Yildiz Technical University

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International Cartographic Association(ICA)

A research in cartographic labeling to predict the suitable amount of labeling in multi-resolution maps.

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My thesis and work

Cartographic labeling in multiresolution maps using web services.

1. A research in Cartographic Labeling to predict the suitable amount of labeling in Multi-Resolution maps.

2. (No name assigned yet)

Understanding the map components

There have been several works and efforts towards making the best computerized map generalization.

An important part of the generalization process, axiomatically, for a map is to understand its components.

Through labeling the user can understand the map a lot easier and more accurate-

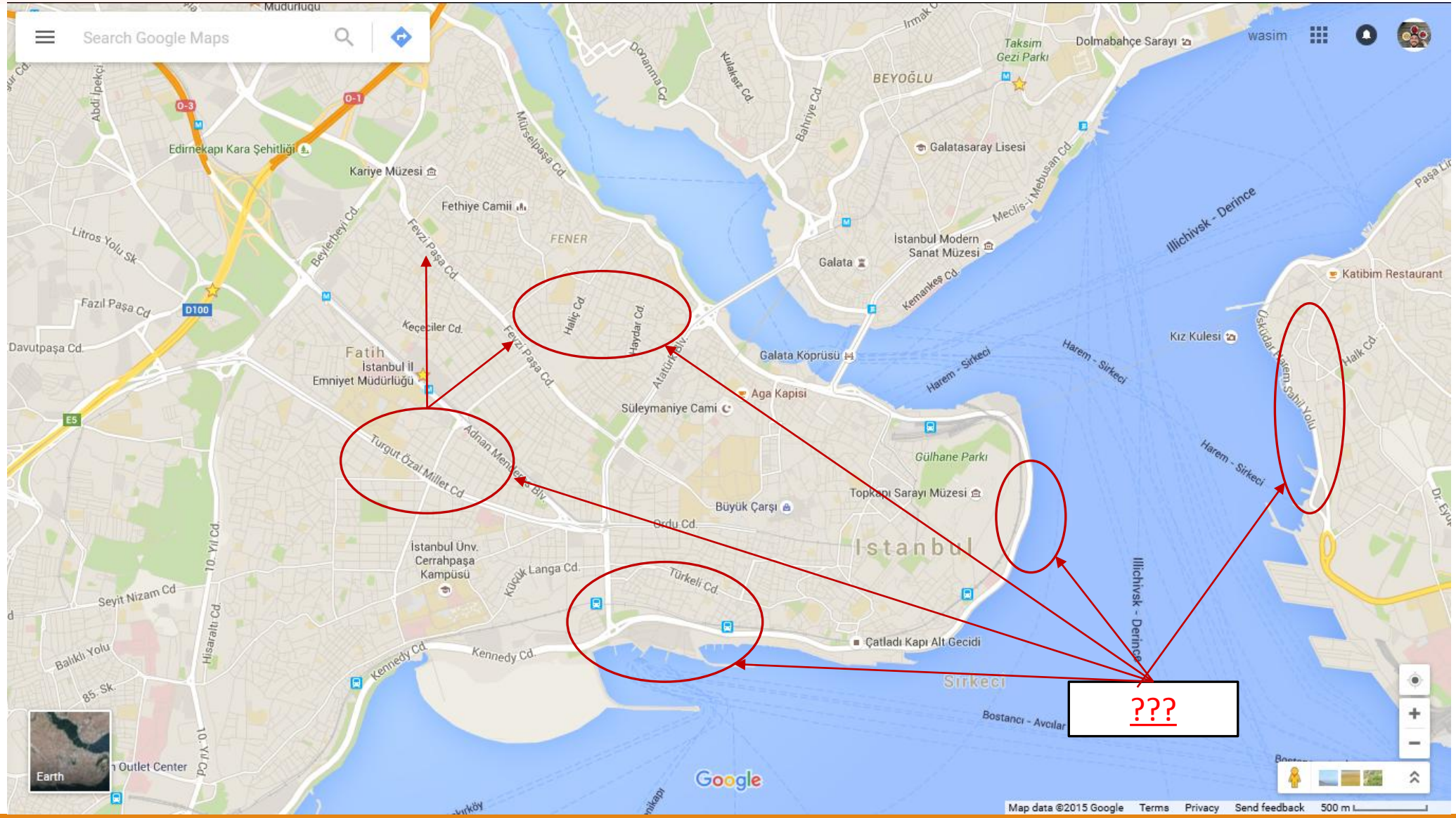
Map Analysis

- We analyzed the best multiresolution map services, such as Google Maps, Yandex Map, OpenStreetMap, Bing Map and others.

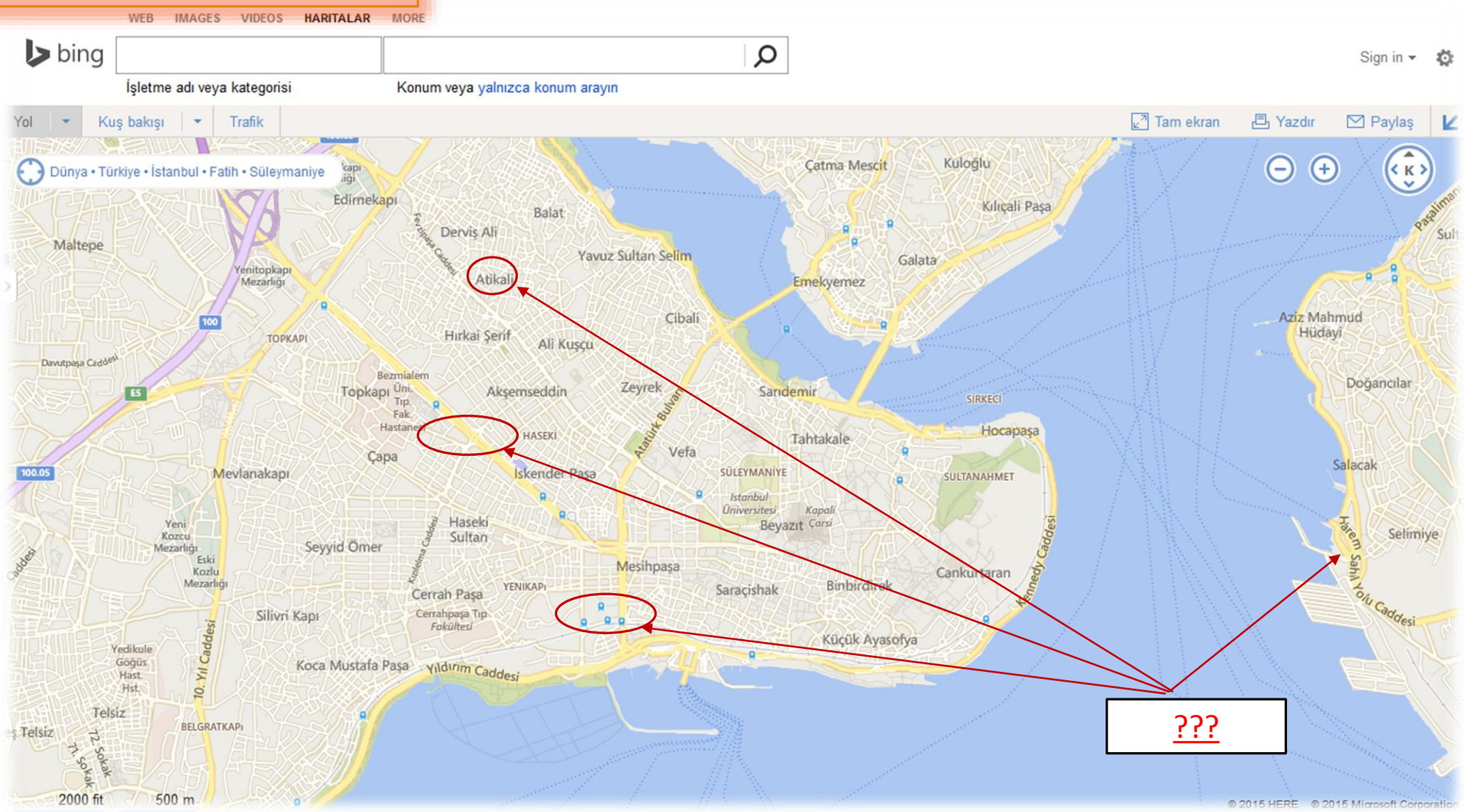
- Most if not all of the used popular online map services do not share their used algorithms or models, thus forced us to analysis and simulate their displaying system using techniques such as the artificial neural network means and tools.

