ISY5001-COGNITIVE SYSTEMS

SANGAM CHATBOT

"Your Singapore Travel Assistant"

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1. Abstract

1.1. Description

The term ‘User Experience Design’ has been one of the buzz words that is driving Industry 4.0. What is UX and why is it so important?

According to Wikipedia, User Experience is a person’s emotions and attitudes about using a particular product, system or service. In order to give the customer a better feel for the app and in order to get a competitive advantage companies must invest in creating a good User Experience. One such UX that is of vital importance to many industries are Chatbots.

It acts as a trade-off between having a real customer agent (which adds up to the cost of the company) vs asking the customer to scroll through thousands of frequently asked questions (which can be a major frustration for most users). Demand for a chatbot is increasing day by day across many industries. We have identified that Singapore tourism can benefit from implementing a chatbot solution to recommend attractions to tourists.

Tourism is one of the fastest growing sectors in Singapore. According to 2018 Q4 report of Singapore Tourism Board, tourism sector achieved record highs in International Visitor Arrivals and Tourism receipts for the third year consecutively. Around 18.5 million visitors visited Singapore in 2018 and it accounted for Tourism Receipts of S$26.9 billion.

Due to the rapid growth of this sector, tourists can easily be overwhelmed with the options they have. In order to facilitate further growth in this sector and help the tourists, we have developed a chatbot application which can recommend attractions to tourists based on their interests. In addition to that it can also provide details regarding specific attractions, their opening and closing times, nearest MRT etc.

1.2. Vision

The complete aid to bestow a unique hassle free experience to explore authentic destinations of Singapore.

1.3. Contribution

Our team built a chatbot to aid users with travel plans according to their interests. It is built with Google Dialogflow for Natural Language Understanding and Python-Flask framework for intent fulfilment. The team was able to apply the concepts of Cognitive Systems comprising Natural Language Comprehension and Processing, Speech Cognitive Systems etc.

2. Introduction

2.1. Overview

Problem: Navigating through hundreds of websites that confuses with their individual ratings makes the tour planning task hectic. There was no one stop solution.

Solution: To overcome this problem we propose to develop a virtual assistant in the form of Chatbot that can guide the users. The user can interact with the chatbot to solicit their convenient travel.

2.2. About Chatbot

Sangam Chatbot provides unique personalised travel suggestions along with features like one day itinerary, tour package based on interest, top accredited recommendations, place description and upcoming events in the locality. It also provides details about opening and closing times, nearest MRT to access the attraction and entry fee on further enquiry. Hence, planning unique trips is easier with Sangam chatbot.

