



General description

More and more people, objects and sensors are connected to the Internet, in what is now emerging as the Internet of Everything (IoE).

The IoE is producing a never-ending flux of raw, unstructured data which can be distilled into information about social interactions, the built and unbuilt environment, traffic, air quality etc. Each minute, 1.7 million bits of information are generated, and the last two years have seen more digital data accumulate than all human history. Estimates point to 4 billion people regularly accessing the internet by 2020 and roughly 31 billion connected devices generating trillions of GB of data.

Collecting and processing this data helps to: (1) better understand the Network Society and (2) create a set of strategies and predictive simulations in the fields of architecture, urbanism, energy consumption, transportation etc.

The term geoweb refers to the technologies and Web 2.0 platforms integrated in Geographic Information Systems, in other words, the geoweb consists of data with a geographic location attached to it.

As a result of this online activity, there are several types of online footprints, which show:

- (a) relations and interactions between users;
- (b) relations and interactions between users and the city's physical environment;
- (c) users' psychological state, opinions, ideologies etc.

Websites such as Thingful show that networks of sensors connected to the Internet are starting to appear in Cluj.

Cluj Geoweb will include different stages of development and will explore different sorts of analyses based on:

- (a) data collection;
- (b) visualization of this data;
- (c) in some cases, the creation of predictive models with agent-based systems.

Cluj Geoweb is an ambitious project which hopes to become inter and trans-disciplinary and will include multiple analyses. We try to create a meta-narrative of the digital exoskeleton which is generated in, around, about and above Cluj. We are interested in transforming this raw data in information and later knowledge relevant for understanding urban centers.

In other words - we want to transform the quantitative, unstructured, and continuously generated stream of data from people, objects and sensors connected to the internet - in information, and knowledge relevant for architecture, urban planning, local authorities, even sociology.

What this project does:

- creates maps which show geolocated data from social media over Cluj
- writes a (meta)narrative on areas of the city where users are producing social media content

Aplicability:

- help in decision making with urban strategies which are correlated to the realities of the city and the needs of their users for urban planners and decision makers

Why is it new:

- as far as we know, no such a study has been done on any city in Romania until now

//Coordinators

Anca Horvath [anca.horvath@gmail.com] *,
Radu Becus [radu.becus@gmail.com]*

// Web design:

