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SMART PASSENGER INFORMATION SYSTEM FOR BRT BUS PUNE (ANDROID APPLICATION)

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Abstract - *As Pune is considered under the smart city project and Rainbow BRT(Bus Rapid Transit) being the advanced source of rapid transit as of now there are buses made available for passengers travelling distances, but not many passengers have complete information about the schedule of these buses. Complete information namely the number of buses that go to the desired destination, bus numbers, bus timings ,schedule adherence, the routes through which the bus would pass, ETA(Estimated Time of Arrival),Nearest Bus stop, TTT(Total Travel Time), maps that would guide the passenger with his/her route and track the current location of the bus. The proposed system aims to fulfill all the above mentioned facilities. The system is an Android application that provides necessary travel information and real time tracking of BRT buses travelling in Pune. Efforts are made to overcome the challenges faced in the existing built application "PMP E-Connect".*

***Key Words*: BRT, Map SDK, KNN Nearest Stop,ETA, notification, real time bus tracking , bus scheduling.**

1. INTRODUCTION

BRT(Bus Rapid Transport)being the current advanced mode of transportation for public transportation it is necessary to have an efficient app to serve the purpose of smart travelling .Also android is an open source platform which is easy to learn and operate. Also JVM(Java Virtual Machine) is free of cost and easily accessible. In today's world, we need effective scheduling for efficient public transportation considering the high importance of time. Being a product of high technology, mobile phones are more widely used and are becoming more and more popular. Considering the heavy traffic congestions and rapidly increasing population transportation has some drawbacks such as untimely arrival times of buses and unfortunate bus failures. Due to all this precious time in this professional world is wasted. The main focus of the project is to provide the passengers with an efficient working android app for real time tracking of BRT buses so that they can plan their journey with proper time management.

The Bus transportation chain in Pune is well developed and well linked but the frequency and scheduling of buses is still unknown to many passengers travelling. Consider a new migrant or a non Pune citizen who isn't aware of the routing system will not know which bus to board and which to not. So in order to provide complete information such as the number of buses that go to the required destination, bus numbers, bus timings, the routes through which the bus would pass, time taken for the bus to reach the destination, live maps that would guide the passenger with his/her route and most importantly, track the current location of the bus and also give the correct time for the bus to reach its bus stop. The proposed android application system deals with overcoming the problems stated above. The system is an Android application that gives necessary information about all the BRT buses travelling in Pune. This system overcomes the problems faced in the previously built application "PMP E-Connect". The platform chosen for this type of system is android. The reason for choosing an Android Operating System is that it has come up on a very large scale and is owned by almost every second person. Also, Android is a user friendly platform. It will enable an ease of access for all the users. A number of applications made for the Android Operating System are increasing on a large scale ever since its advent. Android is an open source mobile software environment, which has a virtual machine that is used to optimize memory usage as well as resources. This application has been developed using IDE (Android Studio 1.6) with ADT (Android Development Tools) and Android SDK (Software Development Kit). There are a number of constraints that need to be satisfied.

1.1 LITERATURE SURVEY

[1] GPS Based Bus Tracking SystemLeeza Singla1, Dr. Parteek Bhatia2

- The system proposed is integrated with the historical average speeds of each segment. It improves the accuracy by including the factors like volume of traffic, crossings in each segment, day and time of day. People will be able to track information using LEDs at bus stops, SMS, web application or Android application.
- It requires RFID and high quality bus stops using LED lights etc.

[2] Mr. Gunjal Sunil N., Mr. Joshi Ajinkya V., Mr. Gosavi Swapnil C., Mr. Kshirsagar Venkatesh B, "Dynamic Bus Timetable Using GPS", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), ISSN :2278-1323, Volume 3, Issue 3, March 2014.

- The proposed system is a GPS based and manual system which is designed to display the real-time location and timetable of buses which can be useful for any public transport system

- The system requires working internet connection and may or may not be GPS tracker.

[3] Mr. Karan Punjabi, Pooja Bolaj, Pratibha Mantur, Sneha Wali, "Bus Locator via SMS Using Android Application" International Journal of Computer Science and Information Technologies (IJCSIT), ISSN :0975-9646, Volume 5(2), 2014

- The application shows the current location of the bus to the server. The server then sends an SMS to all the registered students that are about to board at the bus stop. Here the mobile phone of driver is used as a GPS receiver

- It is a tiresome process where the details of all the students are to be kept and updated time to time. The server is overloaded every now and then to get details of students at every stop.