Online web map browsers

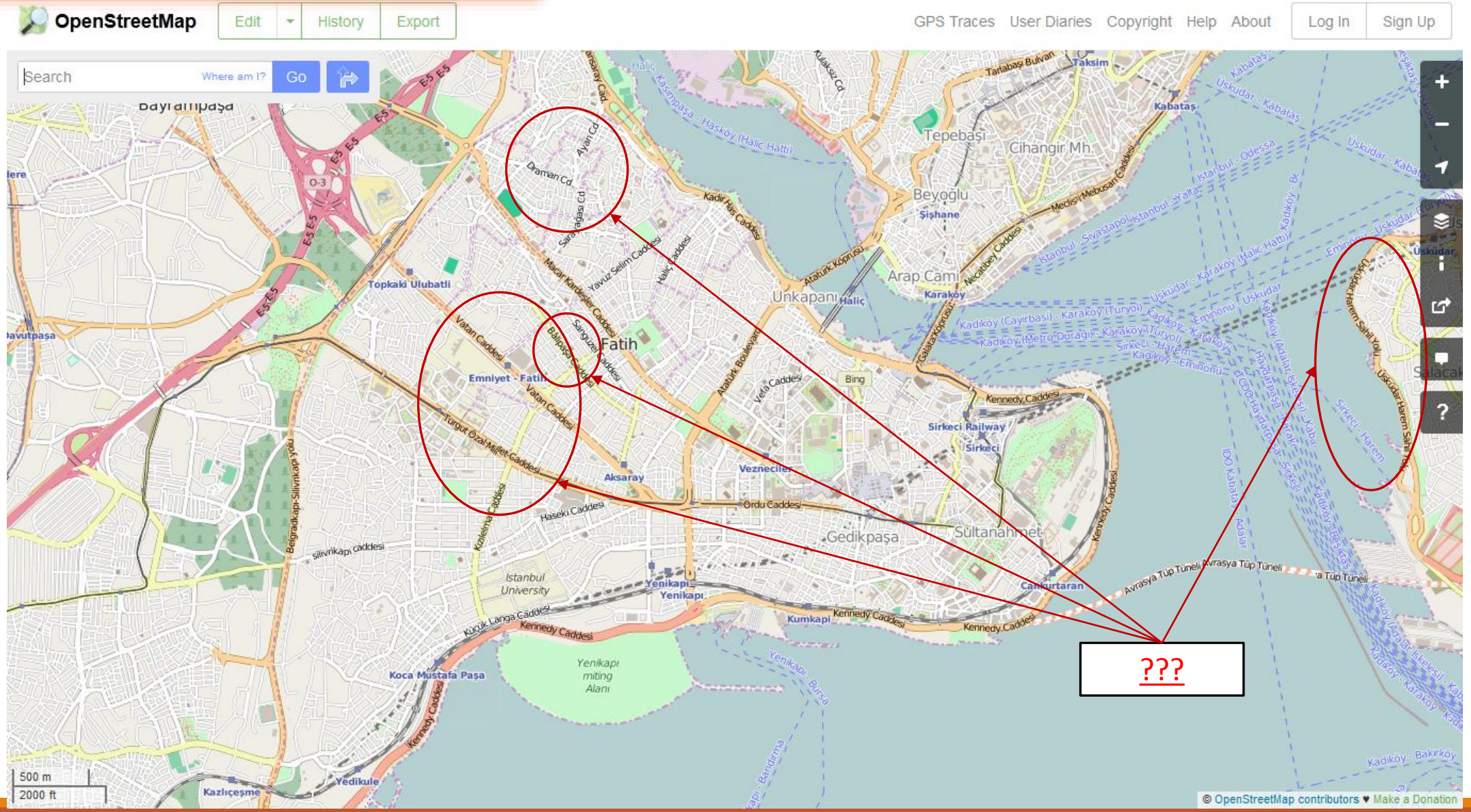
Google map sample



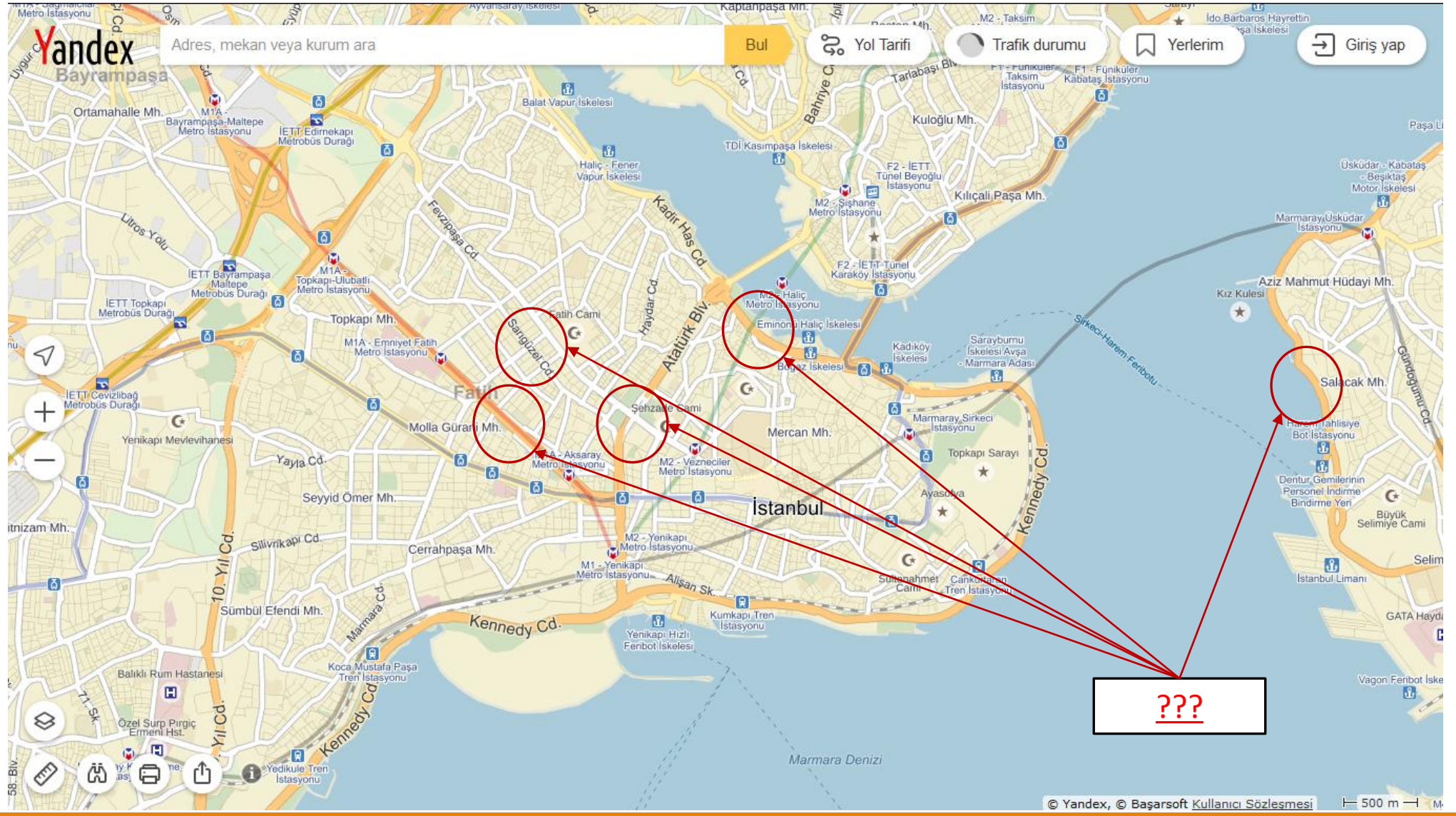
Bing map sample



OpenStreetMap sample



Yandex sample



General Goals

Main goal will be focus on reducing the labeling deficits of the previous mentioned online map browsers and giving the map user the best understood for the street map product.

The previous works

- These works witness a lot of unnecessary data lost
- Focus mostly on point labeling
- Less concentration on real time mapping but more on static hardcopy map production
