8/31/2019

SG FoodBot

An intelligent chatbot for your travel food cravings

Project Team: 7

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Executive Summary

Singapore is a popular tourist destination, receiving a large number of visitors annually. Apart from famous attractions such as the Universal Studios, Marina Bay Sands, it is also home to a large, diverse and unique mix of food cuisines, which is what Singapore is also known for. Tourists in Singapore have a wide range of food options to choose from. However, tourists often have a difficult time choosing a place to have their meals as there are too many choices available and not enough information to guide them in this decision.

Hence, a solution that provides tourists with such information and recommendations may be beneficial to them, enhancing their experience here in Singapore. In this project, we develop an online chatbot using Google Dialogflow and Python that allows tourists to use during their stay in Singapore. The chatbot provides recommendations of food outlets based on tourists' cuisine or location queries.

1. Background & Introduction

As one of the most popular tourist destinations in Asia, Singapore receives more than 65.6 million[1] visitors from across the world annually. It is home to a number of famous landmarks, such as Marina Bay Sands, Universal Studios in Sentosa as well as Changi Airport itself. As a multi-racial country, influences from a diverse mix ethnicity is expressed in many aspects of the country, such as architectural structures, festivals and events, as well as its food options. This mix of ethnicities has resulted in a unique blend of food cuisines available throughout the country, which are largely influenced by Chinese, Malay, Indian and Peranakan styles and flavours. As such, Singapore is also well known for their large and sumptuous range of food options, which tourists also look forward to on their visit to Singapore.

However, this large range of options also presents its own challenges, due to the famed 'paradox of choice'. The large number of options make it hard for tourists to choose a place to have their meals, as they do not have enough information on these places. In addition, they may not be familiar with the unique Singaporean foods that are offered within the country. At present, there are popular websites such as TripAdvisor which provide descriptions and reviews on these restaurants that may be able to aid tourists in their decision. Although these channels provide information on such options, they lack the ability to narrow down and recommend food choices for their users, which is a key point to address for tourists. Hence, there is a need for a solution that allows tourists to receive recommendations quickly and easily based on their preferences and queries. This solution would provide tourists with a better experience in Singapore and allow them to discover the many delicacies that the country has to offer.

2. Methodology

In this project, we develop a chatbot, the SG FoodBot using Google DialogFlow and Python Flask that recommends restaurants and food outlets based on their queries and preferences. We also leveraged on the Zomato's API functionalities for the retrieval of ideal restaurants and their details for the user. In this chatbot, users are able to communicate with the chatbot through a number of messaging platforms, such as Telegram and Google Assistant.

Google DialogFlow parses input queries by the user in the form of text and determines the intent of the query. These intents also create Context objects when they are fired and can be used in subsequent intents in order to direct the flow of the conversation by the chatbot.

Flask is a server microframework based in the Python that processes RESTFUL APIs and handles the routing of these requests. In SG FoodBot, the Flask server is hosted on a Heroku

[1] http://www.changiairport.com/corporate/our-expertise/air-hub/traffic-statistics.html

app server and receives a JSON response from DialogFlow through a webhook call and parses the response. These responses are used together with Zomato API functions in order to retrieve information, such as the restaurant details to build the return response to the user. Depending on the intent that is determined by DialogFlow, different responses are crafted.

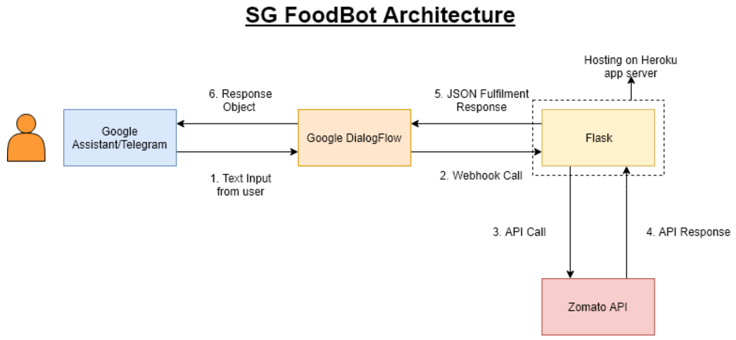


Figure 1: SG FoodBot Architecture

2.1 Usage Methods

A user can access SG FoodBot through invocation of the chatbot using one of the integration platforms supported by Google DialogFlow, such as Google Assistant or Telegram, with a welcome message. Depending on the initial responses given by the user, such as a possible cuisine like “I want some restaurants with Chinese cuisine”, DialogFlow determines the intent of the request and returns the appropriate Intent and Context. The Context object stores the slot parameters determined from the user input and uses it in subsequent intents. The response is returned in the form of a list of restaurants that fit the user’s query.