[4] Dr.(Mrs.) Saylee Gharge, Manal Chhaya, Gaurav Chheda, Jitesh Deshpande, Niket Gajra, "Real Time Bus Monitoring System Using GPS" Engineering Science and Technology: An International Journal (ESTIJ), ISSN: 2250-3498, Volume 2, Number 3, June 2012.

- The system displays the current locations of the bus. The system consisted of a transmitter which is installed on the buses and receiver boards installed on the bus stops. It provided the relevant bus routes and other information to their users.

- It requires a transmitter.

[5] AvdhutSalunke, ShrinivasSirdeshpande, "Real Time Web Based Bus Tracking System" International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395 -0056 Volume: 03 Issue: Feb-2016

- The proposed system provides the relevant information regarding all the buses going from the user's source to destination. The system is operated by GPS which is available with every bus.

- It uses external hardware set-up for its implementation.

1.2 PROPOSED WORK

In order to overcome the above drawbacks, a system is proposed. This is an android based system which will provide all required information about BRT BUSES travelling in PUNE. As android based mobile phones are used on a very large scale among people, it is chosen to develop this system. Android is easy to handle and is user friendly, and hence the application will be used by a maximum number of citizens. For mobile phones, android is an open source operating system. The application will be based on a user friendly environment and hence anyone can access it free of charge. The primary idea here is to provide live tracking with routes and bus timings to the users. All possible stops between source and destination of user and the map for the same will also be provided. The proposed system provides the exact location of the bus to the passenger from their location. Along with this, it also provides the following features:

- Real time tracking

- Know the nearest bus stops

- Details like Bus Number, Bus Route, Stops, daily schedule., Bus missed notification

- Arrival time of the bus at the desired bus stop.

- Total Travel time from source to destination.

- Facility for the driver to report the admin in case of emergency viz. bus failure.

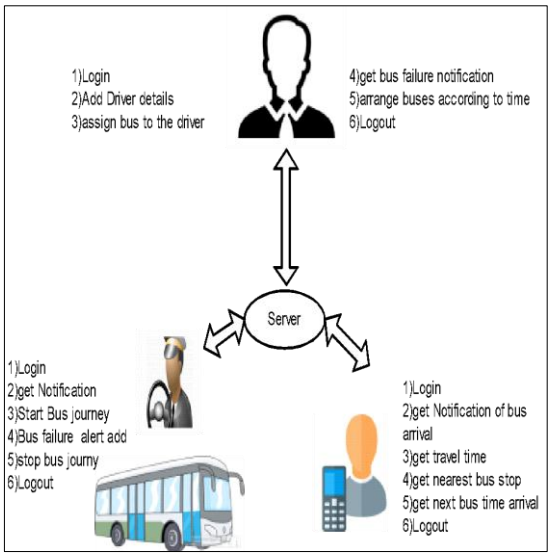

Fig - 1: Proposed System

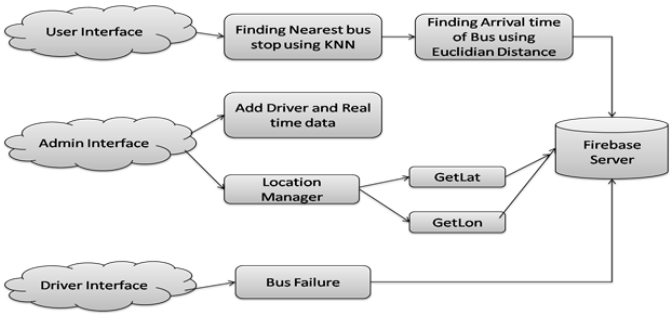

Fig - 2: Three tier architecture diagram

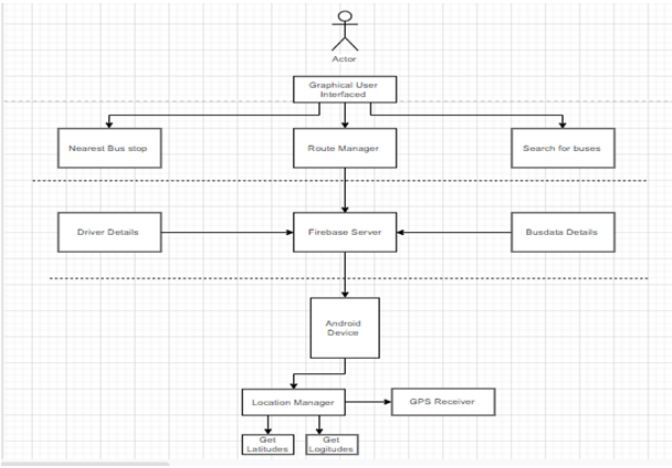

Fig - 3: Architecture diagram

2. ALGORITHM

- KNN

To implement KNN model follow the below steps:

1. First, load the required data
2. Initialize the value of k
3. Iterate from 1 to total number of training data points for getting the predicted class.
4. Now we have to calculate the distance between test data and each row of training data. Here Euclidean distance is used as a distance metric since it's the most popular method. The other methods that can be used are Chebyshev, cosine, etc.
5. Based on distance values, sort the calculated distances in ascending order.
6. Obtain top k rows from the sorted array.
7. Obtain the most frequent class of these rows.
8. Return the predicted class.

