Predicting the probability of getting the seat in the bus

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Abstract: The most frequently available means of transportation in present day is Bus which is highly cost efficient and convenient means to travel nearby places. Moreover, by using the buses will help to control the traffic growth and increase in private vehicles which in turn helps to encourage common public mode of transportation and greatly reduces congestion by achieving a change of commute mode. During the peak hours buses get overcrowded due to the less availability of the required number of buses. During any urgency, passengers do not prefer to wait for the bus and instead they choose the other private means of transportation which in turn leads to increased traffic and pollution. Instead, if the user gets to know the probability of getting seat at any station before the destination then this would help the passengers to take the better decision. Today with the development of smart phones and android made very easy to provide all the features to the common man by application. In this case Cognitive Agents (CAs) can be found helpful as they can think and act accordingly as a human brain. In this paper using CAs with Behavior-Observation-Belief (BOB) model and android application the tracking of count and suggesting is done.

Index Terms: Passenger count, Bus, boarding, alighting, deboarding, cognitive-agents, Behavior-Observation-Belief-model;

I. INTRODUCTION

Transportation plays a key role in the country economic development and helps people to easily commute to all places of the country and to effectively increase the communication with people around. Among all means of transport bus is the most used public transport so most of the people now a days prefer to travel by bus rather than private vehicles due to cost efficient and easy availability for their daily commute, and this majorly has many issues regarding the timings, rush management, and route congestion. From [1] we can see how the population increases day by day and users of the bus also drastically increased which marked hike in the buses required. With this, during peaks hours due to less availability, buses remain overcrowded and which is discomfort for passengers who travel to long distances and inconvenience for who carry heavy luggage’s.

To solve the issues in the transportation, one of the solutions as seen in [1], could be the usage of CAs and BOB. The cognitive agents are those that can take smart decisions based on the observations they make. This BOB model observers the surrounding environment and gather all the different behaviors that take places in the environment, based on these behaviors it generates some set of observations and then with the help of these observations it generates the beliefs. They have the capability to work in a similar way as a human brain. We can place one cognitive agent at each bus station.

The function of CAs will be to retrieve the passengers count and analyze it to check for the behaviors of the similar days. If the passenger count hasn’t exceeded the higher limit, then it is updated to all the stations agents for the decision. Then the agent updates the respective probability to the next station. In this way we can overcome the problem of knowing passenger count and probability of getting the seat. The CAs are intelligent enough to perform tasks just like humans. They have the thinking capability as humans. Being deployed in a predicting system they can take smart decisions on providing the perfect data to all the feasible stations which come before destination. The paper provides an idea of how CAs are used to predict and ensure that it helps the users to take better decisions. In this way passenger’s satisfaction can be achieved which is one of core objective.

II. LITERATURE SURVEY

In this dynamically changing world, transportation serves same as nervous system and is very vital in development of nation. In our everyday life we observe lakhs of people travel form one place to another. Because of this a complex network of chain is created. From [2] there is a web application developed which predicts the probability of getting the seat in Indian railways. Using this as the refers, web application may not be handy at all the times so in this paper the solution is given for the bus system and the android application is used for the implementation.

In [3] we get to know the importance of the transportation and few basics terminology.

III. ARCHITECTURE

The Figure 1 represents the architecture model of how the CAs are being placed at various bus stations. It also depicts the probability of getting the seat at a every station from source to destination passing through intermediate stations. The figure also depicts the flow of data regarding the passenger count at each station which gets updated when passengers board or deboard the bus at the respective stations. Initially, the admin agent selects the route for the bus to travel, then this route is updated in the database and passengers can track bus information.

After fixing the route, it considers the initial passenger count and the particular day as input. In return the admin stores the data of these count into a database. From this data the bus starts from the source and travel forward to the next stations in meanwhile the passenger count will be stored into the data base.
Before the bus reaches the next nearby station, passengers in that particular station checks for the count and seats availability, and the agents queries the database for the previous data based on the parameters considered for model. Day behaviors are mapped to the similar behaviors which are already stored in the database. These agents generate believes and stores it in behavior.