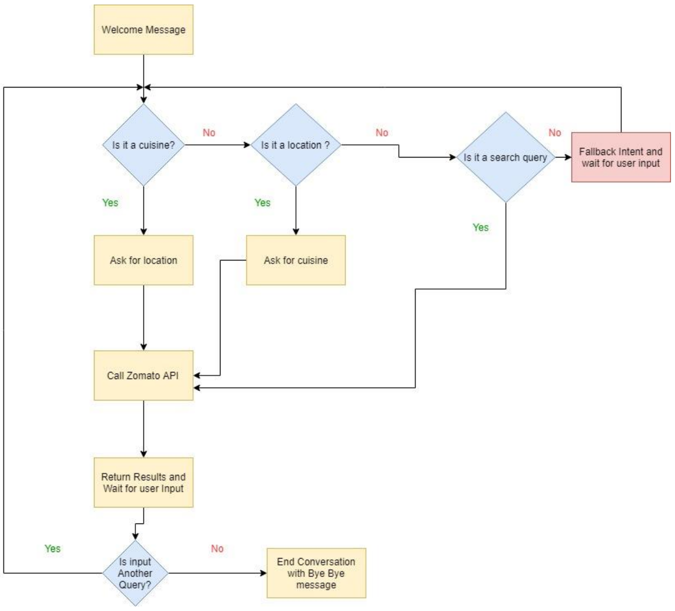


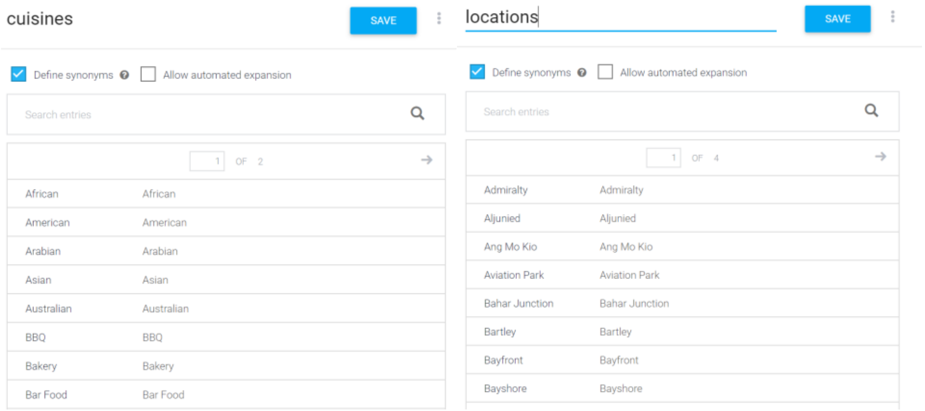
Figure 2: SG FoodBot Conversation Flow

2.2 Google DialogFlow Configuration

2.2.1 Entities

The chatbot has 2 main entities namely – ‘cuisines’ and ‘locations’. Entities are These contexts are pre-defined lists of keywords or phrases that represent common names used in Singapore, such as “Clementi”, “Bugis”, “Thai”. The cuisines entity has a list of all the cuisines that have been fetched by the Zomato API. This ensures that all the cuisines searched show appropriate results when calling the Zomato API. The locations entity is built using all the MRT stations names since they cover all major areas around Singapore.

