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Deztino (An Intelligent Bus Transportation System)

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ABSTRACT
The proposed system provides details about the bus facilities (routes, unique id number etc.) and bus timings dynamically. It prevents the arrival – departure confusions that common people face every day. It can also predict the number of people availing the buses in a route throughout the week. This prediction will help in deciding and automating the number of buses required on a particular day in a certain route. It also detects the drowsiness of the drivers and alerts them in the right time, preventing many accidents. It can also calculate the number of people inside a particular bus and show if it is overloaded or not.
Keywords: **–** Decision tree, Prediction, Drowsiness

I. INTRODUCTION

The most significant negative experiences that drove a reduction in transit use were delays, perceived to be the fault of the transit agency, long waits at transfer points, and being prevented from boarding due to crowding. It is found that, passengers care about much more than just when the bus arrives—a factor traditionally considered influencing perceptions of reliability. Passengers care about the types of delays they endure and when in the trip they occur. Cities are locations having a high level of accumulation and concentration of economic activities and are complex spatial structures that are supported by transport systems.

Urban productivity is highly dependent on the efficiency of its transport system to move labor, consumers and freight between multiple origins and destinations. Many public transit systems, or parts of them, are either over or under used. During peak hours, crowdedness creates discomfort for users as the system copes with a temporary surge in demand. Low ridership makes many services financially unsustainable, particularly in suburban areas. In many regions of the world incomes have significantly increased; one automobile per household or more is becoming common. At an origin stop passengers may be able to wait at home, if they have access to realtime arrival information, and they may be able to consider alternative ways to travel.

The top reasons people give up on public transit, according to the researchers:

- Experienced long wait at a transfer stop.
- Missed departure due to wrong real-time information.
- Unable to board or denied boarding due to crowding.
- Experienced long wait at origin stop.
- Accidents due to carelessness of drivers.

Passengers don't mind standing in crowded buses or trains as long as the vehicles move without delay and run frequently. Commuters are willing to wait 10.2 minutes, on average, before they consider a wait too long, the study found.

To avoid these problems

- Predicting the number of people availing buses from different stops at particular time and day will help in automating buses.
- Rush in the bus can be detected.
- Detecting drowsiness and sleeping off of bus drivers would help in avoiding accidents.

II. LITERATURE REVIEW

A. Moovit

This app provides information about transit options like bus and train. It can be achieved by means of route types like least walking, least transfers and the shortest route. The routes are to be specified and every detail about transits, in a particular day in that route is provided beforehand. They also provide details about bus stops in that route. Their services are only available in proper metro cities. It helps people to find

the fastest, least crowded route by tracking the movements of its users and then syncing that up with official transit data.

Its largest drawback is the lack of location names in its database. While typing a station or address worked every time, looking up the name of a store or restaurant only worked twice during a testing, says a source.

B. Raft

This app provides information about the available local buses, ac buses, trains and metros between two metro cities. It also provides the nearby bus stops or stations. Step by step modes of transportation is listed out and can also be traced in Google maps, i.e., if there is no direct single transit option multiple transit connection information is provided.

In One-Click, people can inform friends/family the bus or local train they are travelling in, along with their expected time of arrival to the destination. One can toggle between multiple modes to see the best travel options.

Its disadvantage is that the app is not working as such it is said, they are showing some preloaded details so any updates regarding the cancellation or changed timings of the data are not set, so people using the app get the wrong information. Recently a lot of network errors and crashing has been reported by the users.

C. Aanavandi

AANAVANDI is an app that allows users to search for details of KSRTC buses. This is purely an unofficial amateur free app meant for the convenience of public/users who want to travel in KSRTC Buses. Services Available, Type/Class of Services, Boarding & Dropping points, Fare, Helpline Numbers can be availed through this app.

The main drawback of this app is limited to the KSRTC buses and has no details about private buses which the majority people use. The app is not reliable since they provide pre recorded data, and doesn't update if there is any change the timing / routes of the bus. A lot of inaccurate data was found when the app was used.

III. ALGORITHMS USED

Decision Tree is a decision-making tool that uses a flowchart-like tree structure or is a model of decisions and all of their possible results, including outcomes, input costs and utility. Decision-tree algorithm falls under the category of supervised learning algorithms. It works for both continuous as well as categorical output variables. The branches/edges represent the result of the node and the nodes have either:

1. Conditions [Decision Nodes]
2. Result [End Nodes]

Decision tree regression observes features of an object and trains a model in the structure of a tree to predict data in the future to produce meaningful continuous output. Continuous output means that the output/result is not discrete, i.e., it is not represented just by a discrete, known set of numbers or values.

