and Control (IC4) 2015 International Conference on*, pp. 1-6, 2015.[5]

In this fast life, everyone is in hurry to reach their destinations. In this case waiting for the buses is not reliable. People who rely on the public transport their major concern is to know the real time location of the bus for which they are waiting for and the time it will take to reach their bus stop. This information helps people in making better travelling decisions. This paper gives the major challenges in the public transport system and discusses various approaches to intelligently manage it. Current position of the bus is acquired by integrating GPS device on the bus and coordinates of the bus are sent by either GPRS service provided by GSM networks or SMS or RFID. GPS device is enabled on the tracking device and this information is sent to centralized control unit or directly at the bus stops using RF receivers. This system is further integrated with the historical average speeds of each segment. This is done to improve the accuracy by including the factors like volume of traffic, crossings in each segment, day and time of day. People can track information using LEDs at bus stops, SMS, web application or Android application. GPS coordinates of the bus when sent to the centralized server where various arrival time estimation algorithms are applied using historical speed patterns.

FoaisalMahedi Hasan et al., "RFID-based Ticketing for Public Transport System: Perspective Megacity Dhaka", *3rd IEEE International Conference on Computer Science and Information Technology (ICCSIT)*, vol. 6, pp. 459-462, 2010.[6]

The paper based public transport ticketing system, prevailing in the megacity Dhaka (Bangladesh), introduces severe malfunction in the system, malicious argument among public, corruption and most of all traffic jam. This paper actually suggests a much more public friendly, automated system of ticketing as well as the credit transaction with the use of RFID based tickets. The total system mainly acts to bring out the consistency among various bus agencies that will conclude in uniform access of passengers in daily rides through an automated server being updated every single time the passengers travel by carrying the RFID based tickets.

R. Hamon, P. Borgnat, P. Flandrin, C. Robardet, "Networks as signals with an application to bike sharing system" in *Global SIP 2013*, Austin, Texas, USA:, Dec. 2013.[7]

Dynamic graphs are commonly used for describing networks with a time evolution. A method has been proposed to transform these graphs into a collection of signals indexed by vertices. This approach is here further explored in a number of different directions. First, the importance of a good indexing of a graph is stressed, and a solution is proposed using a node labeling algorithm which follows the structure of the graph. Second, a spectral analysis of identified signals is performed to compute features linked to graph properties such as regularity or structure in communities. Finally, these features can be tracked over time to evidence the structure evolution of the graph. As a case

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study, the approach is applied to a dynamic graph based on a dataset of trips made using the bike sharing system Vlov in use in Lyon, France. This is shown to offer specific insights on behaviors of bike users over time in two districts of the city.

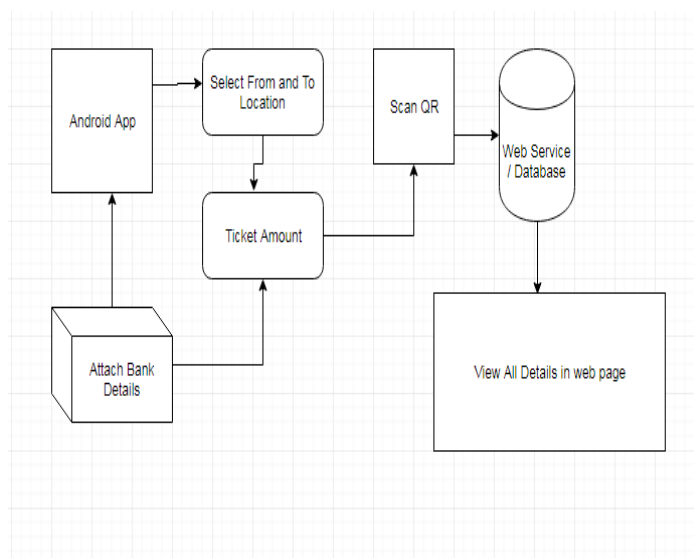
J. Gong, M. Liu, S. Zhang, "Hybrid dynamic prediction model of bus arrival time based on weighted of historical and real-time GPS Data," 2013 25th Chinese Control and Decision Conference (CCDC), pp. 972-976, 2013.[8]

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III. PROPOSED SYSTEM

The proposed system, introduces a digital payment method for collecting the ticketing data's efficiently, for making this happen the proposed system implements a QR based payment methodology for a convenient user interface. To implement the proposed system an android application is used for selecting the travelling route and to generate amount. The generated amount will be processed through QR image system. An automatic update in the financial status will be done in bank as well as the wallet. All the data's generated will be stored in the database for analyses purpose. Then the user will be confirmed with the SMS message about the travelling ticket details. With the gathered data's the admin will do the analysis and will find the peak timings, the overflow of bus in a particular route, insufficient bus in a particular route. This will allow the organization to run in an effective way.