The cuisine or location is identified by the agent in a query by mapping it to the cuisines entity which it has learnt via the training phrases, allowing the agent to extract the entity.



cuisines

☑ Define synonyms ☐ Allow automated expansion

African	African
American	American
Arabian	Arabian
Asian	Asian
Australian	Australian
BBQ	BBQ
Bakery	Bakery
Bar Food	Bar Food

locations

☑ Define synonyms ☐ Allow automated expansion

Admiralty	Admiralty
Aljunied	Aljunied
Ang Mo Kio	Ang Mo Kio
Aviation Park	Aviation Park
Bahar Junction	Bahar Junction
Bartley	Bartley
Bayfront	Bayfront
Bayshore	Bayshore

Figure 3: Examples of Entities

2.2.2 Intents

SG FoodBot has 7 main Intent types that are identified by DialogFlow according to the user responses and an appropriate response is provided to each of these intents. These Intents serve as requests which are routed to the Flask server for processing:

1. *Welcome*

   This intent is the welcome intent which enables the bot to ask the user for a location, cuisine or a query. Based on the user response, appropriate intents are fired.

2. *YesCuisineYesLocation*, *LocationFirstCuisine*

   This intent is fired when the user has entered a cuisine as well as a location. It ensures that the results will be specific to his query.

3. *LocationFirstAnyCuisine*

   This intent is fired when the user has not entered a cuisine but has only entered the location of his interest. In this case the search results are local to the location entered of all possible cuisines in that place.

4. *SearchQuery*

   This intent is fired when the user asks for a cuisine or location or both in a single query. It also handles cases such as “Top 3 Thai restaurants” or “Top 7 Indian restaurants in Jurong East”. This intent only returns the number of results the user has asked for.

5. *YesCuisineIntent*, *LocationFirstIntent*

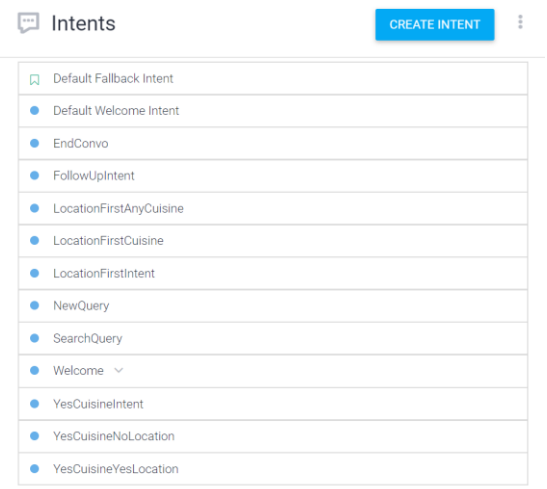
   These are intermediate intents that help the agent understand whether the cuisine has been entered first or the location so that it can ask correctly the next question.

6. *NewQuery*

   This intent is fired after results have been displayed and the user wants to search more results by selecting the suggestion chip “Another Query”.

7. *EndConvo*

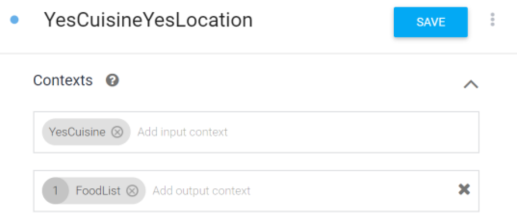
   This intent is also fired once the results are displayed and the user selects the suggestion chip “End Convo”. It enables the bot to display a goodbye message.



- Default Fallback Intent
- Default Welcome Intent
- EndConvo
- FollowUpIntent
- LocationFirstAnyCuisine
- LocationFirstCuisine
- LocationFirstIntent
- NewQuery
- SearchQuery
- Welcome
- YesCuisineIntent
- YesCuisineNoLocation
- YesCuisineYesLocation

Figure 4: List of Intents

The Intents are also coupled with Contexts that store parameters that have recognized from the text responses to be used in subsequent Intents, which are stored as an Output Context like the example shown in Figure 5. In addition, they are also used to determine which Intent will be fired by setting them as an Input Context.