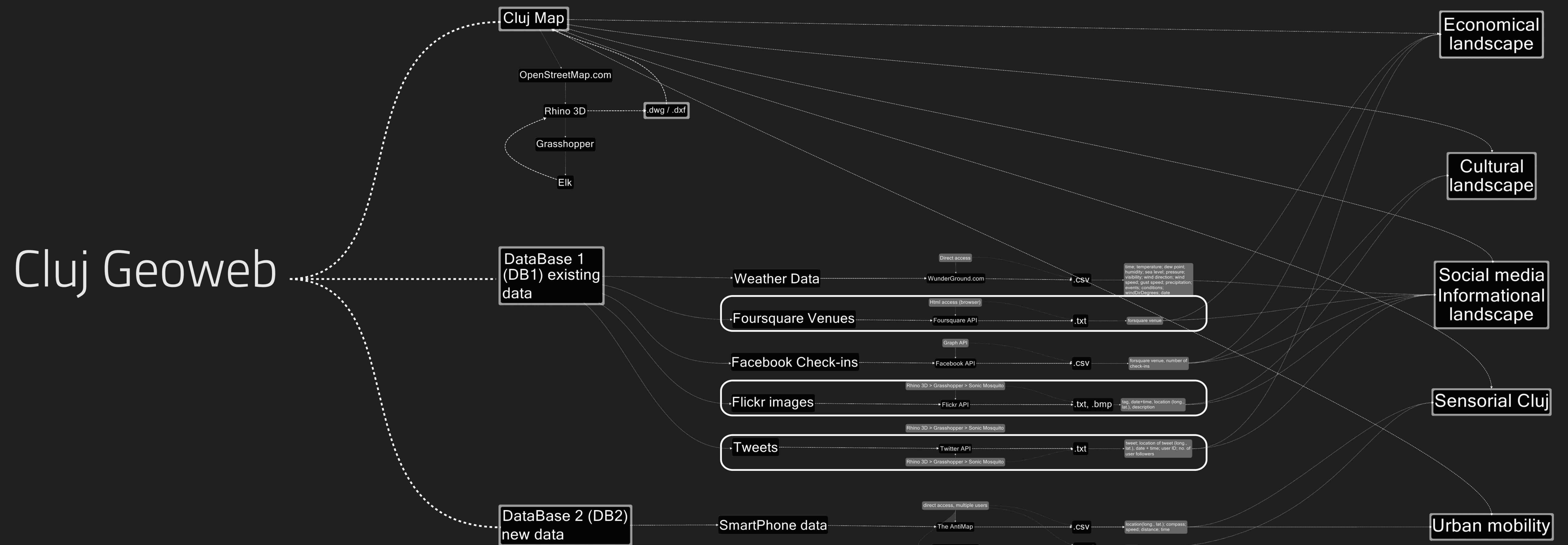
Vlad Codirla*

// Special thanks:

Marius Pavai**, ASTA Cluj*, Daisler

*Universitatea Tehnică din Cluj-Napoca - Facultatea de arhitectură și urbanism, str. Obervatorului 74-76, Cluj-Napoca, Romania

Mindmap Cluj Geoweb:



