ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com
Journal DOI: 10.21474/IJAR01

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

INTELLIGENT SCHEDULING AND ANALYSIS OF PUBLIC TRANSPORT USING SUPERVISED MACHINE LEARNING.

Adesh Atole, Abhijeet Shingade, Piyush Galphat, Shashank Dharmadhikari & Bhushan Thakare.
Department of Computer Engineering, Sinhgad Academy of Engineering, Pune.

Manuscript Info

Manuscript History:

Received: 14 April 2016
Final Accepted: 19 May 2016
Published Online: June 2016

Key words:
Machine learning, scheduling, public transport.

Corresponding Author
Adesh Atole.

Abstract

Intelligent scheduling system provides a clear economical advantage over traditional transport system. This paper describes a new system for public transportation which uses dynamic scheduling using machine learning

Introduction:-

Public transportation is backbone of India. Buses take up over 90% of public transport in Indian cities. But still our public transport organizations incurs loss. Brihanmumbai Electric Supply and Transport (BEST) undertaking has revealed that all BEST bus routes stopped making profits, from 2014.Condition of Pune Mahanagar Parivahan Mahamandal Limited (PMPML) even worst. PMPML organization never had a profit since his start. Root cause of all this is, these organization still using age old technology.

There are many Apps available currently, which provide static information based on the schedule provided by the Public Transport organizations, but none of them address the real time inconsistencies, which can be caused due to variety of factors.

This paper is focused to solve problems faced by the public transport organizations and the commuters by the means of technology. Real-time tracking of buses, providing passengers with near accurate arrival time, eTicketing, passenger flow prediction based on historical data as well as on current demand are some features of our system, which will help organizations to improve their functioning and efficiency. The analysis of gathered real-time data, would help organizations to predict rush on particular routes and handle the same. Along this paper we are going to present a new application for public transport which have all above mentioned features.

The paper is organized as follows section II system description, section III tells about system architecture and last section explains working of our system.

System Description:-

Data Gathering:-

Each bus driver will be equipped with a smartphone, running our app, which will collect and send real-time location of the bus to our backend systems.

The ticketing system will also collect and send the data to backend systems. The data would include source and destination stops for each ticket.

The passenger apps will also collect the data about user's usage patterns and other personal information, which would help in targeted advertisement.

Analytics:-
Analytics of the gathered data forms the core part of our project.

Passenger flow prediction, predicts the flow of passenger on a particular route at particular time based on the historical data as well as on other factors such as weather etc.

Real Time scheduling of buses will be done based on prediction of passenger flow and demands.

Targeted advertisement:-
Based on user's profile, location, source and destination stops and other usage patterns, advertisements can be published on user's app. These kind of targeted advertisements are proven to have benefits for both – advertisers and publishers.

Passenger App and Dashboard for organizations:-
A mobile app and a web based dashboard will be the primary source of interaction for passengers and organizations respectively.

Passenger app would show the near accurate time of arrival of bus at the nearest stop, based on user's location and destination stop provided by the user. The app would also help passengers to pay for the tickets.

Dashboard for organizations would show real-time location and status of all the buses on a map.

System Architecture:-

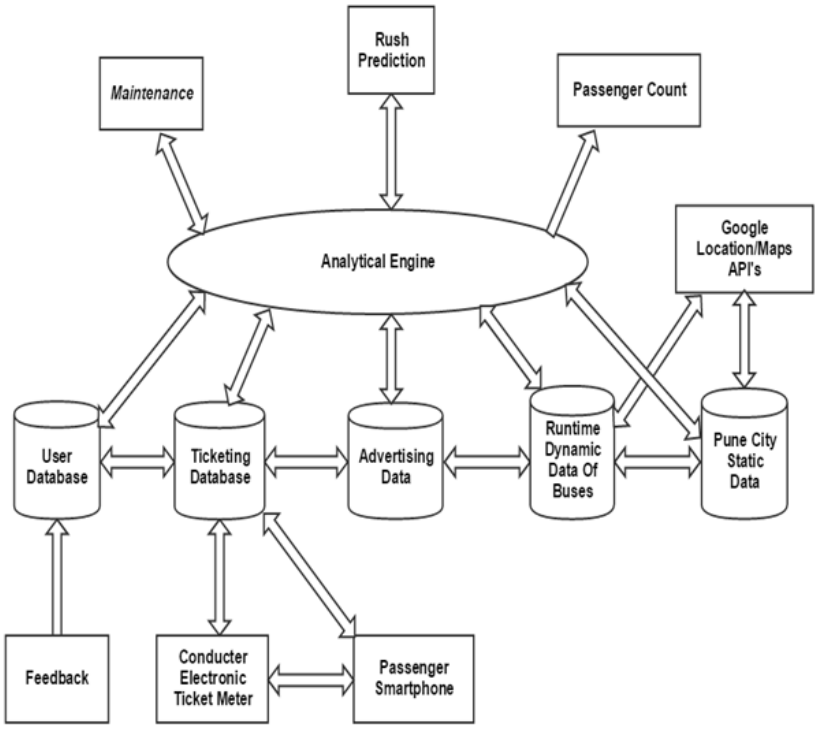

Figure 1:- System Architecture.