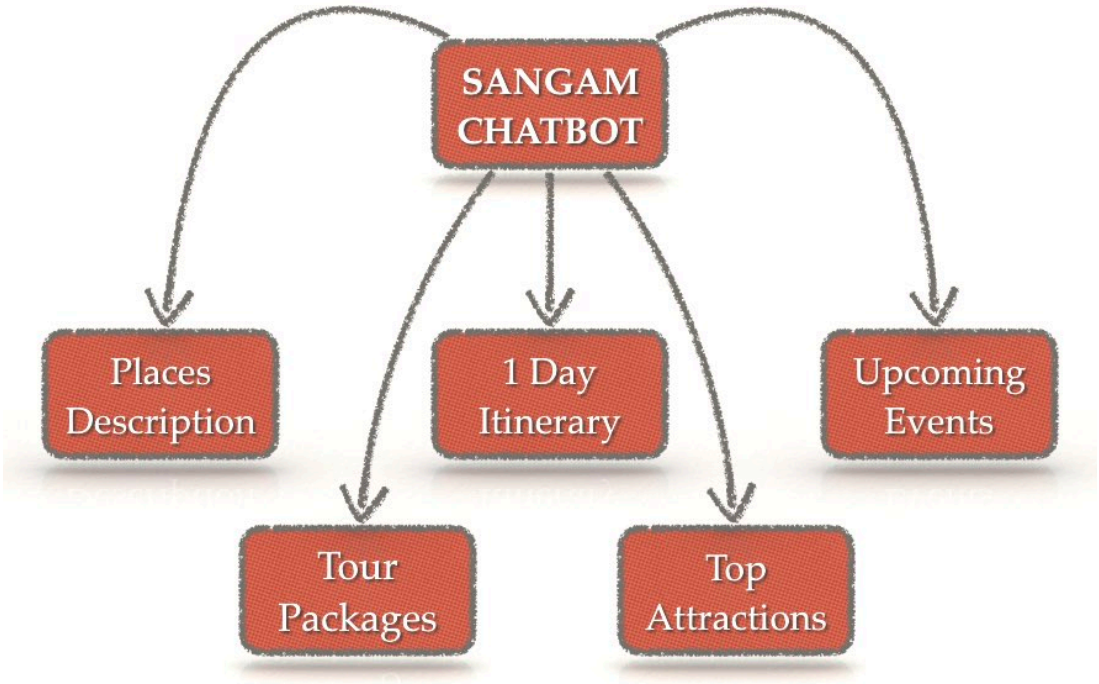

fig.1. Basic Framework

3. Chatbot Architecture

3.1. Tools Overview

Goal : Travel Planner

Channel : Google Assistant

Platform : Google Dialogflow

Programming Language : Python

Framework : Flask

3.2. High Level Architecture

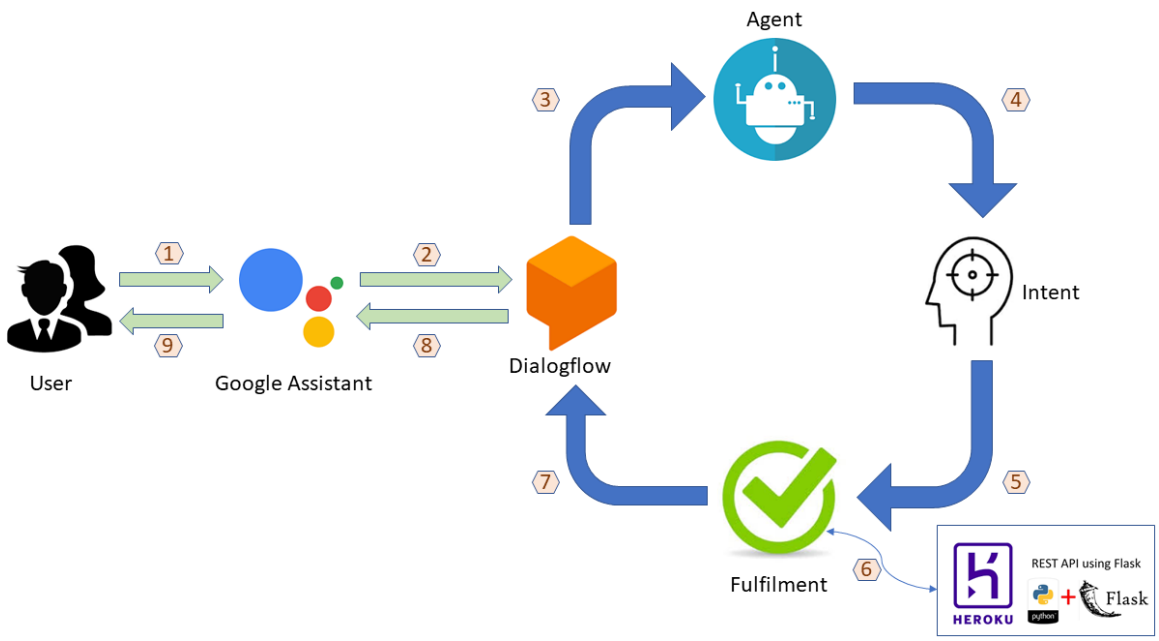

fig.2. High Level Architecture

3.3. Components Description

- Google Assistant – Handles speech to text conversion and text to speech conversion
- Dialogflow – Handles natural language understanding
- Dialogflow agent – Identifies the intent of the user query
- Python, Flask application hosted in Heroku – Process the attributes and generate a fulfilment response

3.4. Process Flow

1. User asks question either as text or voice from Google Assistant
2. Google Assistant converts speech to text and sends a http request to Dialogflow to satisfy the user request

3. Dialogflow handles the natural language understanding part in human-computer interaction and sends the request to the appropriate agent
4. The Dialogflow agent identifies the intent of the user
5. Attributes are extracted from the identified intent and sent to fulfilment
6. The extracted attributes are sent to a python-flask application hosted in Heroku for processing
7. After processing the attributes, a fulfilment response text is sent to Dialogflow from the Flask application
8. Dialogflow sends the response back to Google Assistant
9. The response for the user's question is then answered both via text and voice by the Google Assistant using text to speech conversion.

