Lab 4

Contents

1 Background

1.1 TMA

The Terminal Maneuvring Area (TMA) is designated area of controlled airspace surrounding one or more neighboring airports.

1.2 Waypoints

Every flight (plan) is a sequence of waypoints. Some points have names (called named points), while the others are special points (their names start from special characters).

1.3 Entry points

For every flight there exists an entry point to the TMA (named waypoint).

Arlanda entry points:

```
arlanda_entry_points = {'ELTOK', 'HMR', 'NILUG','XILAN'}
```

The aim of this homework is to analyze flights data. It consists of two tasks. The first one is to find the most loaded entry point. The second task is to analyze the runways load level.

2 Useful functions

2.1 strsplit

Split string at specified delimeter.

Documentation: https://www.mathworks.com/help/matlab/ref/strsplit.html

```
res = strsplit('ABCD_DCBA', '_'); % res == {'ABCD', 'DCBA'}
```

2.2 unique

Returns unique values in array (vector or matrix).

Documentation: https://www.mathworks.com/help/matlab/ref/unique.html

```
a = [3, 6;
     4, 3;
     3, 6];
result = unique(a, 'rows'); % result == [3, 6; 4, 3]
```

2.3 azimuth

Returns the azimuth for pairs of points on the surface of a sphere.

Documentation: https://www.mathworks.com/help/map/ref/azimuth.html

```
segment_start_point = [59.6569444500000 17.9522222166667]; % lat and lon
segment_end_point = [59.6519444500000   17.9186111166667]; % lat and lon

result = azimuth(segment_start_point(1), segment_start_point(2),
segment_end_point(1), segment_end_point(2)); % result == 253.6074
```

3 Homework 4

EUROCONTROL provides flight tracking information in form of so6 format files. Download the historical flights data for one month of the year 2018 and the description of so6 format from the course site: `https://undefiened.github.io/tnk055/`

Task 1

Read the description of so6 format. Write the script, which reads the data from the provided so6 file, find the entry point for each flight and build a histogram of entry points usage. Determine the most loaded entry point.

Hint: use strsplit function to extract the entry point name from the segment identifier field.

Task2

Using the same data, match flights to runways and find the busiest runway. Provide evidence for your conclusion - plot the last segments of flights and build a histogram of runways usage.

We assume that flights from the provided file use 2 Arlanda's runways with the following coordinates(latitude, longitude):

```
rwy08=[59.6584189166667 17.9361345];        % start point of the 1st rnw
rwy26=[59.6638971944444 17.9791531944444];  % end point of the 1st rnw
rwy01L=[59.637256 17.9132249722222];        % start point of the 2nd rnw
rwy19R=[59.6664016944444 17.9237679722222]; % end point of the 2nd rnw
```

Note, that latitudes/longitudes in so6 file are in minute decimals format. To convert minute decimals to degrees divide by 60.

Hint 1: use unique function to plot only unique last segments.

Hint 2: to determine which runway is used you can compute azimuth of the last segment and find which runway's azimuth it fits most. The last segments in ddr data are not very precise. Do not assume, that the azimuth of the last segment will coincide with the azimuth of one of the runways. Create a range of angles for each of the runways. Make sure that every flight is matched with some runway.