- Focusing on the legibility problems (amalgamation, displacement, etc.)

Our study's (Goals)

Online Multiresolution streets map products.

(for map users, extracting the most required information from the map, their needs should differ in every level of detail)

Giving more significant to the displayed feature at every LOD, and considering the amount of displayed features

(the road types which is going to be presented at that certain zoom level should be considered, also trying to make the amount of the displayed data sufficient enough without any shortage or excessive.)

A methodology for better labelling with the use of intellectual hierarchy.

composing a formula using some values that we found.

Our study (Approach)

Study Area

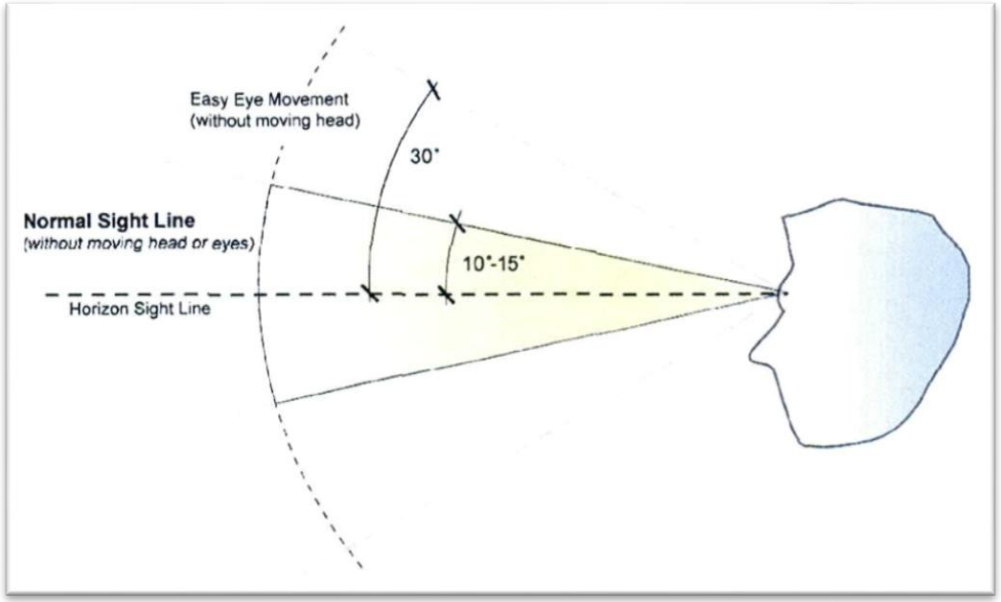
- We choosed a study area for testing contains a well established attribute table and a complete vector data represents the street layer in that area.
  - We controlled the data set and made some data enrichment for it’s needed contents.