Economical landscape

Cultural landscape

Social media
Informational landscape

Sensorial Cluj

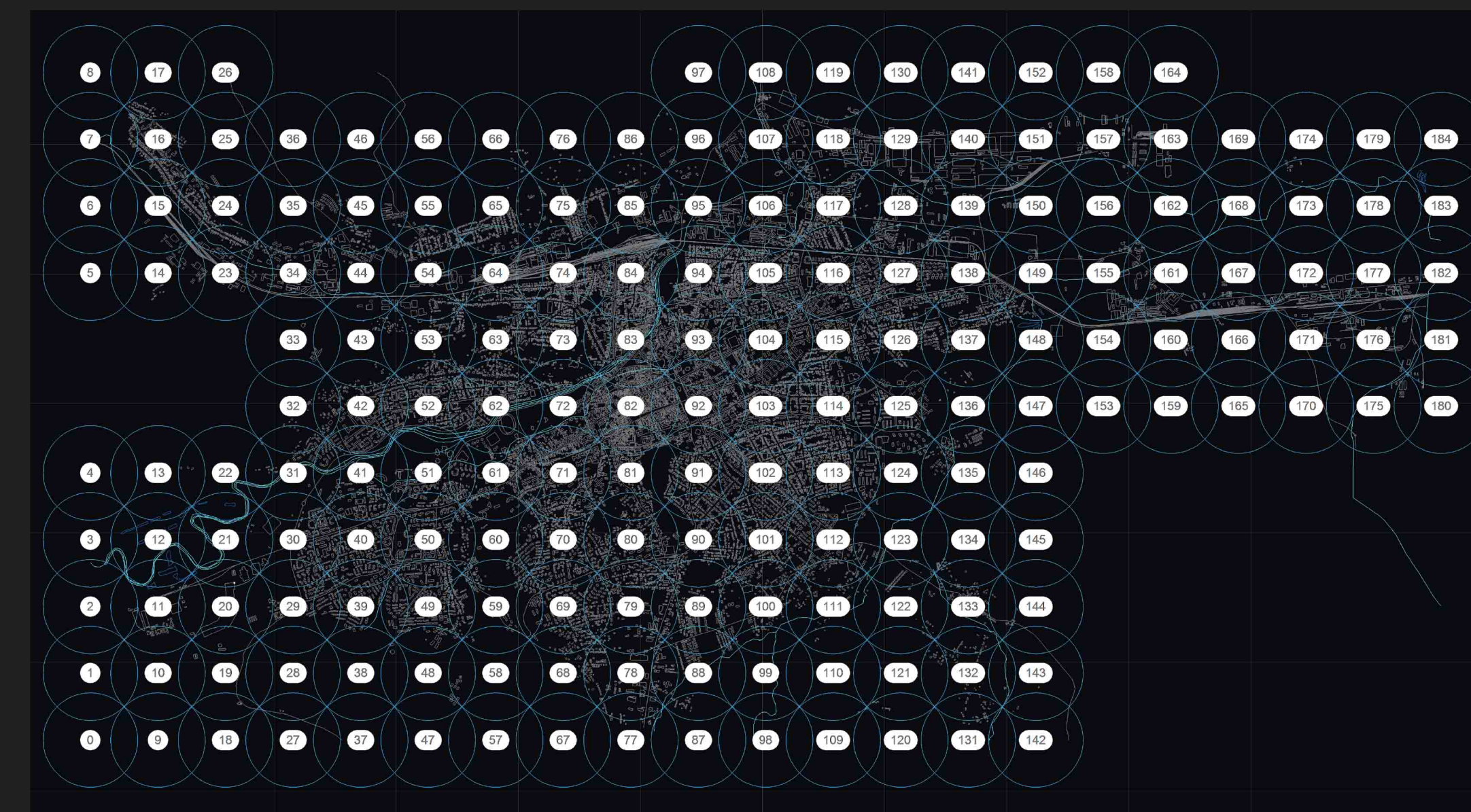
Urban mobility

Database creation methodology for Fr.A.M.E., Twap, we_were_here:

The query is done in 185 points with a 500m radius, and doubled with 875 points with the radius of 110 radius for the central area of the city. From each of these points, all available data is extracted from the API's of the three social media platforms (name of user, date&time of post, long, lat, etc).

