

Practice: Software Development

End of Term Assignment

VISUALISING TWEETS IN GOOGLE EARTH

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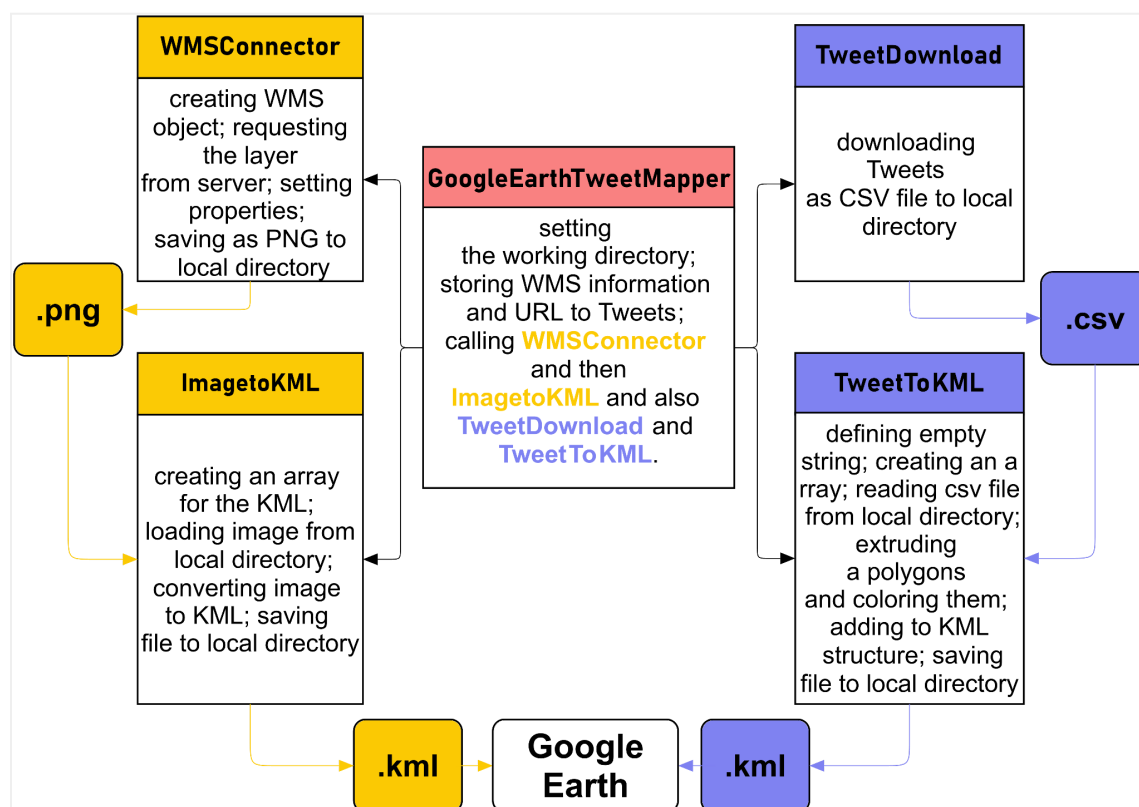
Objective:

The end goal of this work was to create an executable Java class that integrates data from an OGC Web Map Server (WMS) and file containing tweets, and displays them in Google Earth.

Link to the code: <https://github.com/rabenojha/GoogleEarthTweetMapper>

Modularity:

The whole task was divided into different sub components by creating a separate class for each task. This reduced the complexity of the larger task and it got simplified to smaller tasks. It also helped to maintain a clear structure of the codes. Overall, five different classes were created including one main executable class and four other non-executable classes were run from the main class *GoogleEarthTweetMapper*.



Breakdown of our overall program

The breakdown of the problem was carried out in the following ways to create the different individual sub components.

1. Connecting to WMS and downloading image
2. Downloading Tweets as CSV file
3. Converting image to KML structure
4. Converting Tweets text file to KML structure
5. Visualising KML files in Google Earth

Connecting to WMS and downloading image

A class called *WMSConnector* was created and a method called *get_wms_image* was defined with two string parameters: *url* and *working_directory*. Then a WMS GetMapRequest was created to the given web map instance that requests the layer *osm_auto:all* in PNG format. The dimensions, transparency, bounding box spatial reference system for the requested image were specified as per the requirements. The requested image was then saved in the local directory as *wms_img.png*.