Formula

- to predict the most suitable amount of labels for the road features to be displayed also determining the important features that have to be labeled at each LOD.

Our study (Approach)

Calculating values



$$\alpha = 2 \arctan \frac{d}{2f}$$

The human vision must be first considered, providing the necessary context to evaluate the area the eye can focus in while the map user uses the digital map.

When the map users look at the map through their devices, they look through a field of view.

Field of view is the extent of the observable world that is seen at any given movement.

Our study (Approach)

Calculating values

We run a calculation for the features to determine their centrality values.

Also we considered some other values for each street feature, such as their length.

We defined the suitable road types and classes to be shown that we believe would give the map user the best understanding for the map at every zoom level.

Our study (Approach)

Calculating values

The most important centrality values that were used in our study :

Reach

- Captures how many surrounding streets each street reaches within a given Search Radius on the network.

Betweenness of a streets

- Is defined as the fraction of shortest paths between pairs of other buildings in the network that pass by street

Closeness

- Measure indicates how close a streets is to all other surrounding streets within a given distance threshold.

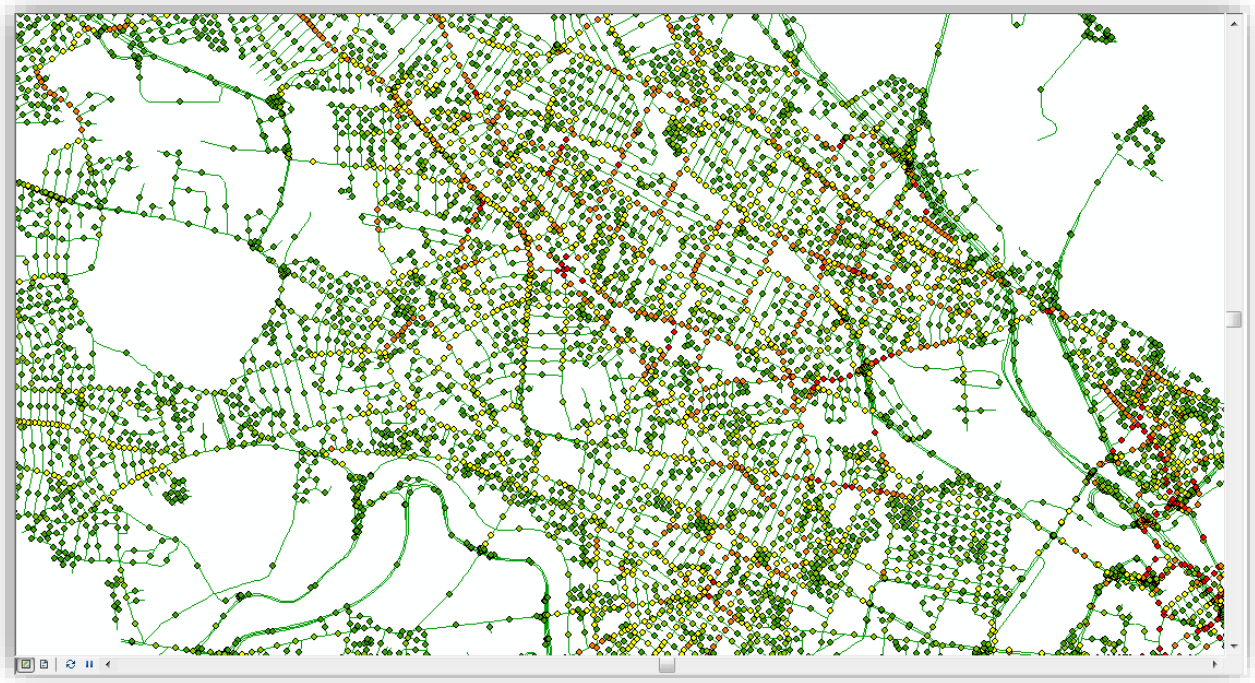
Straightness metric

- Illustrates the extent to which the shortest paths from a node of interest to all other nodes in the system resemble straight Euclidian paths.