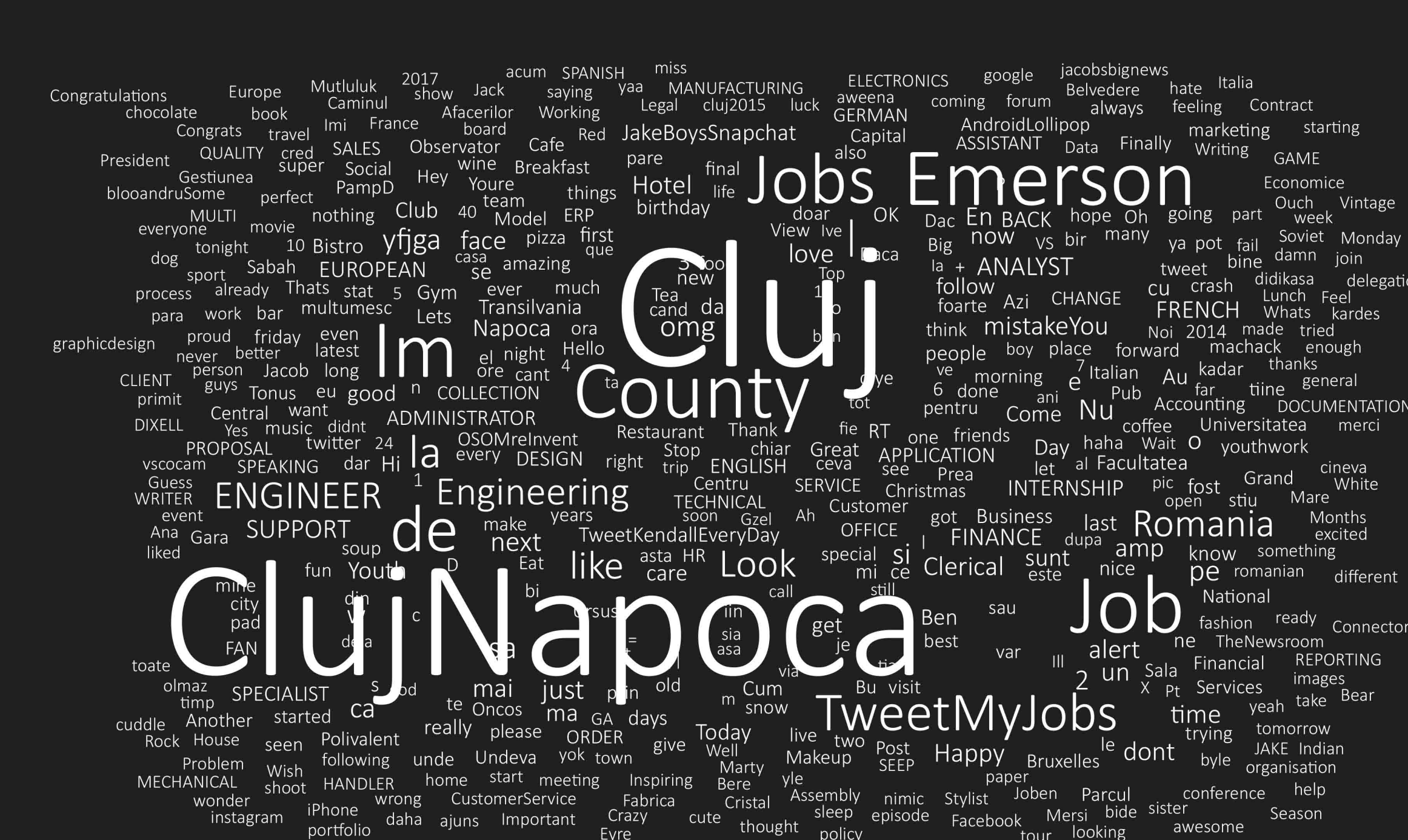
Query Grid 1 - R=500m

Query Grid 2 - R=110m



Wordclouds :

(A). 4535 different words posted on Twitter between 11/17/2015 and 12/04/2015; and (B) the first 500 most used words on Twitter. Dimensioned according to word frequency





Description of maps // where they stand in Cluj Geoweb

Fr.A.M.E

*Flickr Activity map
2005-2015*

We will use **Fr.A.M.E** in the creation of the *cultural landscape* and the *informational landscape of digital social medias*. In creating this map we work with data from DataBase 1 - existing data. **Fr.A.M.E** extends the visual-analytic methodology of the project to include the collection of on-line geotagged photography, on Flickr, in Cluj.

Fr.A.M.E. is a quantification of the activity of one population segment: those with regular Internet access and an interest in photography. The analysis allows for qualitative interpretations: the images are generated through a voluntary act of the authors of isolating a section of the visual field which is of special interest or sends a special message. The flavor of Flickr's tends to favour images of environments (be they built or unbuilt, over photographs of people). The things and places which are photographed and their location show interesting information on points of interest (physical and static - i.e. monuments, temporary - i.e. events), changes or peculiarities in the built environment, sensorial elements which embellish or degrade the 'walking' experience.

The point in creating this map is to identify the most interesting urban spaces for photography enthusiasts. These places are associated, of course, with touristic monuments, public spaces, public parks, leisure areas, but they also show places of temporary interest: like places where events take place, or places which host a 'special sensorial experience'.

we_were_here

*Foursquare check-in map
2009-2015*

we_were_here will serve in the creation of the *economic landscape* and that of the *informational landscape of digital social media*. The map works with data from Database 1. **we_were_here** extends the visual-analytic methodology of the project to include geolocated data from social media Foursquare.

Foursquare offers customized search results to its users, taking into account the data a user shares on the places they go, their reviews on these places, and other user's opinions on a specific place.

Therefore, Foursquare is a social media about places (venues) and spaces. Foursquare stores the following metadata on its the venue: name and geotag, how many users have checked in the venue up until the moment of the query, what opinions have been shared on the venue, the type of venue, and links to other social media pages for the venue.