4. Data Processing

4.1. Data Extraction

To garner data regarding the tourist attractions in Singapore two sources were utilised.

- Application Programming Interface (API) from the Singapore Government's Tourism site: 'Tourism Info Hub(TIH)'
- Data scraping from 'TripAdvisor'

4.2. Data Cleaning and Organising

The data from the API had many missing values. In order to overcome this inconsistency additional data was garnered by scraping from TripAdvisor. Several transformations were applied to this additional data before incorporating into the original dataset to achieve homogeneity.

Since the process involved amalgamation of data from two different sources, data processing and cleaning were done before-

hand instead of calling APIs during intent fulfilment. This method reduces the turn around time for responses from the Webhook but for dynamic data such as events and tour packages API was used to acquire data on the go.

5. Technical Discussion

5.1. Dialogflow

Google Dialogflow was utilised for creating a retrieval based chatbot. For user convenience, it was then integrated with Google Assistant. Google Assistant receives speech and text input from user and transmit the data to Dialogflow. Dialogflow uses Natural Language Understanding to analyse the input and identify the most matching intent. Machine Learning capabilities were used to train the system with training phrases for intent classification. The request is then directed to the identified intent and fulfilled.

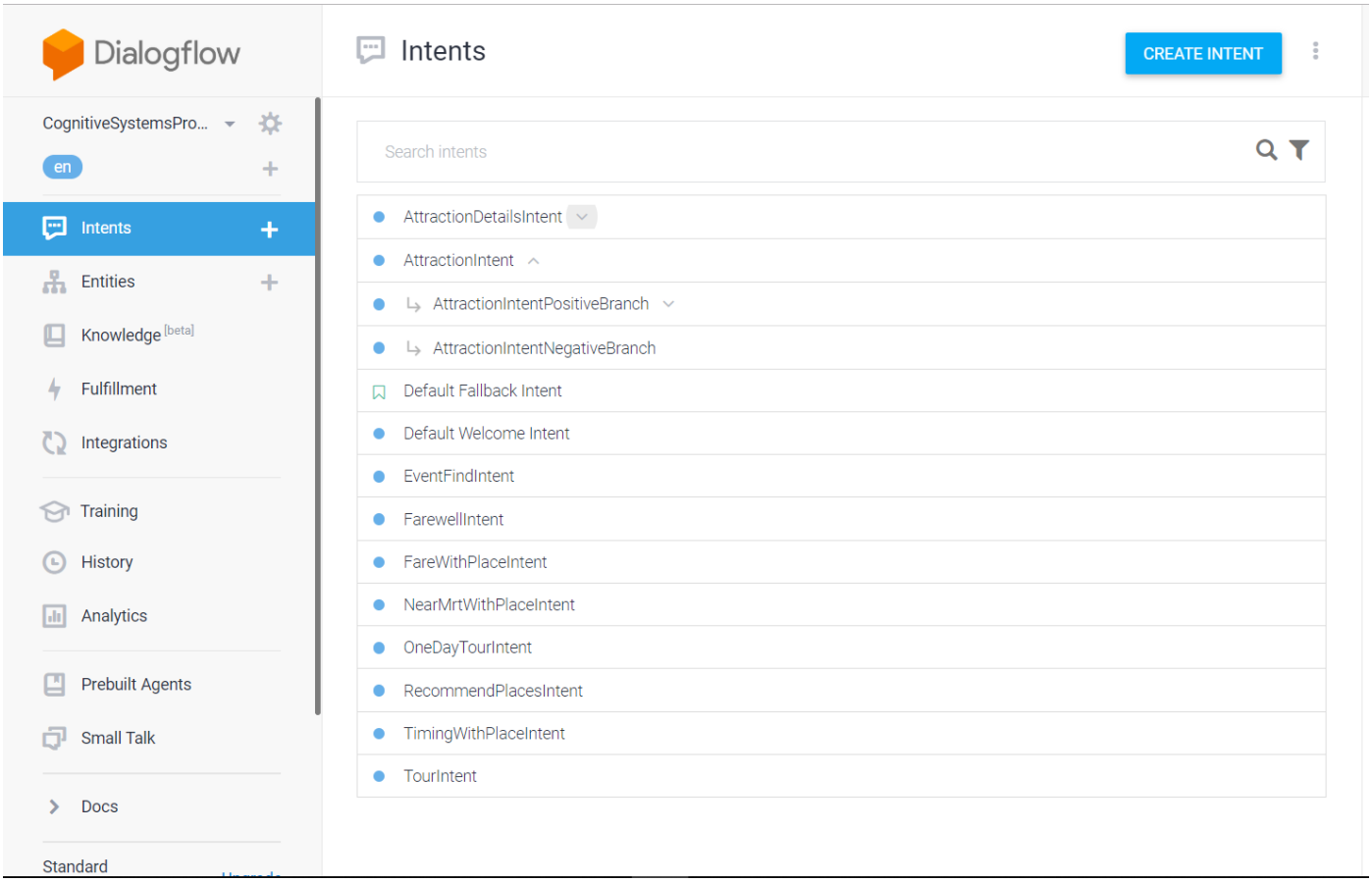

fig.3. Dialogflow - Intents

5.2. Measures for better flow

The training phrases were chosen carefully to account for even colloquial forms of user inputs. Entities are used to match similar words from input for identifying the parameters required for fulfilment. Sub-intents and contexts were encompassed in Dialogflow design which enables the user to hold long conversation with chatbot. Such context processing enhances dialog coherence and improves the user experience.

5.3. Intent Fulfilment: Webhook

External intent fulfilment was enabled to return dynamic responses through the web application. The above stated web application was developed using python-flask framework. To have a tight integration with google assistant all the responses including suggestion Chips, Lists and Text-to-Speech outputs were tailored into the response yet retaining support for basic text conversation. The output context of Dialogflow was altered from Webhook so as to maintain a coherent conversation regarding a particular attraction and handle further queries.

