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Tour Planning Chatbot for Tourism and Travel Industry

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***Abstract*:- Chatbots have become a key revolution in almost every sector of industry, ranging from medical to support. In this paper, we sought techniques to enable chatbot in travel and tourism industry, see related wor krelated to this industry, and the chatbot's as virtual tour guide. Famous tourist spots rich countries such as Italy have started doing mentioned thing for specific Point of Interests, and are experimenting with the chatbot's behaviour with the tourists. India has its own heritages which it is known for, using chatbots for increasing the number of tourists will help boost tourism industry, and would generate revenues to hotels and airline industry on a single click. Providing customisation to each tourist is the key purpose of this paper, using latest technological trends in NLP.**

Keywords— Travel and Tourism, Chatbots, NLP, Hotel and Airline Booking, Recommendation Systems.

1. INTRODUCTION

In this metro era, people take breaks from their work and visit different places along with their families and friends for recreation. India's Tourism Sector is rapidly growing and affects the economy very much. In 2018, World Travel and Tourism Council estimated that tourism sector generated 9.2% of India's GDP, supporting 42.673 million workers, i.e., 8.1% of its total employment [1].

India is visited by both Domestic and Foreign Tourists, some of them even visit for medical treatments. With increasing technological trends, many methods have come forth in recommendations systems. Travel agencies plan various tours for multiple tourists and offer them it as packages which can be costly. They plan itineraries for the tours, book hotels, cabs and flights. They hire local tourist guides for the visits they make in the tour, for example, there will be a tourist guide in the museum explaining you the importance, history and value of a particular monument.

What if this was a replaced by a simple chatbot who could plan your itinerary according to you, recommend and book hotels/flights/cabs based on your preference, who could also act

as a virtual travel agent when you visit some place and provide the information to you. Today we are moving to a world where customisation over generalization is preferred. At our homes and offices, we have chatbots as Alexa or Google Assistant or Cortona who do the given task on a single command. They also learn your behavioural pattern and recommend you the songs or news based on your older queries. This is the beauty of NLP and AI systems which brings customisation to us.

Enormous Information is available on the Internet of various tourist sites which can be utilised for such systems; therefore, they can be introduced in Tourism Industry especially in India where more than 1000 Tourist sites including World Heritage Sites such as Taj Mahal lies.

This paper presents a survey done on chatbot systems who act as a virtual agent, recommends sites, books hotels/flights and understands the pattern of tourists.

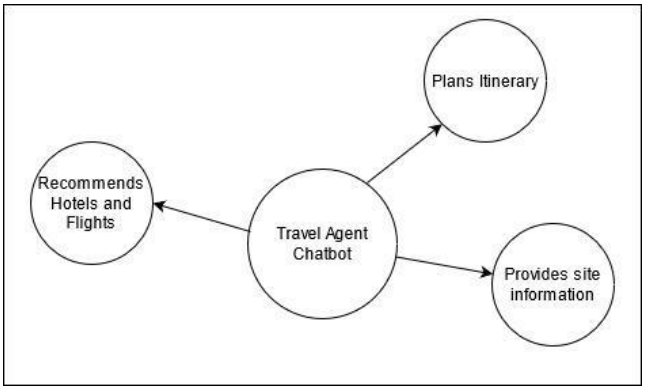

Fig. 1 Functions of the Travel Agent Chatbot

As shown in Fig. 1 the chatbot will perform three main tasks, planning Itinerary, Recommending Hotels and Flights and provide information on the site that is visited or to be visited. It is performing all the given tasks, which are done by some tour and travel agencies, such chatbots will be a bliss and would be a revolutionary development in these times where advancements are constantly happening due to latest technological trends and automation.

2. LITERATURE SURVEY

The study is done on some of the evolutions in Chatbots by using various emerging algorithms in Natural Language Processing, on how chatbots are able to recommend places, hotels and flights based on the tourist. The papers referred to the topic are as followed:

A. Behaviour of Chatbots like Humans – Anthropomorphology

A study [2] was done on a certain amount of people to determine the use of chatbots for customer service, the feedback was considered in this research to determine some of the factors, difficulties and improvements needed.