Again, **we_were_here** shows only the activity of a segment of the city's population: those with regular access to the Internet. The object of the analysis is to map the venues stored in Foursquare, and the number of users who say to have been in that venue. The map shows points of interest and user densities in those points. It is easy to read areas with high data density - like the historical city center, and the two shopping malls - Polus and Iulius.

The search query was made in 185 points with radii of 500 meters and doubled by a query of 875 points with radii of 110 m for the central area. This resulted in 8472 unique venues. For the metaball visualization (pg. 3/3) each location was given a density representing number of users who have signed in the venue.

Tw.A.P

*Twitter activity map
11/17/2015 - 12/04/2015*

Tw.A.P - Twitter Activity Map will serve in the creation of the *economic landscape*, the *cultural landscape* and that of the *informational landscape of digital social media*. The map works with data from Database 1. **Tw.A.P** extends the visual-analytic methodology of the project to include geolocated data from social media platform Twitter.

Again, similar to **Fr.A.M.E.** and **we_were_here**, **Tw.A.P.** shows only the activity of a segment of the city's population: those with regular access to the Internet.

Twitter is a social media where users send and re-send short messages (140 characters). One can follow other users, or pages of companies or institutions. The twitter API allows access to geolocated data of interests, feelings, and interactions between its users.

Projects of data mining Twitter include: mapping of the Egyptian revolution on Twitter (as part of the Arab Spring), charting of languages in which people write on Twitter in a certain time-frame and in certain places in cities (creating maps which show multiculturalism in dense urban areas); mapping of disease spread by monitoring clear or vague suggestions shown in tweets on ones' health and analyzing the friend networks of 'sick' users, and the messages they send; sentiment mapping of tweets sent over certain periods and in different places.

Tw.A.P. shows the geolocation of all tweets between 11/17/2015 - 12/04/2015, and opposite, a wordcloud of the 4535 unique words posted in this period as well as the 500 most used. Twitter is a social media which is dynamic and sensitive to the interests of the community. This type of analysis has the potential to map the mood of a city at different moments in time.

