

## FlowMapper (v0.1.1) Plugin for Quantum GIS

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*“Geographical movement is critically important. This is because much change in the world is due to geographical movement. Movement of people, ideas, money, energy or materiel”*

Waldo R. Tobler

Main intention for developing this plugin is that there is no handy tool for depicting spatial interaction data (e.g. movement mapping, flow mapping) under GIS, especially in free/libre open source software domain.

Considering the development efforts that have been made in the last few decades to discover the full potential of GIS in every aspect, it is surprising to find this subject underdeveloped.

This plugin generates straight flow lines between discrete nodes which yield the simplest forms of spatial interaction maps.

This plugin requires Python 2.6 and GDAL to run properly. Instructions for installing Python, GDAL and bindings can be found at <http://ucsb.pbworks.com/Using-GDAL-with-Python> (Thanks to A. Glennon, 2009)

Plugin needs two inputs: (i) text file storing node coordinates and (ii) text file storing interaction matrix (a.k.a. flow data matrix)

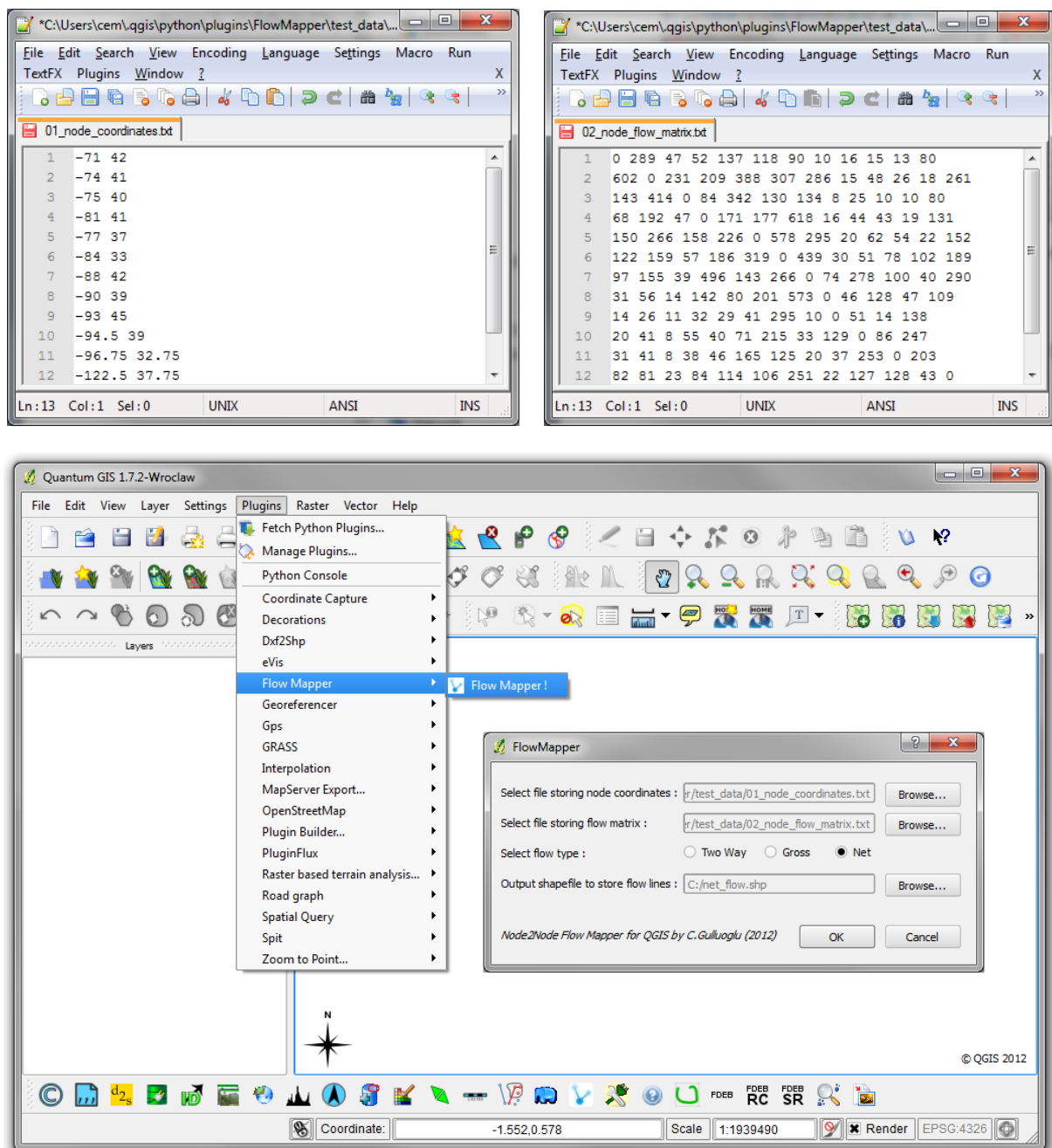
In the first text file, each row corresponds for one node and it should contain one pair of coordinates (x, y) delimited by white space. (Decimal separator for coordinates is point “.”)