Nearest-neighbor algorithm

a) A pseudo code for the nearest neighbor algorithm is

ALGORITHM *Nearest-neighbor*$(D[1..n,1..n],s)$

//Input: A $n\times n$ distance matrix $D[1..n,1..n]$ and an index s of the starting city.

//Output: A list Path of the vertices containing the tour is obtained.

for $i \leftarrow 1$ to n do Visited $[i] \leftarrow$ false

Initialize the list Path with s

Visited $[s] \leftarrow$ true

Current $\leftarrow s$

for $i \leftarrow 2$ to n do

Find the lowest element in row current and unmarked column j containing the element.

Current $\leftarrow j$

Visited $[j] \leftarrow$ true

Add j to the end of list Path

Add s to the end of list Path

return Path

- Euclidean Distance

1. Loop through the elements in the training data.
2. Add the calculated distance (bygetDistanceBetween) in two lists namely distances and distancesClone.
3. Sort only the distances in ascending order.
4. Determine K by the determineK() method.
5. Obtain the K number of elements from the sorted list

   (in ascending order).
6. Loop through the elements of the sorted list.
7. Obtain the index of each element from distancesClone using the index of method.
8. Now sort them into different lists according to their classes.

$$\text{Euclidean distance} = \sqrt{\sum_{i=1}^{n} \left(x_i - y_i\right)^2}$$

9. If CLASS_1 has the greatest number of elements or the greatest size, predict the output as CLASS_1. (i.e. by majority)

3. METHODOLOGY

- Let B be a system that describes BRT details. B={}
- Identify input as I B={I,..}Let I ={i} The input will be Bus Number.
- Identify output as O B = I,O, O= The receiver will receive the Bus all details like Routes, stops, Status etc.
- Identify the processes as P B={I,O,P,..} P={E,A} E={parameter, Bus Details.}A=parameter, Availability, Bus details}
- Identify failure cases as F B={I,O,P,F,. F=Failure occurs when the Bus is Failure by any Electrical problem. Identify success as s. B={I,O,P,F,s,} s=When the Bus is started by an authorized Driver.
- Identify the initial condition as Ic B={I,O,P,F,s,Ic,}Ic=Bus access.

Problem Statement:

EVENT 1

Admin will provide necessary inputs such as bus stop data, Bus route Details, Bus Status etc

Let f(U) be a function of Passenger

Thus, f(U) →{Es∪ Bs}

EVENT 2

Admin and Driver both will Login to the server.

Let f(U) be a function of passenger

Thus, f(U) →{Es∪ Bs}

EVENT 3

Coordinates of the target bus, passenger, bus stop, distances and the data regarding these are stored to the cloud.

Let f(Es) be a function of stored Server

Thus, f(Es) →{K1,K2,.....Kn}⍰ K

EVENT 4

Key Exchange group members(admin & Driver)

Let f (Un) be a function of n Passenger

Thus, f(Un)→{Es}⍰ U

EVENT 5

Key management using KNN Algorithm.

Let f(Un) be a function of n Passengers.

Thus, f(Un)→ {Es}⍰ U

EVENT 6

The search operation of buses will be done using the Euclidean Distance Algorithm receiving the required coordinates, search results such as Bus number or live location will be displayed as output.

Let f(DE) be a function of searching on Server.

Thus, {(DE) → {K1,K2,K3.K}⍰ K.

4. RESULT AND DISCUSSION

In our System we can manage all functions related to the BRT System.

