An Intelligent AI for Transportation System

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Abstract: *Public transportation is used by many people all over the world to visit new places. Individuals are in general make a plan to trip new places and for special occasions they might feel totally lost in new place. At this time our Chatbot acts the helper for travellers. Our Chatbot helps the people to find their desire source and destination. It is a application that is work on web, desktop and also on telegram application. This Chatbot uses the Natural Language Processing(NLP) and Deep Learning methods. It acts as the live human being as a Graphical User Interface(GUI). This AI Chatbot ask user for current location and destination location by asking some questions. It analyze the user's queries and associate with data set of the Chatbot. The deep learning techniques are used in this Chatbot are responsible for understanding the user's questions perfectly to avoid any misunderstanding. Once the users question has been understand, then the Chatbot provides the most appropriate reply for the users query request. Then the users gets all the information related to the bus names with their numbers so the person can travel to the desired location. Our Chatbot implemented by using Pythons Keras library and Tkinter is used for GUI purpose.*

Keywords: Chatbot, Artificial Intelligence, Natural Language Processing, Deep Learning, Keras, GUI, Tkinter.

I. INTRODUCTION

People frequently travel to different states, famous places and sometimes they may feel totally lost in a new place. They don't know the route and buses number to reach their desired destination. Many people face awkwardness in asking the people around them to get information about their destination place. Frequently we arrive at the bus stop, ready to catch our bus but we don't have any idea about which bus to take to reach our destination. This is the main situation we experience in our daily life while using public transport to reach the desired location. You go to unknown place and you don't have any idea about which bus to take.

There will be no data given about the buses or about the bus numbers or the transport that takes you to the destination place. This is the scenario happens with us many times. When you reach to the bus stop you will many peoples waiting for the bus. Some of them know the exact bus timing and which bus to be taken to reach the desired destination and some of them face the difficulty on which bus to be taken. At this condition, you are totally stressed. Here we know that most of the people prefer public transport to reach their destination. In that condition, most of the people don't have any idea about bus timings, routes, bus numbers and other stuffs.

People faces difficulty when they visit the new places for the first time and don't know which bus is suitable for their destination. They wasted the time for waiting the bus and collecting information about bus from some native people. So there is one solution to overcome this problem is that our interactive Chatbot which gives entire information related to the bus timing and route. This Chatbot solves all the problems related to the transport and it will interact with users at any place or any time. One main thing is that Chatbot are very helpful for users in day to day life. This Chatbot will saves the time of user and there is no need to ask someone about bus information.

II. MOTIVATION

Individuals deal with an issue when they are new to the spot and don't realize which transport to take. All things considered, much time is squandered for hanging tight or for get-together the data about the transport what they need to get in to arrive at their objective. There is one arrangement possible for this issue is that an intelligent Chatbot that gives the whole information of the transports and their timings which makes it simpler for individuals to utilize or to impart at any spot or any time. One central concern is that chatbots are fundamental for user's everyday life.

The motivation is to develop an AI chatbot for the transportation system that can help travellers to reach their destination easily. It will be available 24x7 and prevent travel scams. User can easily find the best routes, bus numbers, their arrival time based on their current location and destination using this chatbot. We have used Python libraries to implement this chatbot. We have used Tkinter for developing the user interface. Keras from the Tensorflow library is used to train the model using intent.js on file which contains patterns of questions that users may ask and different responses for that questions.

We have added one more feature of voice assistant. Using this feature, users can ask queries by typing or by using voice commands. If the user asks a query using a voice command, then the chatbot also gives a voice response along with the data displayed on the screen. If the user asks a query using typing text, then the chatbot displays the response on the screen. For this, we have used a speech recognition library to implement this feature. Using this feature, the user gives a voice command. speech recognition library converts speech to text. This input text is sent to the trained model to get an appropriate answer. When text response is received, it is converted to speech using the gTTS library. For improving the interaction between users and chatbots, we have trained a model using Keras from the TensorFlow library. We have created a JSON file of various patterns and their responses. Patterns are different possible locations and responses are buses for these locations. We have given a unique tag to each pattern using which we can recognize that pattern. Pattern contains the same question in different formats that the user may ask. The response contains different answers that the chatbot should give to any question. Firstly, we performed tokenization and lemmatization on this JSON file. After that, we trained a sequential model using this formatted data. When the user asks a question, the query is gone through the tokenization and lemmatization process. We then passed this cleaned query to a trained model to predict the response to that query.

III. OBJECTIVE

- Easily find the best routes, bus numbers, their arrival time based on current location and destination of the user.
- Help people to reach their destination safely without facing any problems.
- Provide all bus information at the user's fingertip.
- Users can ask for help without any hesitation.
- Saves users time.
- Provide a better user experience.
- Available 24x7.
- Help people to avoid travel scams.
- Use NLP to understand regular language.
- Implement a Telegram chatbot for mobile users so that they can easily get required bus information.
- Implement Tkinter GUI for desktop users.
- Implement a chatbot that can accept voice commands and give corresponding voice response.

IV. PROBLEM STATEMENT

Public transportation is a very common way of traveling in big cities. People travel to different places and sometimes may feel completely lost at these places. They may not know the route and buses to reach their destination. So, develop an AI Chatbot that will help them to find the best routes and buses to reach their destination. The chatbot should ask questions to know about the user's current location and destination. Use this information to analyze available data and provide appropriate bus numbers with their arrival time and routes. Develop different GUIs for desktop and mobile users. The user must be able to type a query or give a voice command. According to the user's query, the chatbot should give an appropriate text response or voice response.