In the second file, magnitudes of flows from the first node to last are given respectively. Resulting text file stores a square interaction matrix whose values are white space delimited. Each row corresponds to a “from” node and each column corresponds to a “to” node. The order of magnitudes listed in this text file should conform to the order that is used in the first file. (e.g. with reference to Figure 1 given in next page; number of outgoing bank interacts from node 4 to 6 is 177, vice versa number of outgoing interacts from node 6 to 4 is 186. Notice that matrix is not symmetric.)

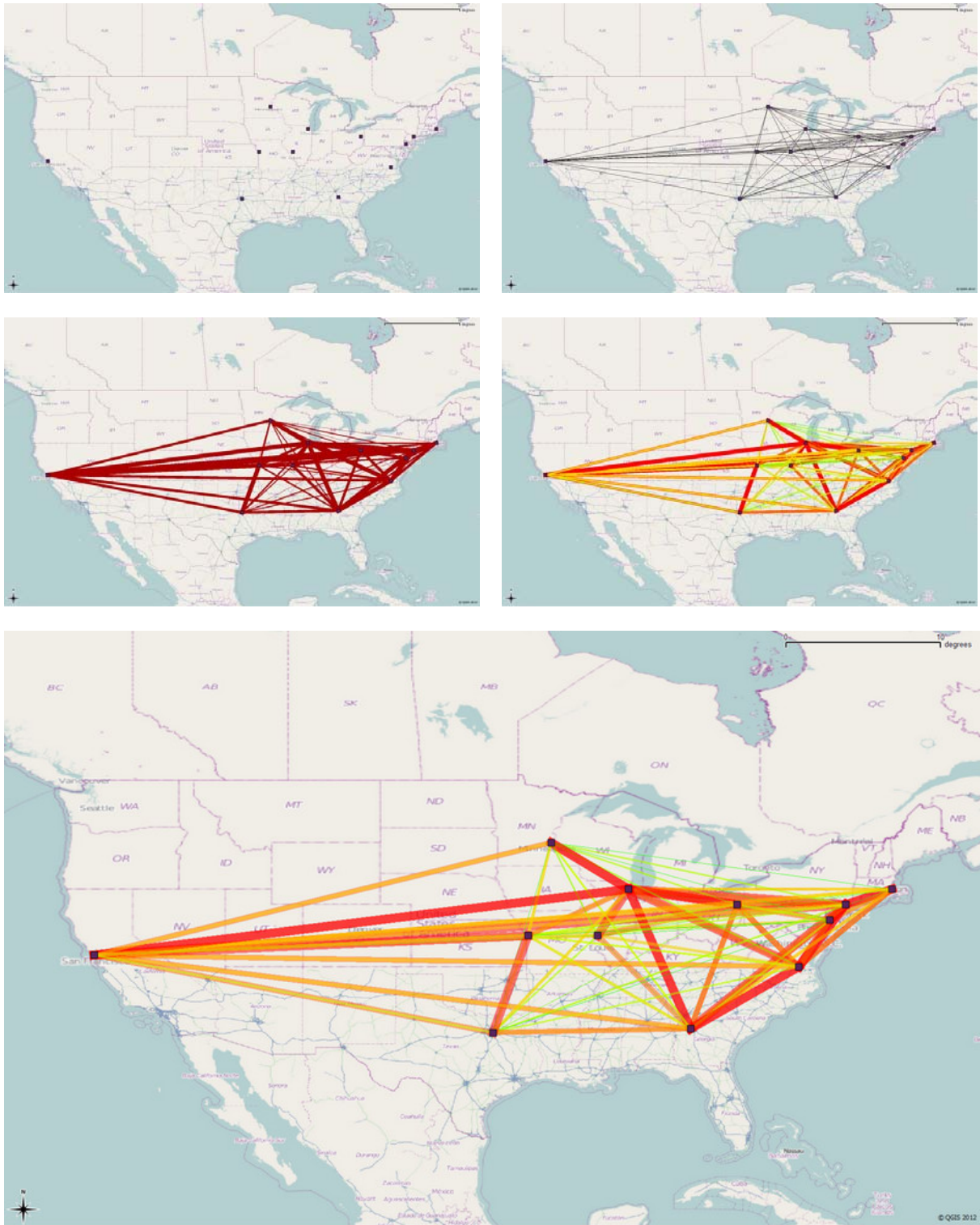
Three types of flow lines can be generated by using this plugin: (i) two way, (ii) gross, (iii) net. When two ways option is selected, both incoming and outgoing flow lines are generated. When gross option is selected summation of interactions between a node pair is considered. On the contrary, when net is selected, absolute difference of interactions between a node pair is considered.