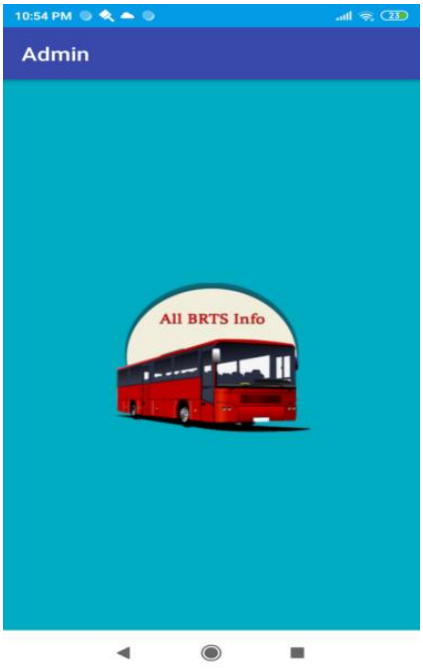

Fig-4.1: Splash Screen

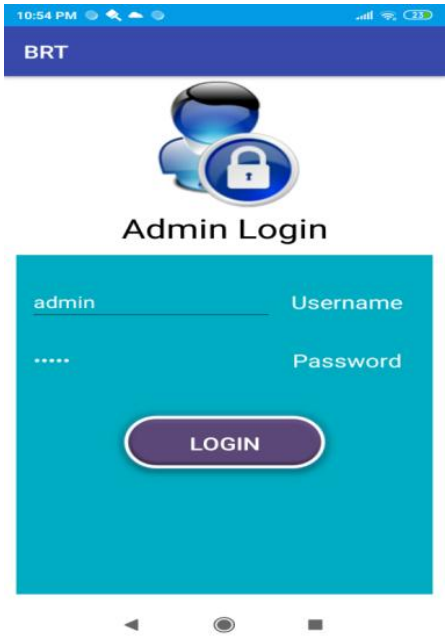

Fig-4.2: Admin Login

Fig-4.3: Admin Dashboard

Fig-4.4: Enter bus stop

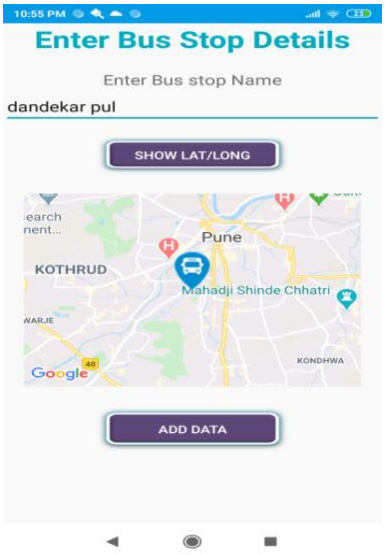

Fig -4.5: Add Bus Details

Fig -4.6: Add Bus Details

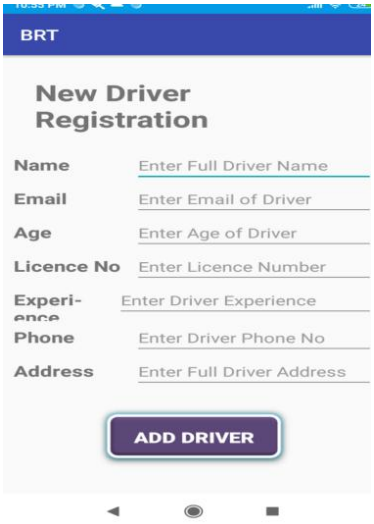

Fig-4.7: Add Driver Data

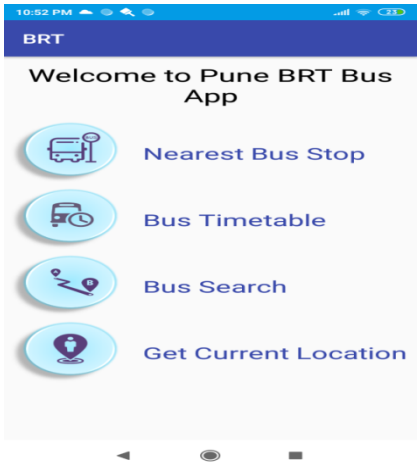

Fig -4.8: User Dashboard

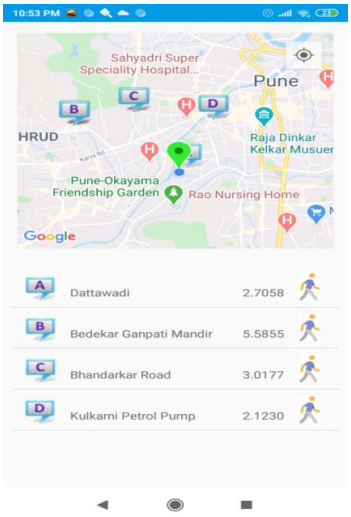

Fig -4.9: User's Nearest Bus Stop

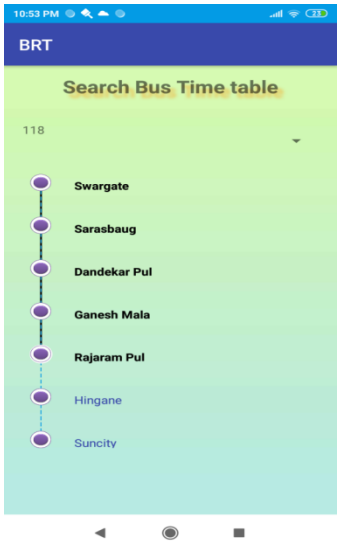

Fig -4.10: Bus Status

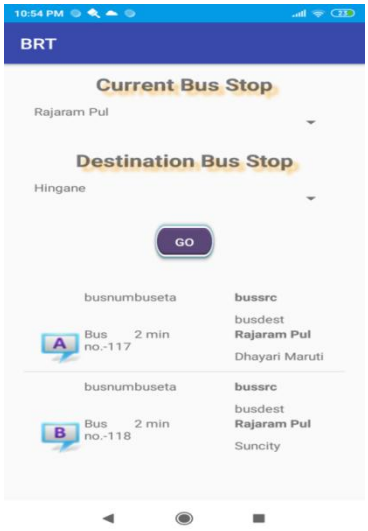

Fig -4.11: Search Bus source and destination

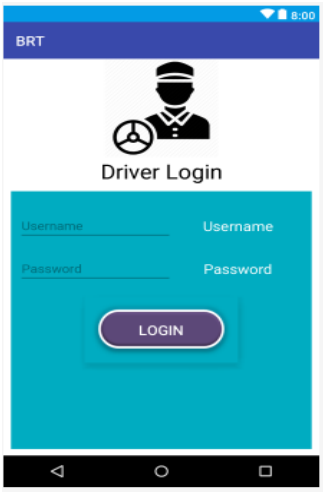

Fig -4.12: Driver Login

