SMT203: Smart City Systems and Management

Assignment 01 (Pairwork)

Due Date: Sat 10 Feb 2019 @ 1000 hrs

INSTRUCTIONS

1. This assignment is to be done **in pairs**; only one person in the pair needs to submit the assignment via eLearn.
2. You should submit a single Python file (ending with .py) for your assignment. **Use the skeleton Python file provided.**
3. Your solution should be uploaded to eLearn by the stipulated deadline.
4. The late submission penalty is as follows:
    - submit <= 24 hrs late: 20% penalty (i.e., maximum grade is 80%)
    - submit <= 48 hrs late: 50% penalty (i.e., maximum grade is 50%)
    - submit > 48 hrs late: 100% penalty (i.e., maximum grade is 0%)

GRADING CRITERIA

1. This assignment will constitute 10% of your final grade.
2. Marks will be awarded based on the *logic*, *completeness* and *efficiency* of your solution.

OBJECTIVES

The objectives of the assignment are as follows:

1. Familiarity with API GET/POST requests and responses.
2. Usage of 3rd party APIs – such as Telegram and LTA Data Mall (requires authentication).

OVERVIEW

You are required to use both the Telegram API and the LTA Data Mall API to develop a simple service Telegram bot that provides information on bus arrival. A bus arrival app typically displays the next 3 bus arrival timings (in minutes) for each of the buses at a given bus stop number.

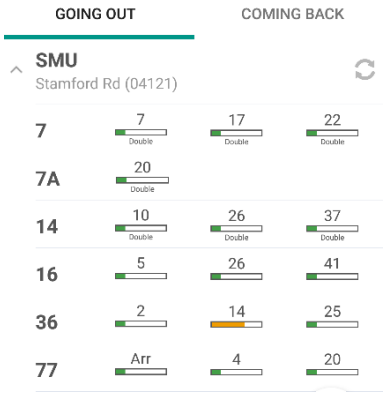


Fig 1: Bus arrival at the SMU Stamford Road bus stop, from the SG BusLeh app.

Functionalities

In particular, your bot should perform the following functions:

1. Send a welcome message to a user (using the user's chat id), whenever the Python script is executed. The welcome message informs the user of the command(s) that the bot can respond to. You may use your own chat id during your development.
2. Listen to incoming messages from the user. You may assume that the user will type in the bus stop number that he/she is interested in.
3. Process each incoming message and determine the bus stop number that the user is interested in.
4. Fetch data from a 3rd party API (i.e., LTA Data Mall) to service the request.
5. Process the response of 3rd party API query (i.e., LTA Data Mall) to extract the bus services and corresponding next 3 bus arrival timestamps, at the bus stop.
6. Provide the appropriate information to the user. For example, if the user types in a valid bus stop number (e.g., 13019), then the bot should reply with the next 3 bus arrivals (in minutes) for each bus service that is available at that bus stop. If the user does not input a valid bus stop, then your bot should reply that this is an invalid bus stop number.

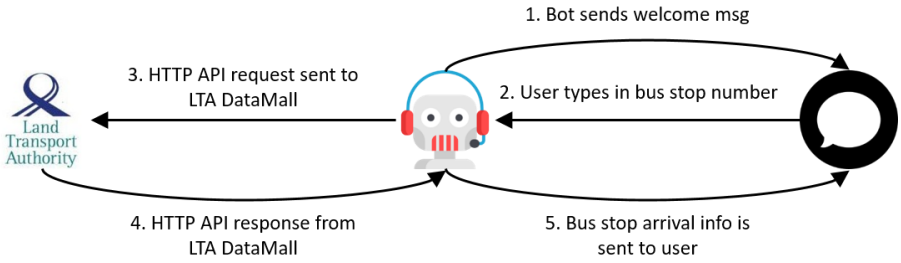


Fig 2: Sequence of steps for functionalities to be completed.