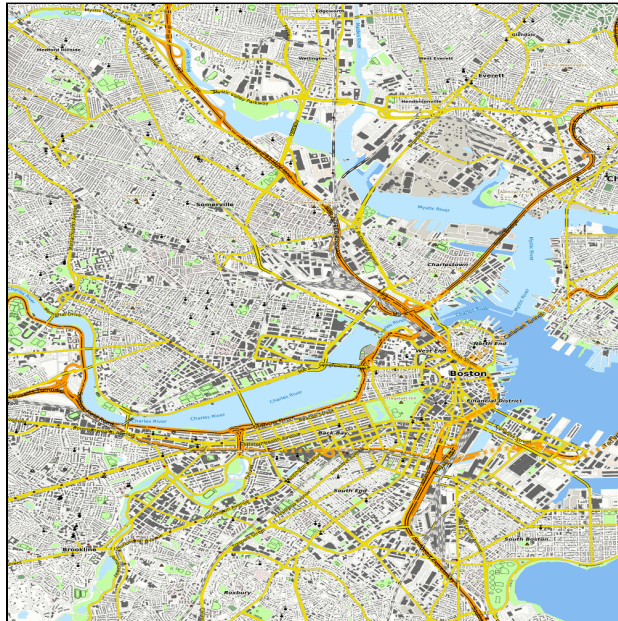


Image retrieved from WMS

Converting image to KML

For this purpose, a class called *ImageToKML* was created and a method called *image_to_kml* was defined with a string parameter *working_directory*. Then a string array was created for KML encoding. *GroundOverlay* element was used to integrate the WMS image into KML structure. The resulting KML was written to another string called *output* which was then returned back to the method.

