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# **Open Source Development for Google Applications**

**EXC1081**

**Locate-Me**

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## **Abstract**

This project aims at

- Finding the names of astronauts currently at the International Space Station (ISS)
- Finding the current location of ISS above the earth
- Plotting the location on the world map

## **Introduction**

The International Space Station (ISS) is a space station, or a habitable artificial satellite, in low Earth orbit. It is a multi-nation construction project that is the largest single structure humans ever put into space. The International Space Station is moving at close to 28,000 km/h so its location changes really fast. In order to determine the position of the ISS, API's are used.

An application programming interface (API) is a set of rules and specifications that software programs can follow to communicate with each other. It serves as an interface between different software programs and facilitates their interaction.

Open Notify is an open source project to provide a simple programming interface for some of NASA's data. The data is scraped and turned into APIs related to space and spacecraft.

Plotting data on the map is done using basemap toolkit. The matplotlib basemap toolkit is a library for plotting 2D data on maps in Python.

## **Methodology**

In this implementation, coding is done in Python, using Jupyter notebook for interactive execution and visualisation.

The Python modules used are

- requests - to fetch API content
- numpy - for handling arrays
- matplotlib - for plotting
- pprint - for formatting dictionary data
- datetime - for formatting timestamp

### **API's used**

1. For getting location of ISS

<http://api.open-notify.org/iss-now.json>

This API returns Current ISS location over Earth (latitude/longitude) with Unix timestamp.

2. For getting astronaut details

<http://api.open-notify.org/astros.json>

This API returns the number of people in space at the moment.

## Code

```
# importing requests library to fetch API content
import requests
# importng pprint for pretty printing of dictionaries
import pprint
pp = pprint.PrettyPrinter(indent=4)

# Get the response from the API endpoint.
response = requests.get("http://api.open-notify.org/astros.json")
# Print the status code of the response
print "Status Code:", response.status_code
# Convert to dictionary
data = response.json()
print "Data type: ", type(data)
print "Response"
pp.pprint(data)

print "There are", data["number"], "people at ISS"
print "They are"
for i in range(data["number"]):
    print "\t", data["people"][i]["name"]

# Making a get request to get the latest position of the ISS from
the opennotify api.
response = requests.get("http://api.open-notify.org/iss-now.json")

print "Status Code:", response.status_code
print "Response"
data = response.json()
pp.pprint(data)

import datetime
latitude = data['iss_position']['latitude']
longitude = data['iss_position']['longitude']
timestamp = datetime.datetime.fromtimestamp(data['timestamp'])
date = timestamp.strftime('%Y-%m-%d')
time = timestamp.strftime('%H:%M:%S')
print 'Date: ', date
print 'Time: ', time
print 'Latitude: ', latitude
print 'Longitude: ', longitude

## The Robinson projection is a map projection of a world map
which shows the entire world at once.

# importing basemap for plotting
from mpl_toolkits.basemap import Basemap
```

```

import matplotlib.pyplot as plt
import numpy as np
# setting size of the plot
plt.figure(figsize=(8,8))

map = Basemap(projection='robin', lat_0=0, lon_0=50,
               resolution='l', area_thresh=1000.0)

map.drawcoastlines()
map.drawcountries()
map.fillcontinents(color='coral')
map.drawmapboundary()

map.drawmeridians(np.arange(0, 360, 30))
map.drawparallels(np.arange(-90, 90, 30))

# Convert latitude and longitude into x/y co-ordinates
x, y = map(longitude, latitude)

plt.text(x, y, 'Here', fontsize=12, fontweight='bold',
         ha='left', va='center', color='black')

plt.show()

from mpl_toolkits.basemap import Basemap
import matplotlib.pyplot as plt
plt.figure(figsize=(8,8))
map = Basemap(projection='ortho',
               lat_0=0, lon_0=120)
map.bluemarble(scale=0.5);

x, y = map(longitude, latitude)

plt.text(x, y, 'Here', fontsize=12, fontweight='bold',
         ha='left', va='center', color='w',
         bbox=dict(facecolor='b', alpha=0.2))

plt.show()

```

## **Result**

### **People at space**

There are 3 people at ISS

They are

Anton Shkaplerov

Scott Tingle

Norishige Kanai

### **Latitude and Longitude**

Date: 2018-03-21

Time: 16:02:20

Latitude: 39.8734

Longitude: 160.6039

## Map plots

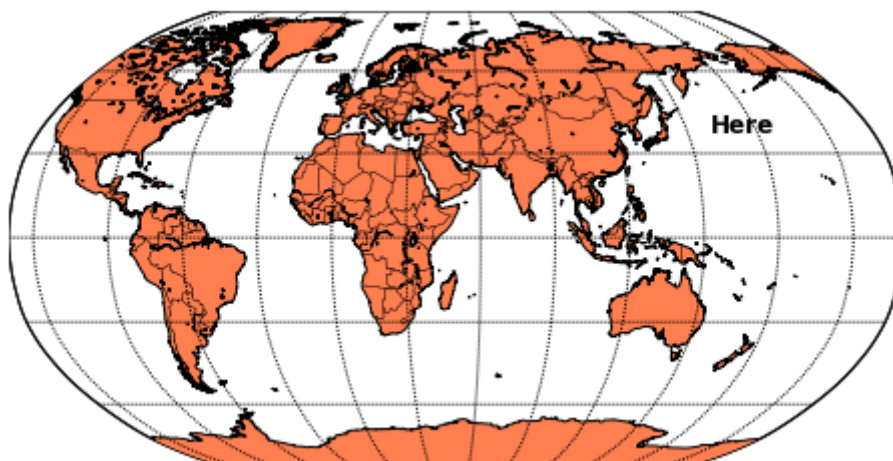


Figure 1: Cylindrical projection



Figure 2: Orthogonal Projection

## **Issues faced and rectified**

1. While installing basemap, the programmer must make sure the dependencies are present in the system
  - matplotlib
  - numpy
  - pyproj – a Cartographic Projections Library.
2. The API returns latitude and longitude in this order, but for plotting the co-ordinates are passes as map(longitude, latitude) and not map(latitude, longitude).

## **Conclusion**

The names of the astronauts currently at the ISS are found. The current location of ISS is determined and is plotted on the world map. This project has given a clear insight on working with API's in python.

## **References**

<http://open-notify.org/Open-Notify-API/>

<http://open-notify.org/Open-Notify-API/ISS-Location-Now/>

<http://open-notify.org/Open-Notify-API/People-In-Space/>

<https://matplotlib.org/basemap/users/installing.html>

<https://media.readthedocs.org/pdf/basemaptutorial/latest/basemaptutorial.pdf>