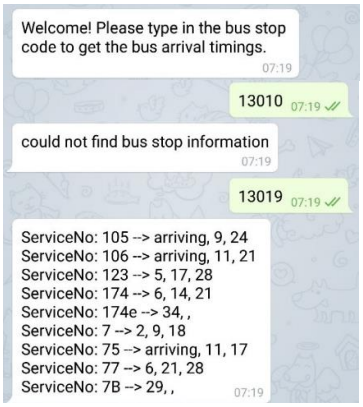


Fig 3: Example of a conversation between the bot and the user.

You are free to present the information to the user in any formatting style that you like, as long as it provides information on the next 3 bus arrivals (in minutes).

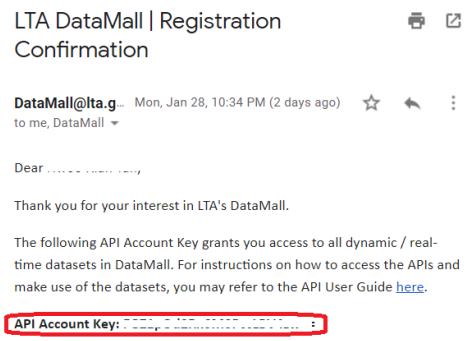
BONUS 1: If the user inputs a bus stop number and a bus service number, then the bot should reply with only the bus arrivals for that particular bus service number.

BONUS 2: Your bot should be able to support and service multiple requests by the user, by continuously monitoring the incoming messages from the user.

PRE-REQUISITES / GETTING STARTED

You will need to:

1. Create a Telegram bot (follow the instructions in this link, or follow the steps as covered in class). Note down the **Telegram HTTP API access token**; you will need this token in your assignment, in order to send HTTP API requests to Telegram.
2. Request for LTA Data Access by filling up the form in this link. You should receive an email notification containing an **DataMall API account key** (see sample below).


LTA DataMall | Registration Confirmation

DataMall@lta.g... Mon, Jan 28, 10:34 PM (2 days ago)
to me, DataMall

Dear

Thank you for your interest in LTA's DataMall.

The following API Account Key grants you access to all dynamic / real-time datasets in DataMall. For instructions on how to access the APIs and make use of the datasets, you may refer to the API User Guide here.

API Account Key:

HINTS

In the following, we provide some hints on how you can go about your programming assignment. It is not necessary to follow the steps outlined below.

Retrieving bus availability information from LTA Data Mall

You may refer to the LTA DataMall API User Guide, **Section 2.1 (Page 11)**. The HTTP URL to obtain bus arrival timings is http://datamall2.mytransport.sg/ltaodataservice/BusArrivalv2. Based on Page 6 of the LTA DataMall API User Guide, you will need to include the DataMall API account key in the header of the API request, in the following format:

```
url_busArrival = 'http://datamall2.mytransport.sg/ltaodataservice/BusArrivalv2'
headers = {
    'AccountKey': '', # enter your LTA DataMall API account key here
    'accept': 'application/json'
}
r = requests.get(url=url_busArrival, headers=headers, params=params)
```

where `params` is a Python dictionary containing the parameters of the HTTP API request (if necessary).

You may wish to write a Python function `get_busarrival_api(bus_stop_code)` that requests for bus arrival information from LTA DataMall, and then retrieves the list of bus services at the bus stop, as well as the timestamp of the next 3 buses.

Estimating time arrival

The bus arrival time for each bus service is given in a string timestamp (e.g., 2017-06-05T15:02:41+08:00). You will need to convert this string timestamp to a Python `datetime`, in order to compute the time (in minutes) until the bus arrives, i.e.,

```
time_diff = next_arrival_time - current_time
```

REFERENCES

1. http://docs.python-requests.org/en/v0.6.1/api/#requests.models.Response
2. https://core.telegram.org/bots/api
3. https://docs.python.org/3/library/datetime.html#strftime-and-strptime-behavior
4. https://www.mytransport.sg/content/mytransport/home/dataMall/dynamic-data.html#Public%20Transport
5. https://www.mytransport.sg/content/dam/datamall/datasets/LTA_DataMall_API_User_Guide.pdf
6. How to convert Python date string mm/dd/yyyy to datetime?
7. Calculate hours, minutes between two times in Python

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