Downloading tweets as CSV file

For this task, a class called *TweetDownload* was created and a method called *download* was defined with two string parameters: *tweet_link* and *working_directory*. This part of the program downloaded the tweets from the given URL and stored them in the local directory as *tweet.csv*. The downloaded text file contained the tweets along with other information such as coordinates, hashtags, place_id, user_id, created_at, etc.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	id;lng,lat;hashtags;place_id;tweet;created_at;user_id																	
2	26545976; on the floor in class and screamed . When they all looked it they said eww my friend said i squirted;2012-11-05 15:25:15+01;194439442																	
3	265459770683711500;-73.98893999;40.73792159;;086752cb03de1d5d;Back in the office for the first time in two weeks (@ Birchbox HQ w/ 4 others) http://t.co/YoXNiz2;2012-11-05 15:25:15+01;																	
4	265459771530936320;-74.14859654;40.89123297;;23a06e5cc6d83009;@BEANIES_RULEzz lol;2012-11-05 15:25:16+01;444157252																	
5	265459774236270600;-73.98024956;40.75165756;;086752cb03de1d5d;RT @womensweardaily: Nicolas Ghesquière is to leave Balenciaga after a 15-year collaboration: http://t.co/YVQ6m11;2012																	
6	265459775138041860;-73.99609061;40.76348875;;086752cb03de1d5d;i m at Social@Ogilvy w/ @heydtc http://t.co/t9bWj1ch;2012-11-05 15:25:17+01;46543780																	
7	265459776052424700;-74.31127843;40.89118717;goodlooks;23a80b90cabba6d5;DMG shout out to the Canadian electrical company parade i just saw on route 80 #goodlooks;2012-11-05 15:25:17																	
8	265459782817837060;-74.17727579;40.73816787;;fa3435044b52ecc7;4 hours of sleep should be good enough .. Until i get home ðŸ˜ˆ CE;2012-11-05 15:25:18+01;534774000																	
9	265459789579038720;-74.16203002;40.72321205;;fa3435044b52ecc7;@lulu_ ctulhu why? Whatever the reason that s awesome!;2012-11-05 15:25:20+01;338156472																	
10	265459790250123260;-73.8457795;40.6832726;b6ea2e341ba4356f;@uh_ jynn ummmm.... I DONT THINK I CAN HANDLE THAT SUGAR MAMA lmao;2012-11-05 15:25:20+01;528746266																	
11	26545979f instead of \$76 a month. #bringbackPATH;2012-11-05 15:25:22+01;42109709																	
12	265459797707608060;-73.9899061;40.7263692;;086752cb03de1d5d;@SperryNoSocks I second that emotion.;2012-11-05 15:25:22+01;182427078																	
13	265459803625758720;-73.89598086;40.73340308;Election2012;b6ea2e341ba4356f;Don t forget to vote for me tomorrow! #Election2012;2012-11-05 15:25:23+01;325628508																	
14	265459804523335680;-73.79312166;40.70779871;;b6ea2e341ba4356f;Up O.o;2012-11-05 15:25:24+01;761733085																	
15	265459810487652350;-74.2038889;40.7668757;;858cec499f8adba6;@Dominiqueeeeeee_ Now Following Back;2012-11-05 15:25:25+01;189756797																	
16	26545982: el poder el dinero y la mas absurda LA FAMA hay q estar muy atento R.A;2012-11-05 15:25:28+01;68503296																	
17	265459821732589570;-74.08316201;40.73105837;;b046074b1030a44d;@Gmb_ tierra ðŸ˜ˆ;2012-11-05 15:25:28+01;65092689																	
18	265459830720978940;-74.6996783;40.1368132;;65b4760a2b411e11;i need to go on a diet;2012-11-05 15:25:30+01;64949206																	
19	26545983! first day in a week. Still no power at home or the office in Parsippany for me.;2012-11-05 15:25:31+01;19307915																	
20	26545984! and i ain t talking about no intimate conversation.;2012-11-05 15:25:33+01;256059932																	
21	265459848848752640;-73.97334084;40.74629188;;086752cb03de1d5d; back to work! :) (@ 345 E. 37th Street) http://t.co/TxqMu6tb;2012-11-05 15:25:34+01;374979187																	
22	265459856255889400;-74.29136786;40.84542005;;2ee2a9232db9851a;â€œ@CoryBooker: Please call 973 733 4311. Thank u! RT @STARCHILD098: how could I go about making a donation to help																	
23	265459858751512580;-74.15438821;40.72357309;;fa3435044b52ecc7;bandz a make her dance;2012-11-05 15:25:36+01;432815280																	
24	265459861888856060;-74.0830667;40.7072763;;b046074b1030a44d;Ne-yo - Lazy Love;2012-11-05 15:25:37+01;515061557																	
25	265459861821718530;-73.85094188;40.75296858;;b6ea2e341ba4356f;@Daahveed na. Cause then it would have hit the kid in front of me and then he would have been blind. I m saving lives out he																	
26	265459869719601150;-73.9724288;40.749669;;086752cb03de1d5d;We have power as of this morning!;2012-11-05 15:25:39+01;43697249																	
27	265459877214818300;-73.99529165;40.74836401;TIU;086752cb03de1d5d;Morning booty call â€œ #TIU;2012-11-05 15:25:41+01;180567763																	
28	265459891223805950;-74.17972044;40.60542143;;3e4dc51c1dc24df2;@krisdionisio kris im gonna die like i m convinced i m gonna;2012-11-05 15:25:44+01;29351310																	
29	265459892867977200;-73.79595652;40.7227812;;b6ea2e341ba4356f;@_chippychatz some kid i m my math class. He decides not to go to class and his sitting in front of me watching reply to you!;2																	

Information contained in the CSV file

Converting tweets text file to KML

A class called *TweetToKML* was created and a method called *to_kml* was defined with a string parameter *working_directory*. String variables *kml_header*, *kml_footer* and *kmlbody* were declared and an arraylist *csvtokml* of type string was created. The *readLine()* function was used to read the csv file line by line. Using *split()* function, the whole compact string was split into an array of substrings. For extruding polygon out of point, three other points were created around the main point. This was done by declaring random variables of type double and assigning values by performing basic mathematics on the latitude and longitude of the main point. For coloring the extruded polygons according to their value, blue color was assigned to the polygons having tweets with at least one hashtag whereas pink color was assigned to the polygons having tweets with no hashtag. Selected information from the tweet were then added to kml structure along with the extruded polygons and also returned string from *ImagetoKML* class. The resulting KML file was written to a file *tweet.kml* in the local directory.