The Figure 2 represents the BOB model for belief generation. It takes different possible parameters. Based on the value of the parameters it generates the behavior of the passengers and then generates the corresponding beliefs. These believes are used in decision making. In this designed model the beliefs are the probability of getting the seat in a station before the destination is reached. The probability of getting the ranges from 0.1 to 0.9 as the probability of getting the seat 100 percent and not at all getting the seats are considered to rarely happen.
IV. ALGORITHMS

This section briefly describes the algorithms used for the prediction. The Algorithm 1 shows the working of the Bus Station Agent, the main agent of this paper. The agent first gathers all the vital parameters from all the sources and fetch the actual parameters. By comparing these two it calculates the change in parameters. From this it generates a set of behaviors and observations based on them. Then it generates beliefs based on the observed characters.

**Algorithm 1: Working of Bus Station Agent**

1. **Begin.**
2. Initialize the behavior storage to zero.
3. **For each Route r, selected do**
   a. Accept vital parameter \{n1, n2, n3……nn\} from various previous data learnt.
   b. Fetch actual parameters \{a1, a2, …..an\} of route r from database.
   c. Calculate similarity in the parameter for some parameters \{p1, p2, p3….pn\}.
   d. **For i from m+1 to n do**
      i. \( P_i ← n_i \).
   e. **End for.**
   f. Behavior set BEH ← Behavior identifier (\{p1, p2,….pn\}).
   g. Observation let O←Observation generator (BEH).
   h. Belief let B←Belief formulation (O).
   i. **If** B=0.1 to 0.3 probability of getting seat, **then.**
      a. Node k←FindNextNode (Destination).
      b. Provide the probability and station details.
   j. **Else if** B=0.4 to 0.6 probability of getting the seat **then.**
      a. Node k←FindNextNode (Destination).
b. Provide the probability and station details.

k. Else if \( B = 0.6 \) to 0.9 probability of getting the seat then.

a. Node \( k \leftarrow \text{FindNextNode} \) (Destination).

b. Provide the probability and station details.

l. Else

i. Continue.

m. End if.

n. Store the belief in database.

4. End For.

5. End.

Based on it the belief it takes the decisions about the probability of getting the seat at a particular station and same is conveyed whether passenger gets the seat or not in the that route. Once a proper belief is generated it is all stored in a database for future references.

The Algorithm 2 shows the working of the Admin agent. From all the routes that are present the agent first selects the route for each bus and appends it to list of routes.

Algorithm 2: Working of Admin Agents

1. Begin.
2. For each route \( r \) in existing routes do

a. Create probability object \( P = \{p_1, p_2, p_3, \ldots, p_k\} \) from route \( r \).

b. For each probability \( p \) in \( P \) do

i. Accept vital parameters \( \{a_1, a_2, a_3, \ldots, a_n\} \) of probability \( p \) from various sources and store it to database of probability \( p \).

ii. Node \( k = \text{findNextNode} \) (destination).

iii. Display the probability of getting the seat for the \( k \).

c. End For.

3. End For.

Then it checks each route for all the vital parameters that are generated during the previous days and appends these data to the database of routes. Then the agent intelligently finds the next corresponding node that leads to the destination and predicts the best probability of getting the seat through the application.

V. RESULTS AND DISCUSSION

The performance of the proposed architecture for predicting the probability of getting the seat in bus using CAs is found to be good with respect to accuracy, predicting rate can be seen below. In Figure 3, a graph of accuracy in predicting the probability analysis rate versus time is shown. It is observed from the figure that predicting analysis rate increases overtime.

![Figure 3: Accuracy in providing the probability rate overtime](image)

But with the help of BOB model, the agent learns on how to decide faster and the accuracy increases faster during the initial stage. Overtime as agent learns from experience of probability decisions, the accuracy in the probability rate increases twice as more than without agent.

In Figure 4, a graph of successful probability prediction rate versus time is shown. It is assumed that successful prediction rate is 50% and gets increased overtime.
Figure 4: Successful prediction rate over time

Without CA, the rate increases at a constant rate until sometime and thereafter becomes constant. But with CA, the agent learns on how to decide on forwarding and as a whole, the successful prediction rate increases drastically till its maximum potential.

VI. CONCLUSION

The paper presents an idea of how CAs can be a helping hand in a tracking and predicting system. The results obtained shows the accuracy of usage of these agents in all the transport and tracking activities. By the help of CAs all the issues of transportations can be easily addressed and resolved. In this way an efficient predicting system can be built.

REFERENCES