Two sample datasets are supplied under the “test\_data” folder. First one is a relatively small dataset that contains 12 nodes and a 144 element square matrix. Second dataset is a medium sized one containing 81 nodes and a square matrix with 6561 elements. Both datasets are tested and found to be working with FlowMapper v0.1.1 & QGIS v1.7.

First dataset includes total number of interactions between banks between 12 cities in the USA.



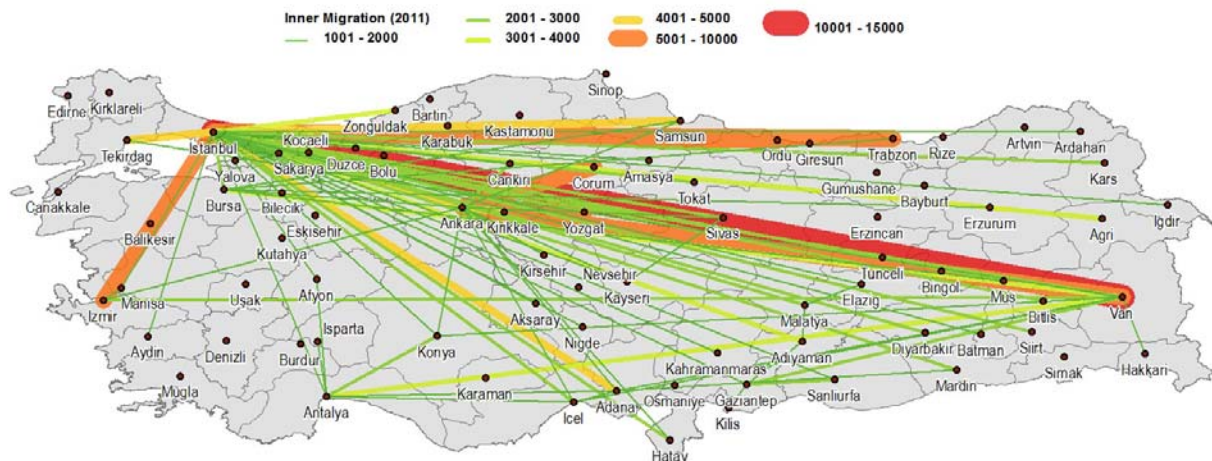
**Figure 1.** Text file storing coordinates of cities (upper left), text file storing square flow matrix showing number of bank interacts between cities (upper right), FlowMapper plugin (bottom)



**Figure 2.** Location of cities (upper left), generated flow lines (upper right), flow lines with widths proportional to magnitude (middle left), flow lines with widths and graduated colors proportional to magnitude (middle right), semitransparent flow lines with widths proportional to magnitude (bottom)

Second test dataset includes;

- (i) coordinates of 81 cities in Turkey (01\_city\_center\_coordinates.txt) and
- (ii) a square matrix storing the amount of inner migration between cities in one year period 2010 – 2011 (02\_migration\_matrix\_between\_city\_centers.txt).



**Figure 3.** Flow map of inter city (net) migration in Turkey between years 2010 – 2011. (Flow lines depicting migrations less than 1000 people are ignored)

### Known Bugs in v0.1.1

Closing the plugin window without selecting any input data pops up an error message.

Long file paths may encounter some problems. So please keep it short (e.g. ..\some\_project\input\_data\node\_coord.txt)

No success message is given upon generating desired shapefile (plugin writes the shapefile quietly to the selected output directory)

### Whats next?

I will try to fix bugs.

Cartographic visualization options (e.g. auto graduated colors, auto proportional widths, auto transparency would be nice for quickly producing maps as given above)

Basic statistical filtering options (e.g. eliminate generating flow lines having magnitude less than..., more than...)

Include some node clustering, node adjustment options for reducing visual clutter.

Edge bundling algorithms.