Decision tree builds regression or classification models in the form of a tree structure. It breaks down a dataset into smaller and smaller subsets while at the same time an associated decision tree is incrementally developed. The final result is a tree with decision nodes and leaf nodes. A decision node has two or more branches, each representing values for the attribute tested. Leaf node represents a decision on the numerical target. The topmost decision node in a tree which corresponds to the best predictor called root node. Decision trees can handle both categorical and numerical data.

Neural Networks (NN) are important data mining tool used for classification and clustering. NN learns by examples. NN when supplied with enough examples performs classification and even discover new trends or patterns in data. NN is composed of three layers, input, output and hidden layer. Each layer can have a number of nodes and nodes from input layer are connected to the nodes of hidden layer. Nodes from hidden layer are connected to the nodes of the output layer. Those connections represent weights between nodes. In back propagation algorithm, the output of NN is evaluated against desired output. If results are not satisfactory, weights between layers are modified and the process is repeated again and again until an error is minimized. The inputs are varied accordingly to give predictions based on time series and critical events from the calendars. The input factors can be: special events from calendars, time of a particular day, number of buses available, location, depo, route, trips etc.

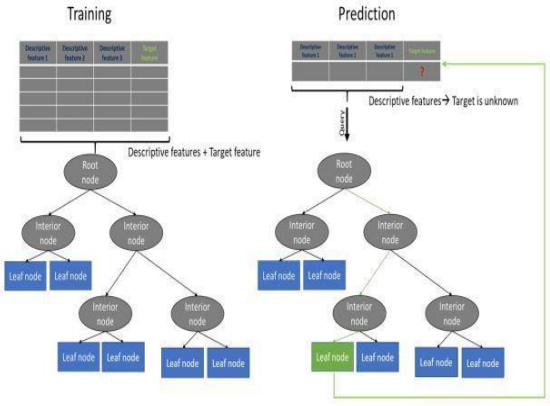

Figure 3.1 – Decision tree model

IV. EXPERIMENT AND RESULT

The areas where bus services are provided are split into many depos. The details of every bus in that particular location are managed by particular depos. The prediction and automation of buses done according to buses availed by users in that particular depo. If more number of people is availing buses under a particular depo, then more buses are assigned according to the need. The main admin and depo admin modules manage overall functionalities of the entire system. The conductor module counts the number of passengers inside the bus on a particular trip. The dynamic location of the bus is accessed based on the updating done by the conductor application. The public can avail bus by providing their starting location and destination point. They can also view bus status.

Prediction implementation – since real world dataset was not available for direct implementation to the model, a dataset was generated for the same. For the generation of dataset, data for 'route_id, time, event, holiday and day' were manually created and a logic function was implemented to generate the number of buses. For this calculation, a day was divided into 4 slots of 3hour gap. The entire set, i.e., the generated and manual data, constitutes generated dataset which is used for training the model.

The user input required for prediction are; route_id, time, event, holiday, day. This is done using the decision tree regression model which predicts the number of buses required on that day as the output.

Updating location implementation – the conductor manually updates the location to the database using his app module. When the location is updated the time is also entered into the database so that it can be used for further calculations.

Rush calculation implementation – the source and destination location are saved to the database when a ticket is issued. This information is used to keep the count for the rush calculation. When the bus passes the destination location, the count is decremented accordingly for all records related to that destination entry.

Drowsiness detection implementation – there are 64 points on the face used for face detection of which 4 points surround the eyes. The drowsiness is detected using by calculating the Euclidean distance of the 4 points surrounding the eyes and the distance of the head tilt of the person.

V. CONCLUSIONS

This project has been implemented on Android platform. Also, different attributes have been added to the project which will prove to be advantageous to the system. The requirements and specifications have been listed. This project is implemented using Jupyter notebook, Visual Studio Code, Sublime Text, SQLyog. Using the GPS system, the application will automatically display the maps and routes to the different locations and also track the bus location using client-server technology and forward it to the client device. It uses basic measurements of distance between two locations and provides necessary details of each and every route for people to easily pick up buses possible on the specified route. Specific location details are provided to the user along with bus details so that the person can identify the bus correctly. It uses remote server as its database. Due to this the records can be easily manipulated on the device itself and the server burden gets reduced.

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