1. Architecture Diagram



SVM(Support Vector Machine):

More formally, a support vector machine constructs a hyperplane or set of hyperplanes in a high- or infinite-dimensional space, which can be used for classification, regression, or other tasks like outliers detection^[3]. Intuitively, a

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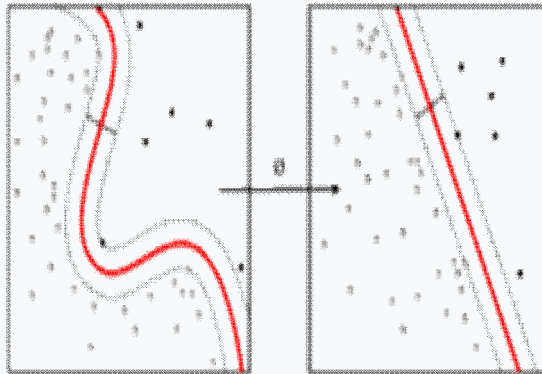
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good separation is achieved by the hyperplane that has the largest distance to the nearest training-data point of any class (so-called functional margin), since in general the larger the margin the lower the generalization error of the classifier^[citation needed].

2.SVM Using Kernel



Kernel machine

Whereas the original problem may be stated in a finite dimensional space, it often happens that the sets to discriminate are not linearly separable in that space. For this reason, it was proposed that the original finite-dimensional space be mapped into a much higher-dimensional space, presumably making the separation easier in that space. To keep the computational load reasonable, the mappings used by SVM

schemes are designed to ensure that dot products may be computed easily in terms of the variables in the original space, by defining them in terms of a kernel function selected to suit the problem.^[4] The hyper planes in the higher-dimensional space are defined as the set of points whose dot product with a vector in that space is constant. The vectors defining the hyper planes can be chosen to be linear combinations with parameters of images of feature vectors that occur in the data base. With this choice of a hyper plane, the points in the feature space that are mapped into the hyper plane are defined by the relation: Note that if becomes small as grows further away from , each term in the sum measures the degree of closeness of the test point to the corresponding data base point . In this way, the sum of kernels above can be used to measure the relative nearness of each test point to the data points originating in one or the other of the sets to be discriminated. Note the fact that the set of points mapped into any hyper plane can be quite convoluted as a result, allowing much more complex discrimination between sets which are not convex at all in the original space.

3.2 Functional Requirements

3.2.1 Function_1: User Registration:

Purpose: The purpose of registration is to attach all the images of the moves of unauthorized intruder.

Inputs: The user will enter details in the registration form according to required fields, some of the fields include are username, password, confirm password, first name etc

Processing: On the server side the servlet is used to capture the details of the user and then store the details in the database.

Output: After the registration the user will be directed to the main home

Error Handling : If error is encountered than try to handle it with some suitable exception handling method

3.3 Non-Functional Requirements

Some of the non-functional requirements are as follows:

1. Performance-is high as only it gets processed when necessary.
2. Reliability – is high as only registered users will get the intruder’s images.
3. Security- It provides security to the data by authentication, only those users who are registered can access
4. Portability-SISME-HSS is a real time project which can be implemented on any system which supports the requirements.
5. Logical Database Requirements – data base is needed for storing the details of the users and images.

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3.Admin Login



The administrator is provided with a web page in order to search and retrieve data's of a particular route so as to make the analysis and to implement it effectively. This web page is specifically for administration purpose to view and analyse for a particular route.

4.Query Entry

Date Wise Information

Search
Analysis

Username	Bus Number	From	To	Time	Amount
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This admin enters the query that is to be processed in this page. There are three fields that are required to do the processing they are from, to, date. With these data the query processing is done.

5.Query processed

Date Wise Information

Search
Analysis

Username	Bus Number	From	To	Time	Amount
messi	B1	tambaram	tnagar	03:20:00	90
messi	B1	tambaram	tnagar	03:20:00	60
messi	C1	tambaram	tnagar	04:30:00	20

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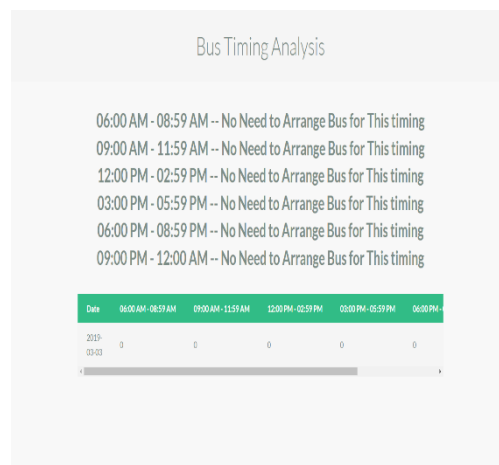
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The admin can retrieve the specified details with the help of these three fields. The resultant table will contain the Username, Bus number, from, to, time, amount. These data's will be helpful in the analysis phase.

IV. CONCLUSION

This paper proposes an effective way in collecting and utilizing the ticketing data's that is generated in public transport. This efficient method of analysing data can allow the administrator to organize and understand about the detailed transportation module. Thus it results in providing a better model of organization. The challenge in mainly inculcated in gathering the data's of the passengers and that is sorted using QR system. The implementation of the proposed system can be done in a large scale provided sufficient network facility.

6. Analysis Page



All the data's that is been stored helps in the analysis phase. The timings are divided into three hour slots such that to identify the peak timing to which the buses need to be allotted.

V. FUTURE ENHANCEMENT

The paper is aimed in providing a complete user friendly and administrative friendly public transportation system. As of now this paper deals from the administrative perspective and not completely on the user perspective. The future enhancement can be made by implementing a live GPS tracking in the public transport and also to communicate the current head count of passengers in the public transport. There is a good scope for all the future enhancement that are made in providing the public transportation digital.

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