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This paper also tells how chatbots are being demanded in many sectors, big companies like Facebook are developing chatbots for automating responses for support queries. It also showcases how chatbots can replace human agents and behave like humans.

Two of the main objectives of the paper on which the author sheds a light on are: - (1) Anthropomorphic Design Cues(ADCs), (2) Foot in the door (FITD). The experiment was set up by having ADC and FITD, each two.

ADC is generally the method of interacting with the users, like humans. Whereas in FITD, we respond to small target requests made by the users.

Some of the findings were:

1. It was able to generate social responses for the users.
2. Users were able to interact with it correctly.
3. Despite knowing that the users were interacting with the Chatbots, they had applied the same social responses.

B. Evolution of Chatbots

The paper [3] surveys different papers published in this field. Some of the paper focuses on how the trend of using chatbots for hotel booking, site suggestion and airline booking increases year by year.

The paper has surveyed many articles from various authenticated sources such as Springer, IEEE Xplore, ACM, Google Scholar. This aims at addressing current trends in this industry, the technological advancements in this field with the help of third-party apps (using chatbots can reduce the task of a travel agency 80%, leaving 20% to humans. APIs of IBM Watson can be incorporated in the chatbots) and advanced NLP.

There are research communities in specific countries who focus on the evolution of chatbots in the travel and tourism industry, some of them being Bulgaria, Italy, US and some countries of Europe.

Majority of the study is being done on hotel and airline booking. At prototyping level, the authors have targeted a specific location. The developers have mined data from sources like Google, TripAdvisor, Wikipedia…etc.

C. Methods used for Tourist Sites Recommendation

This paper [4] introduces the concept of chatbots in the tourism industry. Additionally, it focuses on the issues of chatbots, two mentioned problems in the paper are 1) If the recommendation space of the chatbot is too big, the chatbot will be unable to find a preferable solution. 2) If the users give too much of a search query, inconsistencies increase due to which again the chatbot is unable to find an optimal solution.

The authors of this paper have developed a recommendation algorithm based on ConDiag and Shannon's Entropy algorithm.

A tuple consisting of the knowledge base of the recommender and requirements of the users are given input to the system. We identify attributes which are causing inconsistencies in the requirements.

It is verified if such a requirement can exist and if it doesn't, the inconsistent attribute of the requirement is removed.

Therefore, the author proposes the idea of model-based reasoning and inculcates Shannon's entropy algorithm to give preferences to the attributes present in the problem. It also helps remove inconsistencies in the query.

The prototype of the chatbot developed in this paper [5] successfully gives information to tourists about the cultural heritage sites in Campania. The aim of the paper is to suggest the tourists the context and services to them by their persona.

A context aware system is a system which can analyse current scenarios and based on that information it can provide suggestions to the users. One of the examples is if the visitor/tourist is a student, it would suggest the student with his context. Similarly, the chatbot will be able to do things which are perceived by the user profile. It will also be able to provide services like hotel booking based on the user's location, it may also reserve seats as preferred by the user. Basically, the chatbot will act as the virtual tour guide who will do all tasks customised for the users.

The proposed architecture in this paper has a storytelling module which will do the task of informing the user about the place. The context manager will draw a context dimension tree considering different contexts, which will lead to the inference engine. The inference engine will perform analysis on the user's needs and extract the context.

Latent Dirichlet model is referred for this purpose which finds the correlation between keywords and topics extracted from the context. The proposed system looks for the Bayesian filters for keywords. In the end LDA helps the model to make a mixed graph tree by the topics which were extracted from the context.

The accuracy this modelled achieved is 87.13%. The model was able to satisfy the tourists by its dialogue delivery, understanding and recommendations.