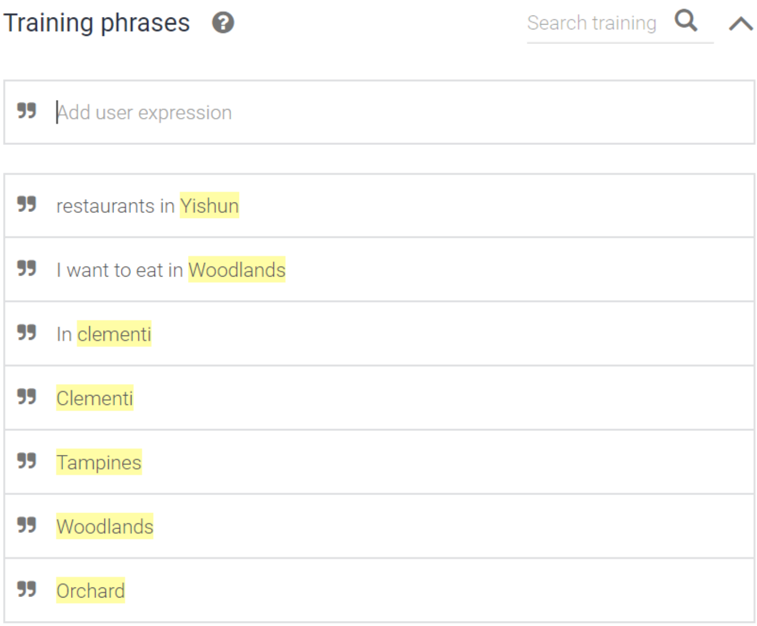
YesCuisine

1 FoodList

Figure 5: Examples of Contexts

2.2.3 Training Phrases

Examples of possible user text responses, such as “restaurants in Yishun”, “I want to eat in Woodlands” are supplied to each of the intents as training phrases for the DialogFlow agent. The trained DialogFlow agent model is then able to recognise similar phrases and entities that have been entered by the user.



restaurants in Yishun

I want to eat in Woodlands

In clementi

Clementi

Tampines

Woodlands

Orchard

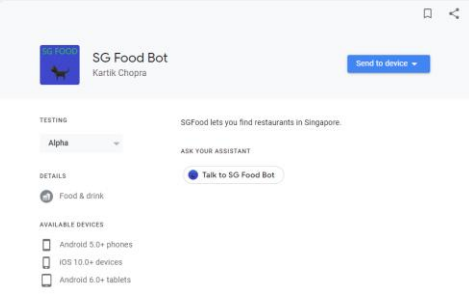
Figure 6: Examples of Training Phrases for "Yes Cuisine”

2.3 Deployment

SG FoodBot is deployed on both Google Assistant and Telegram platforms, which users can access in order to use the chatbot using the steps for the respective platforms below:

Google Assistant

1. Start up Google Assistant and enter/say "Talk to SG Food Bot"
2. Alteratively, access the chatbot through this link: https://assistant.google.com/services/a/uid/00000079f9fd6f18?hl=en
3. Select "Alpha Testing" and submit. Select "Talk to SG FoodBot" to start the chatbot
4. Enter a cuisine, location, or a query like "Top 5 Chinese Restaurants"
5. Select a restaurant from the list to find out more about it
6. To start another query, select "Another Query" to restart the search function.
7. To end the conversation, select "End Convo"



SG Food Bot
Kartik Chopra

TESTING: Alpha

DETAILS: Food & drink

AVAILABLE DEVICES
Android 5.0+ phones
iOS 10.0+ devices
Android 6.0+ tablets

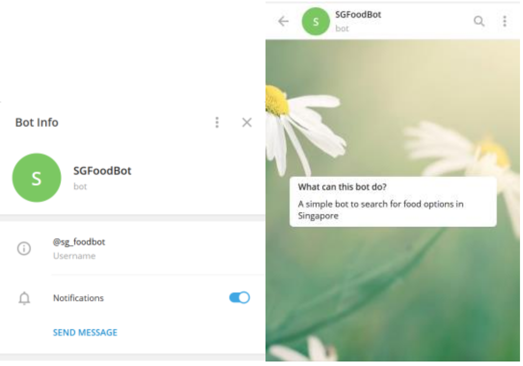
SGFood lets you find restaurants in Singapore.