Fr.A.M.E

*Flickr Activity map
2005-2015*

Geolocations of images posted on Flickr between 2005 and 2015 - 2d view



we_were_here

*Foursquare check-in map
2009-2015*

Geolocations Foursquare venues in Cluj 2009-2015 - 2d view

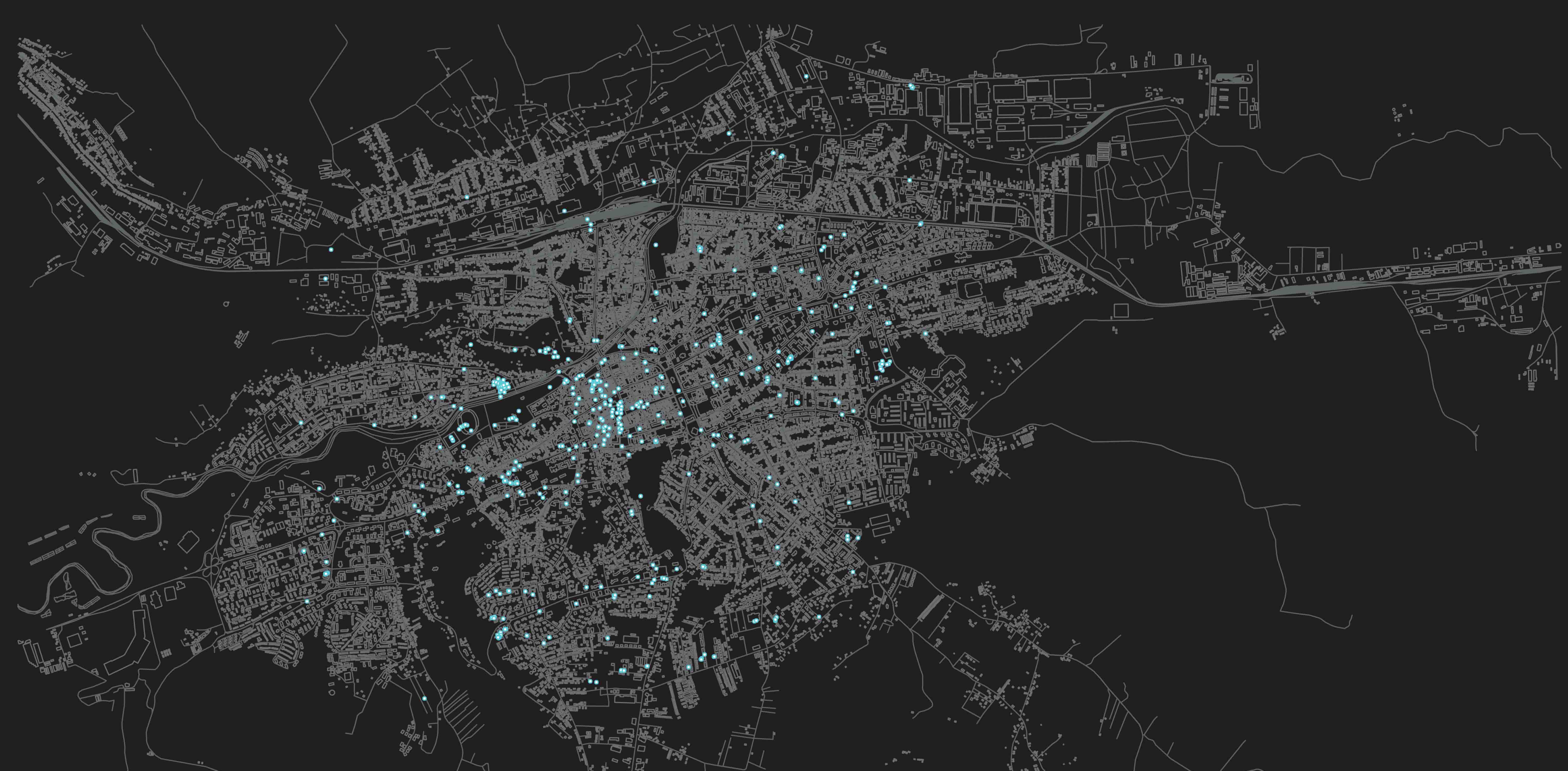


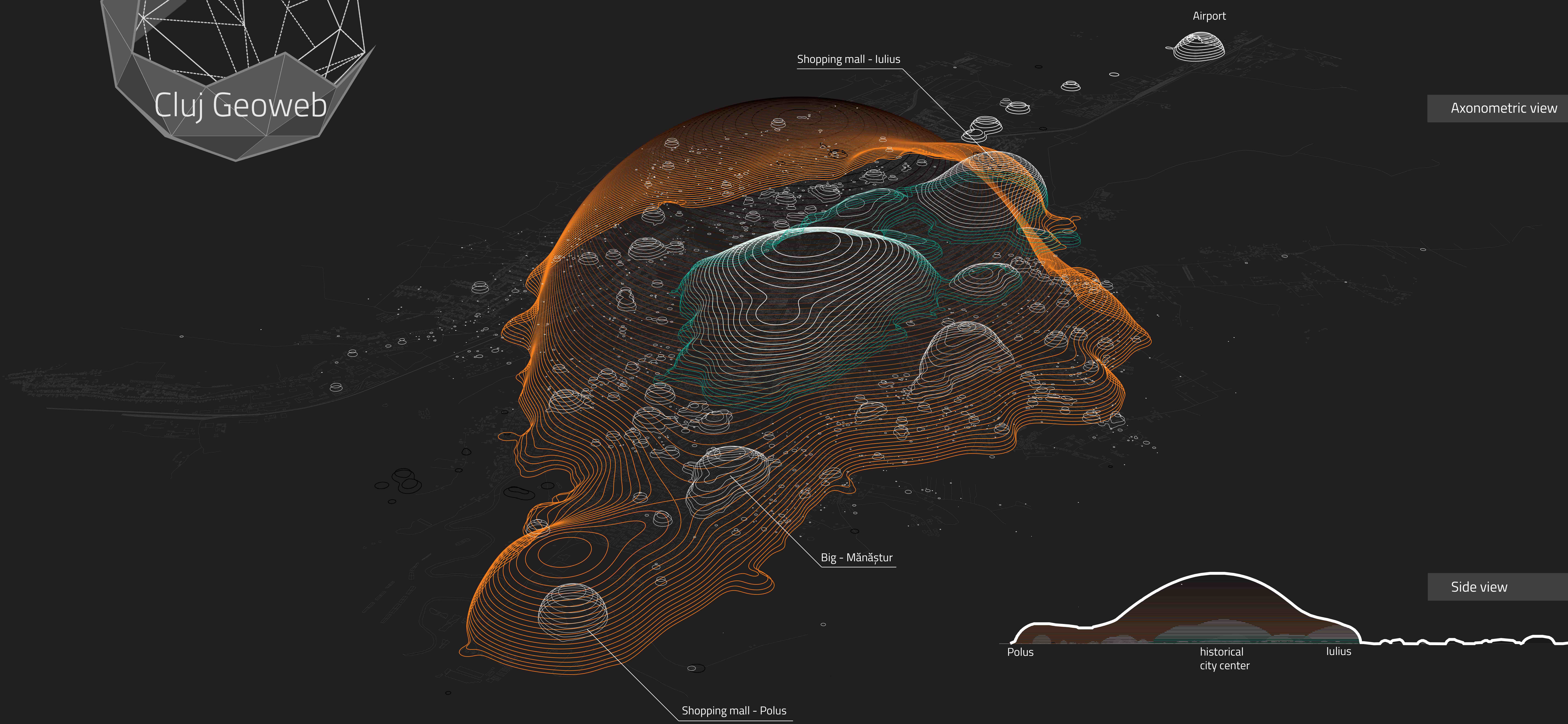
"It is interesting to look at the difference between these 2d visualizations (Fr.A.M.E. and we_were_here), especially imagining them without the map of the city behind. For Foursquare we see points which correspond to the query grid. It is obvious that the query grid could have been more dense than the circles with 500m radii doubled by those of 110 radii, which would have made the analysis more comprehensive.

Tw.A.P

*Twitter activity map
11/17/2015 - 12/04/2015*

Geolocations of tweets 11/04/2015 - 20/04/2015 - 2d view





Description of vizualizations // metaballs for Foursquare and Flickr

This metaball representation vizualizes a third dimension of the geotagged data - the number of signatures/-check-ins associated to each place.

TSO we have: x-longitude, y-latitude and z-number of check-ins for a location. Adding this new dimension, the Foursquare check-ins map changes dramatically and starts to look more similar to the metaball representation of Flickr.

On both maps we can read the historical city center, the two shopping malls - slightly periferal, but also the area around Big in Mănăştur, the botanical garden, the train station, the university campuses from Zorilor and Mărăşti.