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Sr. No	Paper Objective	Key Points (in terms of Domain)	Methodology	Remarks
1.	Recommending Tourist Places based on User's Input by Entropy Algorithm [4]	NLP, Issues in Chatbot and Framing Answers	Shannon's Entropy Algorithm	Whenever a user fires a query, there are n no. of attributes involved. Shannon's Entropy algorithm looks for important and relevant attributes in a query and removes inconsistencies.
2.	Surveying Research in the Evolution of Chatbots in Tourism [3]	Different trends in this industry with the help of a chatbot	Follows the GQM (Goal Question Matrix)	The goal of this paper is to identify and study different papers related to the tourism chatbot. This presents the statistics and progress of chatbots in tourism industry.
3.	Exploring how a chatbot interacts like a human while handling in customer services [2]	NLP, acting like a Human, and Understanding the User's Feedback	Anthropomorphic Design Cues and Foot in the door	The said techniques explored in the paper shows the relation between a human and chatbot interaction. It shows how complacently the chatbot can handle queries and how efficient it is.
4.	Recommending Tourists sites in Campania based on User's profile (i.e., Student, Employee, …etc) [5]	Customised Storytelling by the chatbot and Topic Extraction	Context Dimension Tree (CDT), Latent Dirichlet Model (LDA)	The prototype is only developed for heritage sites in Campania, Italy. The main purpose is to extract context from the user's query and after extracting it give a proper response to the user. The suggestions that are made to the user, depend on his/her profile.
5.	Understanding previous visits of users and recommending next-POI [7]	Recommendation System, Reinforcement Learning Algorithm, and Clustering	Q-BASEX and SKNN	Set of trajectories are formed from the past visits of the tourists. These then are clustered together using KNN. An Inverse Reinforcement Learning Algorithm (Q-BASEX) will predict next POI.
6.	Recommending Sites in Pompeii for Cultural Heritage sites [6]	As in paper [5], but slightly different method	LDA	Similar to [5], this model also extracts topics from the user. A study was conducted on a group of people, which was received positively. The information of the sites was taken from sites like Trip Advisor.
7.	SnapTravel's method for Hotel Bookings [8]	Hotel Recommendation System, and NLP	AllenNLP, ELMo, Name-Entity Model	Multiple Algorithms contribute to multiple modules in the architecture. The chatbot captures the user input looks for important words. SPACY2 algorithm; dataset containing names of hotels, is used for recommending the hotels.

Table I Survey Summary on Different Papers

The paper [6] focuses on helping the tourists in the Pompeii Archaeological Park with the help of the chatbot developed for this purpose.

The developed system (protype version) in this paper [6] extracts topics from the user with the help of Latent Dirichlet Algorithm (LDA). After topic extraction, the system elaborates it and finds an appropriate answer to the query asked by the user.

The information of the sites is taken/referred from websites like TripAdvisor, Wikipedia and etc.

The experiment was conducted on 502 users, the chatbot had received a positive response to it. The proposed system was used to help users find information of the sites and provide a walk through to them like a travel agent.

The paper [7] suggests a state-of-the-art neighbour-based model. The use case describes where next POI (Point of Interest) is recommended based on the previous POIs trajectories. Mostly, where people usually prefer and also how they decide over the POI.

Four factors that depend on each other are taken into consideration; they are selectivity, rapidity, repetition and capriciousness.

These four factors are operationalized and a Reinforcement Learning based recommendation system called Q-BASEX which predicts the next POI which were not considered in the training, the four factors would contribute to the clusters which would be calculated using the SKNN algorithm (Session KNN).

Two datasets of trajectories captured by Geo-locations. An expert score is calculated by extracting crowd-sourced data (such as ratings) from TripAdvisor. The Markov Decision Model is then used to understand the behaviour of the user. A tuple will store no of states available, actions, transitional probabilities, source and destination. The goal will be to find an optimal policy that maximises the reward R. Similar users are grouped together and if the system wants to recommend the next POI for the user, it will match the new user with the existing groups and suggest the POI.

D. Hotel Booking

SnapTravel [8] is a commercial app which helps in Hotel Booking and Recommendation. In this paper they shed the light on the working of the chatbot which recommends hotels to the user and in difficult situations forwards the case to the human agent.

The developed model consists of the intent prediction module which predicts the intent of the user's message, suppose the

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user mentions search keyword in his message that means he indicates the chatbot to search the hotel for him.

The ELMo model and LSTM generate unambiguous responses to the user. The pre-processing and implementation are called AllenNLP.

The Name-Entity Relation model looks for the city and hotel names. The dataset used for training is CoNLL 2003 which extracts city names. SPACY2 for labelled hotel and city names. The models are evaluated by their precision, recall and f1-score for each entity. In the end the model predicts the relevance score, which evaluates the top 1 and top 3 suggestions. The result is shown to the user for his/her choice.