Since attraction names are obtained as input from user, it might not be exactly the same as prescribed in the database. User might rephrase the name or just query with partial information (example: merlion instead of merlion park). To tackle this problem, we have used Levenshtein distance to find similarity between user input and the database to best match the information. Python package fuzzy-wuzzy was used to obtain Levenshtein distance for approximate string matching.

6. Outlook on Chatbot

6.1. Benefits

A Digital Travel Assistant always with you!

- Choose from a unique inventory of local authentic attractions.
- Perfect for experiential trips.
- Flexible itineraries to match your interest.

A Recommendation Engine always working for you!

- Personalised advice based on your travel needs.
- Best places and the required time to visit.

A Planning Guide helping you to organise your days!

- Last minute planning.
- Recommends how much time to spend.
- Check when the activities are opened.

A Complete Maestro in one place!

- Witness your entire must do activities through a single window.
- Efficiently organise your trips.

6.2. Challenges Faced while creating Chatbot

- One of the main challenges faced was cleaning and processing of data since the data was scraped from internet.
- Attempt was made to build the chatbot as pervasive as possible (covering a wide breath in tourism segment), which incurred challenges in identifying training phrases to match colloquial language of users.
- There were complexities in matching the correct intent for the ambiguous questions.

7. Conclusion

7.1. Future Enhancements

In addition to the developed features, the following improvements are part of the roadmap for future.

- Ongoing promotions and offers on the entry fee of the attractions.
- Predict and consider weather forecast for recommendation.
- Suggest best offers from third party agents.
- Integration with google maps.

7.2. Contented Cessation

The outcome of the project is a solution for a pragmatic implementation that can be commercially employed. We developed our intellectual and team work skills. The discussions among us pitched in increasing the familiarity of cognitive systems and its practical implementation. It stimulated our thinking and deepened our understanding. This opportunity encouraged us to apply, test and consolidate our own learning. This Project instilled us to invest efforts in building chatbots that could be at the forefront of innovation for various fields of business!

Many fields are just in the beginning phase to understand the benefits of a Chatbot. This technology is still in its early stage. Its capabilities continue to increase and the best chatbots are yet to be created.

Thank you.