The main goal of this system to replace current manual system for public transportation by fully automated system. To develop and to implement this functionality, several modules are involved. Fig. 1 shows briefly structure of the System. It contents several different modules of our system. Ticketing database, advertising data, user database, run time dynamic data of buses is maintained by firebase. Data in your Firebase database is stored as JSON and synchronized in real time to every connected client. When you build cross-platform apps with our Android, iOS, and JavaScript SDKs, all of your clients share one Firebase database and automatically receive updates with the newest data. Pune city static data is directly accessed using Google APIs. Our analytical engine learns from a data using decision tree regressor algorithm. System uses scikit learn python learning library for that. Analytical engine provides results such as rush prediction, passenger count, e-ticketing, real time tracking of buses using Google API's. We are providing additional module like feedback, SOS for users.

System Working:-

Our system assumes that the routes are predetermined and aims to provide an optimal schedule for buses.

Past ticketing data proves very useful for analysing and finding patterns and trends of passenger flow with respect to numerous factors such as weather, time of the day, day of week, regional festivities. This tagged and aggregated data for a period can provide insights and prove useful in predicting the patterns and trends in the future.

Analytical engine, which we've built uses supervised machine learning to identify patterns and trends and provide predictions later. Decision tree regression is an optimal algorithm for given scenario. As per many experiments and evaluations done by us, decision tree regression provides a whooping accuracy of 97.2% on average.

Following is a tuple representing an entry to analytical engine.

$T= (S\_ID, PASSENGER\_COUNT, F_1, F_2, F_3.. F_n)$

Where,
S_ID = Segment ID
PASSENGER_COUNT = Passenger Count
F = Factors which purportedly affect the passenger count

In our case, the factors are weather, time of the day, day of the week, regional festive seasons.

This prediction of passenger flow is used later to schedule available resources (buses/attendants) optimally.

A notifier daemon is triggered at regular interval of a day, to calculate and update the predicted count to firebase.

Scheduling:-

The scheduler assumes that the information of routes and stops is predetermined and provided to the scheduler beforehand. Scheduler also has access to predicted trends and patterns in passenger flow from Analytical Engine. Given a capacity of a bus, scheduler calculates number of buses, which are needed. Scheduler then constructs two matrices – the demand matrix [D], the availability matrix [A]. Both matrices A and D are two dimensional with timeslot and terminal stops as axes. The elements of these matrices are the number of buses. In matrix D, the count represents the calculated bus count. Scheduler uses Google Maps Distance Matrix APIs to determine the time required by the bus to reach destinations stop. This is used to determine the available buses at a particular stop at particular time. All this information is then used to construct A, which shows availability of buses with respect to timeslot and terminal stops. These two matrices are then compared to know the excess or deficit of buses. If buses are excess, then they're used to fulfil the deficit. If the deficit can't be fulfilled by the excess in optima way, additional resources (buses and their attendants) are assigned from the pool.

References:-

1. Shingade, A., Atole, A., Galphat, P., Dharmadhikari, S. and Thakare, B., "Analysis of approaches to short term passenger volume prediction in Public Transport", International Journal of Computer Applications, 132 Decemer 2015, pp. 91-121.
2. www.pmpml.org
3. https://en.wikipedia.org/wiki/Pune_Mahanagar_Parivahan_Mahamandal..
4. http://epaper.timesofindia.com/Repository/getFiles.asp?Style=OliveXLib:LowLevelEntityToPrint_TOINEW&Type=text/html&Locale=english-skin-custom&Path=TOIPU/2010/04/02&ID=Ar00500
5. "Kazuhiro Ohkura, Takashi Igarashi and Kaqji Ueda" Kobe University and "Shin'ichiroOkauchi and Hisashi Matsunaga" of Dentsu, IncA "Genetic Algorithm Approach to Large Scale Combinatorial Optimization Problems in the Advertising Industry" IEEE 2001
6. SüleymanEken and AhmetSayar "A Smart Bus Tracking System Based on Location- Aware Services and QR Codes"IEEE 2014
7. RuiXue, Daniel (Jian) Sun, and Shukai Chen, "Short-Term Bus Passenger Demand Prediction Based on Time Series Model and Interactive Multiple Model Approach."
8. Jianchu Kang, Songsong Pang , band Yan Zhang,"Study of the Intelligent Analysis and Prediction about Subway Passenger Flow during Large-scale Events"
9. http://www.hindustantimes.com/mumbai/mumbai-all-best-bus-routes-stopped-making-profits-last-ear/story-U3UY50aLAlym5HZojvGG4H.html