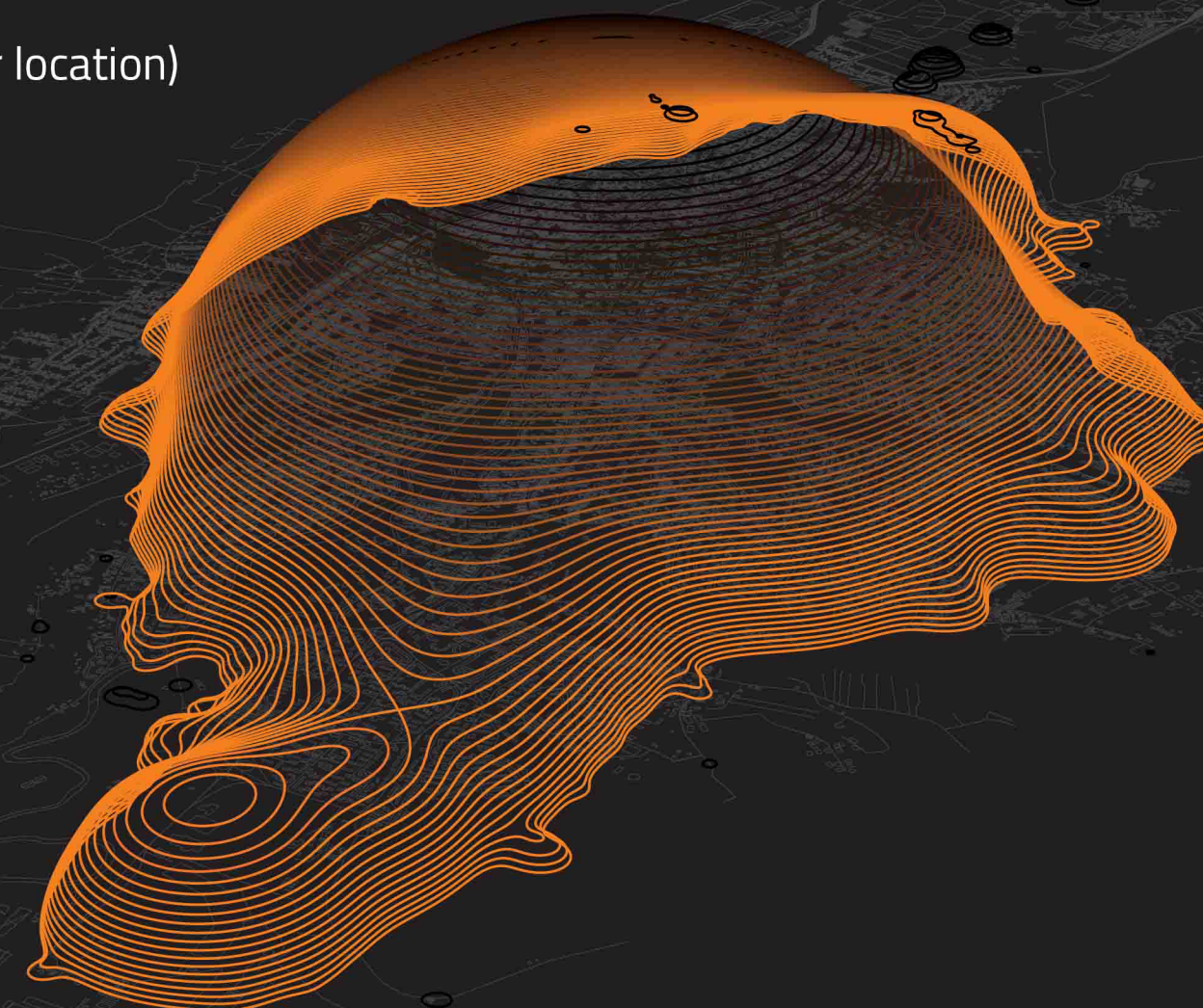
For Flickr, the third dimension, z - numbers of users who post an image in a certain place - is always 1. The database shows where all pictures posted on Flickr were made in the past 10 years.

These maps shows that currently Cluj has 3 major poles: the historical center and the two shopping malls. From Foursquare, we can read larger 'informational densities' also along some streets, like Câmpului and Brâncuşi.

Fr.A.M.E

Flickr Activity map
2005-2015

Geolocations of images posted on Flickr between 2005 and 2015 - metaball vizualization
x - longitude,
y - latitude,
z - 1 (one photo per location)



we_were_here

Foursquare check-in map
2009-2015

Geolocations Foursqaure venues in Cluj 2009-2015 - metaball vizualization
metaball vizualization
x - latitude,
y - longitude,
z - number of check-ins in a venue