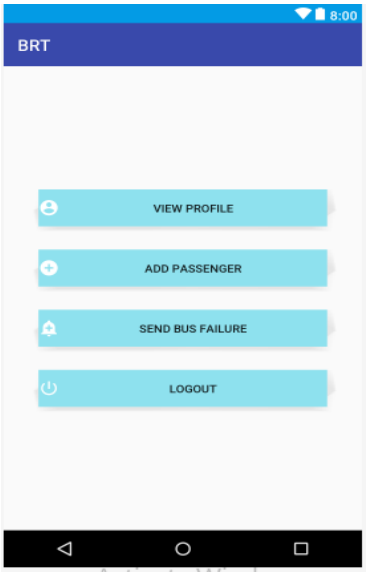

Fig -4.13: Driver Dashboard

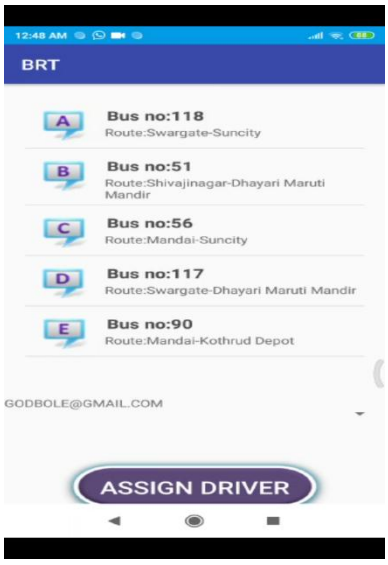

Fig -4.14: Assigning driver to BRT Bus

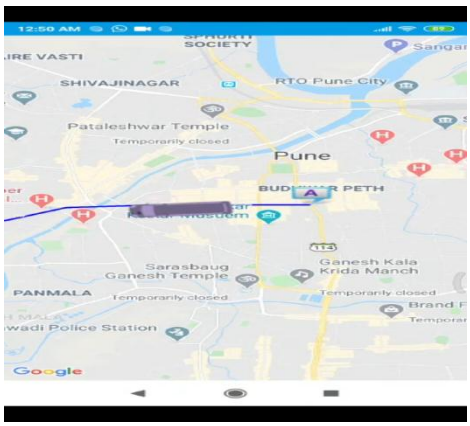

Fig -4.15: Live Tracking of bus

5. CONCLUSION

The system is an Android Application to track BRT buses and provide relevant information to users. This paper has described the design and architecture of BRTs info system. The proposed system comprises of user's android smartphones and a server. This system is able to demonstrate its performance to track BRT buses within Pune city. Furthermore, the proposed system is low-cost as it doesn't require any external hardware for location tracking.

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