2. PROPOSED SYSTEM

Several chatbots are used in place of human agents, it has the ability to efficiently interact with the user. Gia, Goibibo's chatbot is able to book flights/trains/hotels causing to have reduced the workload of the support employees.

Similar in this paper, the proposed system targets Pune as its experimental case study. As seen in earlier papers, the Point of Interests, Tourist Sites and Hotels are to be mined from the famous travel firm websites such as TripAdvisor, Trivago, and Google Reviews.

The tourist will interact with the user and ask him for particular sites that he would like to see, for example, if the tourist wants to visit trekking spots, the chatbot will identify the main topics such as Trekking and would suggest the tourist a travel plan, and if the tourist prefers to stay nearby the site the day before, he/she can also ask the chatbot to book hotels based on his/her recommendation.

The proposed system will involve multiple modules, one of the most is Data Preparation, Topic Extraction, Answer Formation and Input Query Processing.

Dataset can be prepared from the travel planning websites, for example Sinhagad Fort and it can be labelled as Trekking, Historical Monument. Such (x, y) pairs can be formed for few tourist sites. Itinerary Data can be also prepared similarly, and based on its popularity it can be rated, or prioritized.

After the tourist builds the conversation with the chatbot, the input is processed by the LSTM [10], which can be called as Input Query Processing. The module sees that the chatbot is able to give appropriate answers to the user.

Topic Extraction [9] – LDA is widely used for Topic Extraction, this will require the important bag of words, therefore we can plot words which can be relevant to the Input Queries which can be extracted from the web.

The chatbot should answer the Tourist's Query in a given format, an inference engine would infer the query, after a certain topic is extraction.

It can be possible that the tourist may use a different slang, or would mistype things, so processing this important, LSTM will help process the input sentence word by word, pre-process it, and then give it to the Topic Extraction.

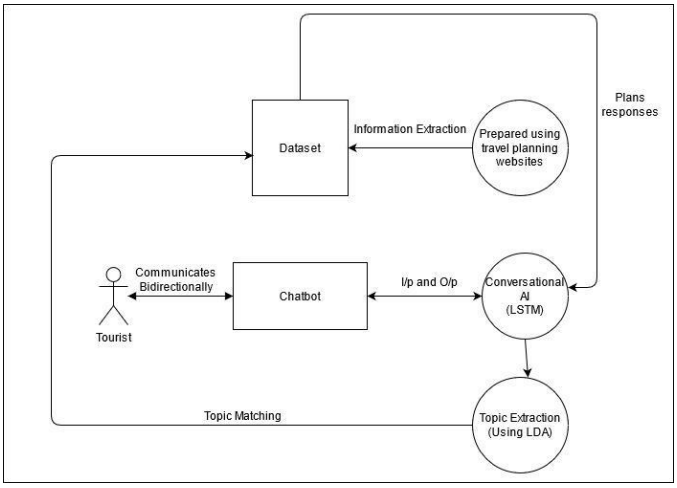

Fig. 2 The Proposed System Workflow

3. CONCLUSION

Table 1 summarizes all the papers referred to in this paper, the review shows that there are multiple research communities who are coming together to make the tourism chatbot possible. Some of the places in Italy have already developed prototypes.

A chatbot is a leading buzzword in the current technological trends. Using it in the travel industry will promote tourism in the country, and also make it more exhilarating.

We are in the world of customization, cost-cutting, and enthrallment. We all do things on a single click, there are various cases where famous organizations such as Facebook, Google and many such more, have shifted their support in the form of a chatbot, hence reducing the human workload to respond to common user queries. They have all tried to understand the user's mindset, and based on that, answered them.

Average earning people who cannot afford big packages of the tour agencies can prefer some solution like this which can plan the whole tour for a family on a base price of a solo member.

Advancements in making a chatbot using NLP have shown remarkable outcomes, and we are about to see a world which will be mostly automated. Deep Learning is a key methodology which can help recognise patterns and recommend suitable answers to the user, that means more usability and interactivity. Professionals Organizations can adapt to this to increase their profit and reducing their human workload.

The most important requirement for these systems is the crowd-sourced data provided by millions of users, which can be converted into specific form and can be used for multiple chatbot systems.

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