V. METHODOLOGY

5.1 Perform Literature Survey

To gain an understanding of existing work we gather required information from books, journal articles and from google. Teachers also helps a lot in our work and we also refer the previous published papers to gather information.

5.2 Apply Waterfall Model

The waterfall model is a sequential design process, used in software development processes, in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of conception, initiation, analysis, design, construction, testing, production/Implementation and maintenance.

5.3 Design of AI Chatbot

Designing a chatbot is a combination of both art and science. The art is to understand your target clients and their necessities and the science is to change those bits of knowledge into little steps over to convey a frictionless client experience.

5.4 Implementation of Chatbot

By using NLP i.e.; Natural Language Processing to breakdown and to interpret human language. And using Keras which is used to provide the python interface to the artificial neural networks. It is a open source library.

5.5 Verify and Test the Test Cases

Testing of project problem statement using generated test data (using mathematical models, GUI, Function testing principles, if any) selection and appropriate use of testing tools, testing of UML diagram's reliability.

5.6 Provide AI Chatbot for Use

This is the last step where we deliver chatbot to the end user. And take feedback from them, and provide support to them.

VI. MATHEMATICAL MODEL

Let P1 = Given success cases viz., user's voice query correctly detected, the correct response is provide for given query, Telegram chatbot gives correct responses to user's query

For a Problem P1 to be NP-Hard, Satisfiability problem (SAT) must be reducible to P1; i.e. SAT $\propto$ P1

Let for CNF-SAT, CNF = $(X_1 \lor \overline{X}_2 \lor X_3) \land (\overline{X}_1 \lor X_2 \lor \overline{X}_3)$

X1: True (i.e.1) if user's voice query correctly detected

X2: True (i.e.1) if the correct response is provide for given query

X3: True (i.e.1) if Telegram chatbot gives correct responses to user's query

Here, there are 8 possibilities for which CNF will be satisfied. They are:

X1	X2	X3
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1

This means, we have 8 possibilities for 3 variables. We can check whether CNF is true or not for these 8 possibilities.

i.e. For n variables, we have 2n possibilities.

This tells us that our problem P1 is taking exponential time. This is similar to satisfiability problem as it is also an exponential time taking algorithm. As satisfiability problem is reducible to our problem P1, problem P1 is NP-Hard.

We will devise non-deterministic algorithm for problem P1:

```
Algosat () {
    for i= 1 to 8
    {
```

Xi=Choice (true, false) ——— Non- deterministic statement

if (CNF == true)

Success () ——— Non- deterministic statement

else

Failure () ——— Non- deterministic statement

}

}

This algorithm will take O(1) time i.e. polynomial time if we know the correct values for Xi. So, this is a non-deterministic algorithm that takes polynomial time O(1).

We have proved that P1 is NP- Hard. Also, we have written non-deterministic polynomial time taking algorithm for P1. So, our problem P1 is NP-Complete.
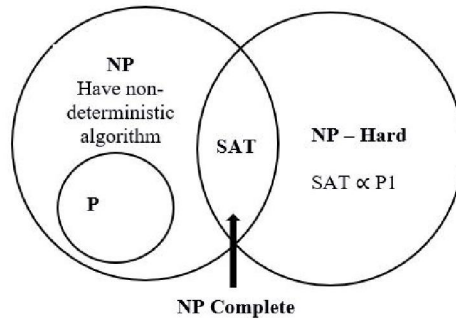

Figure 1: P, NP, NP-Hard, NP-Complete Classes
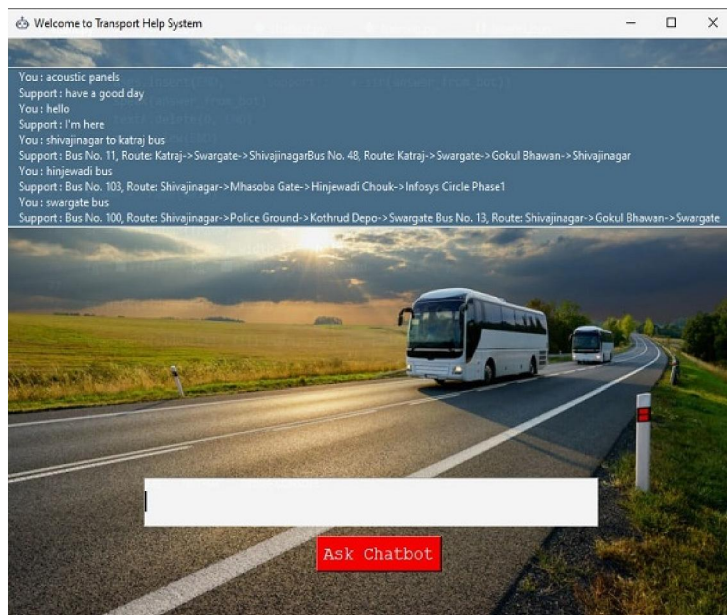
VII. RESULT

Fig.2: Telegram Chatbot

Fig.3: Desktop Chatbot

VIII. CONCLUSION

AI chatbot helps people to easily find bus numbers, their arrival time and best routes. In this project, we used Keras to train model so that chatbot will respond to user's query. Chatbot gives correct results if we provide destination location and current location of user. Chatbot correctly provides the bus numbers, their arrival time and routes as per user's queries. This saves time of user and prevents travel scam.

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