ASK YOUR ASSISTANT
Talk to SG Food Bot

Figure 7: SG FoodBot on Google Assistant

Telegram

1. Search for the Telegram bot: "@sg_foodbot"
2. Enter /start to start SG FoodBot
3. Enter a cuisine, location, or a query like "Top 5 Chinese Restaurants"
4. Select a restaurant from the list to find out more about it



Bot Info

SGFoodBot
bot

@sg_foodbot
Username

Notifications

SGFoodBot
bot

What can this bot do?
A simple bot to search for food options in Singapore

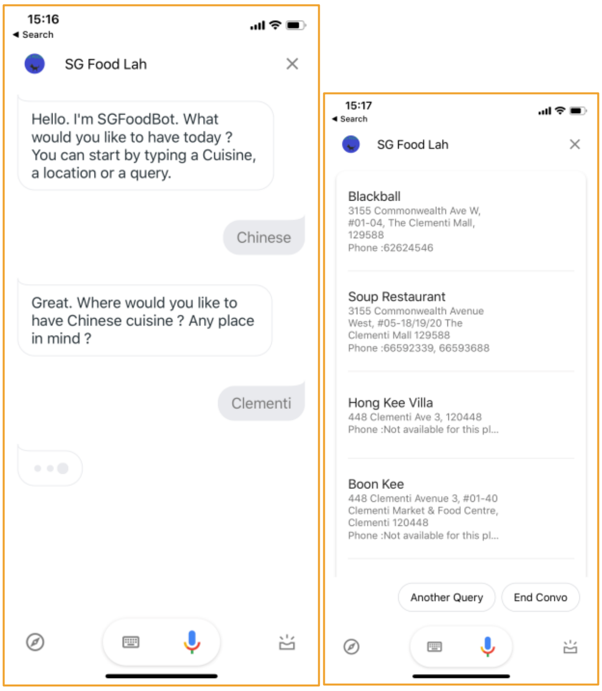
Figure 8: SG FoodBot on Telegram

3 Sample Cases

When our agent is invoked, it asks the user to either enter a location, a cuisine or a full query specifying both, which will result in different follow up requests.

Case 1: Request for Cuisine and/or Location

- The user first enters the cuisine.
- The agent then asks the user if he has any particular location where he or she wants to have that cuisine.
- The user is presented with a free choice to either enter the location or can say "anywhere" as well if he doesn't know where he or she wants to eat.
- After the user's input, the agent looks for restaurants having that particular cuisine in the location specified. If no location is specified, it displays restaurants all across Singapore.
- The agent then displays the restaurants in the form of an interactive list where the user can click on a restaurant.
- The user is then directed to the Zomato app/site opening the restaurant he selected.
- Finally, the user can come back to the agent and can select either Another Query or End Convo.



Hello. I'm SGFoodBot. What would you like to have today ? You can start by typing a Cuisine, a location or a query.

Chinese

Great. Where would you like to have Chinese cuisine ? Any place in mind ?

Clementi

Blackball
3155 Commonwealth Ave W, #01-04, The Clementi Mall, 129588
Phone :62624546

Soup Restaurant
3155 Commonwealth Avenue West, #05-18/19/20 The Clementi Mall 129588
Phone :66592339, 66593688

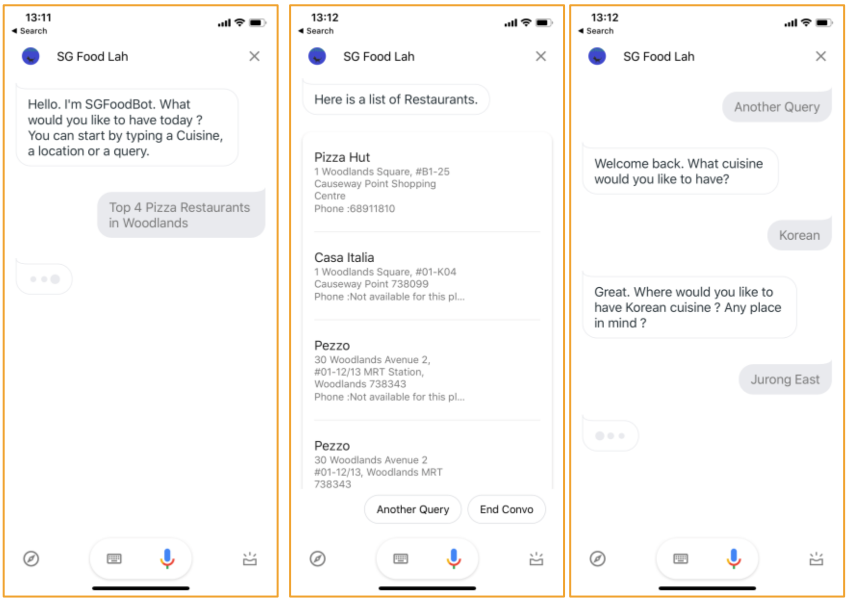
Hong Kee Villa
448 Clementi Ave 3, 120448
Phone :Not available for this pl...