Executing the GoogleEarthTweetMapper main class

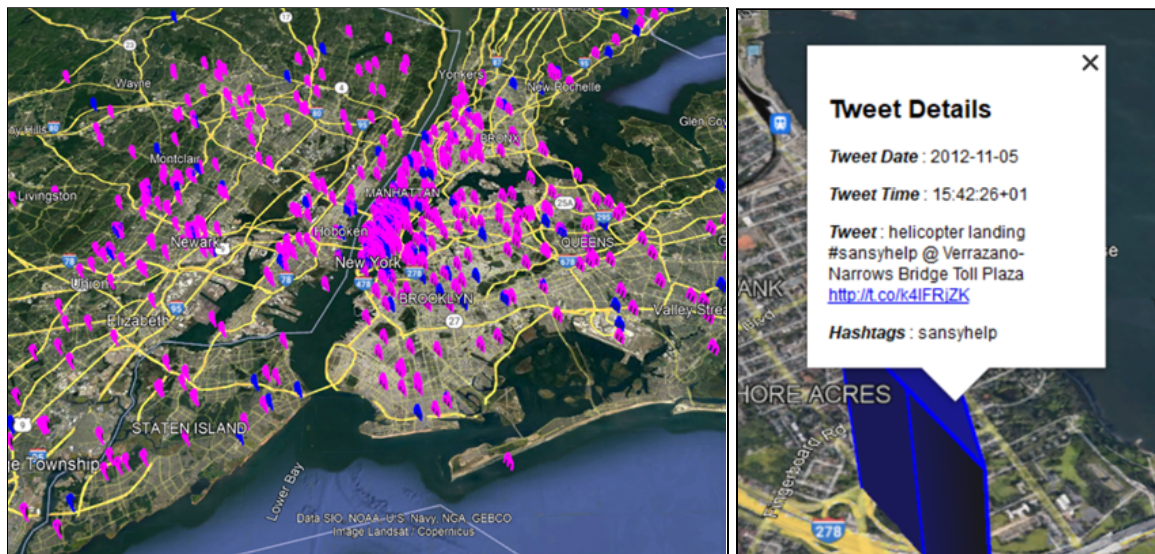
The GoogleEarthTweetMapper was the main executable class and all the other classes defined above were run from this main class. The working directory for storing outputs, the URL for WMS connection and the link for downloading twitter data were assigned to three string variables *working_directory*, *url* and *tweet_link* respectively. Then a main method was created within this class and all the other methods were called from this main method. Overall, on executing the GoogleEarthTweetMapper main class, the messages are also printed on the console along with the creation of *three different outputs* (*wms_img.png*, *tweet.csv*, *tweet.kml*) in the working directory.

```
No issue with the URL
-----
No errors in communicating with the server.
-----
The image has been written to your working directory.
-----
-----
The CSV file containing the tweets is downloaded to your local directory
-----
KML structure is created.
-----
-----
KML structure is written to the file in local drive.
-----
The KML file created in your directory shows tweets in two color of extruded polygons.
-----
Blue color for tweets that contains at least one hashtag and Pink color for tweets that doesn't contain hashtag.
```

Message displayed in console after execution of the main class

Visualising KML files in Google Earth

Both the tweet.kml and img.kml files were loaded to Google Earth for visualisation. The tweet.kml is visualised as a ground overlay element in Google Earth. A number of polygon features are displayed that indicate the tweets on these locations. The blue colored polygons represent tweets containing at least one hashtag whereas the pink colored polygons represent the tweets with no hashtag. Other information about the tweet such as tweet date, tweet time, tweet and hashtags can be viewed by clicking the tweet polygons.



Final results on Google Earth

Important note: Prior to establishing the WMS connection, required JAR files were added to the project build path as libraries.

References:

<https://docs.oracle.com/javase/8/docs/api/index.html>
<https://developers.google.com/kml/documentation>
<http://tutorials.jenkov.com/java-internationalization/simpledateformat.html>
https://www.sedgeochem.uni-bremen.de/kml_building.html
<https://stackoverflow.com>