Boon Kee
448 Clementi Avenue 3, #01-40 Clementi Market & Food Centre, Clementi 120448
Phone :Not available for this pl...

Figure 9: User Interaction by Cuisine/Location Search

Case 2: Request for List of Restaurants

- The user enters a search query asking for “Top 4 Pizza Restaurants in Woodlands”.
- The agent is able to extract the cuisine as well as the location and the number of results required by the user with just a single input.
- The agent then displays the desired number of results.
- Again, the user is presented with two options, “Another Query” and “End Convo”.
- If the user selects “Another Query”, the agent asks the user where he or she wants to eat or what cuisine the person would like. This cycle is repeated.
- If the user selects “End Convo”, the agent sends a bye-bye text.



Hello. I'm SGFoodBot. What would you like to have today ? You can start by typing a Cuisine, a location or a query.

Top 4 Pizza Restaurants in Woodlands

Here is a list of Restaurants.

Pizza Hut
1 Woodlands Square, #B1-25
Causeway Point Shopping
Centre
Phone :68911810

Casa Italia
1 Woodlands Square, #01-K04
Causeway Point 738099
Phone :Not available for this pl...

Pezzo
30 Woodlands Avenue 2,
#01-12/13 MRT Station,
Woodlands 738343
Phone :Not available for this pl...

Pezzo
30 Woodlands Avenue 2
#01-12/13, Woodlands MRT
738343

Another Query

Welcome back. What cuisine would you like to have?

Korean

Great. Where would you like to have Korean cuisine ? Any place in mind ?

Jurong East

Figure 10: User Interaction using Search Query

4 Chatbot Limitations

As the cuisine and location entities are fixed, the queries made by users are limited by the entities available in the DialogFlow agent. As such, this list will have to be updated manually in order to update on the available cuisines and locations in Singapore.

As SG FoodBot leverages on the Zomato API functionalities to retrieve possible food outlet choices for the user, there are certain limitations to the extent of the queries the chatbot can handle. For example, Zomato's API does not include a full list of Singapore's subzones or regions, resulting in less accurate responses when the user queries a certain location that is not found in the database.

5 Future Work

At present, SG FoodBot can provide a list of restaurants to users based on their preferences and responses. This list can potentially be enhanced to make the list more interactive, such as providing expandable restaurant menus within the response itself. This feature would also improve the user experience and would also supply the user with in-depth information about the restaurant. However, this would also require extensive search and web-scrapping of restaurant information, which has to be curated in order to be retrieved easily.

SG FoodBot can also be integrated with other available platforms apart from Google Assistant & Telegram, like Facebook, Slack, Twitter and Alexa. This would extend the accessibility of the chatbot to more channels, allowing users who are more familiar with these platforms to access the chatbot. In addition, response logging from SG FoodBot can also provide detailed insights on the appropriateness of the responses supplied to the user and would be an opportunity for analysis and improvement of the chatbot.

6 Conclusion

In this project, we develop a chatbot, the SG FoodBot using Google DialogFlow and Python Flask that recommends restaurants and food outlets based on their queries and preferences. The team gained the knowledge of implementing solution to a real-world problem using an intelligent system. Using Dialogflow with Google Assistant's powerful NLP capabilities provided us to devise this cognitive system with relative ease. From this module's lectures, we grasped the important techniques used for making a robust system and implementation of these techniques in this project gave us a thorough understanding & practical knowledge of present cognitive systems concepts.