Our study (Approach)

Calculating values

Reach

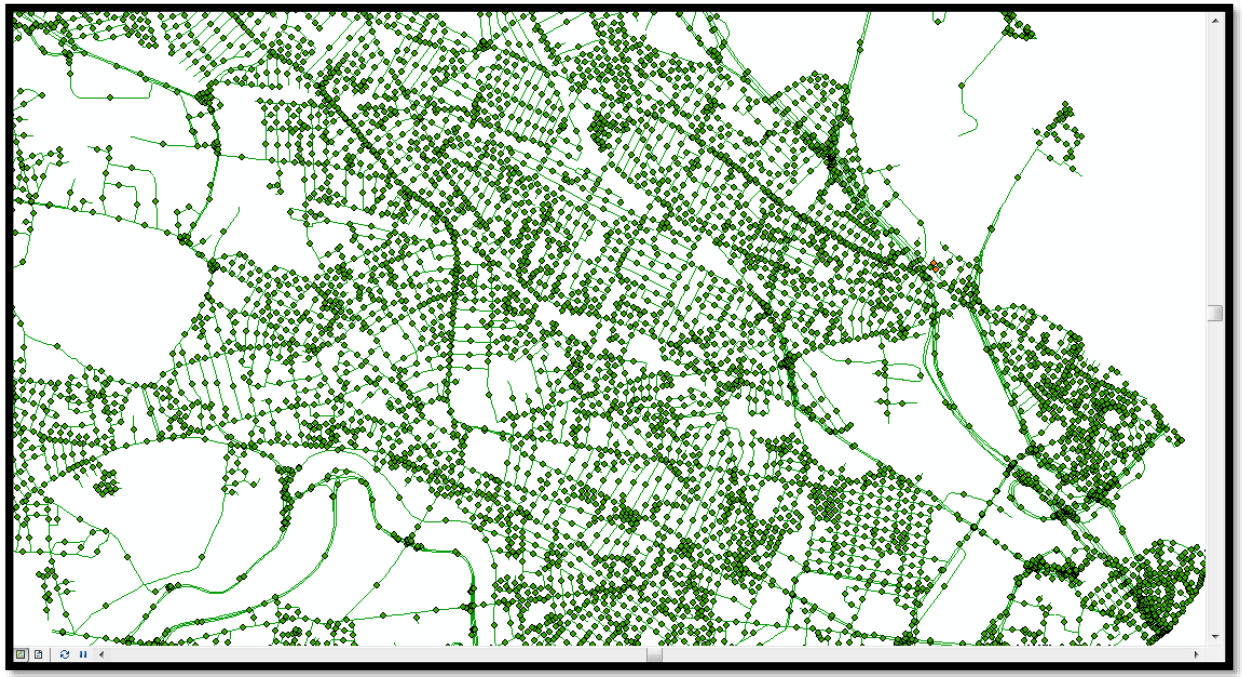


Betweenness

Our study (Approach)

Calculating values

Straightness



Closeness

Our study (Approach)

We will use the values we calculated before and generate it in our formula to produce hierarchy to label the features by its importance as the most important factor next to other factors that will be consider in street labeling.

We will decide the importance of each field by applying some Analytic Hierarchy Processes such as (AHP).

The expected Results

Our formula is expected to display the best amount of labels along with the most important road features to be labeled at every level of detail.

The elements will be used to insure that are	(1) The artificial neural system principles means and tools, the actual number of road objects and actual number of the labels displayed at each level of detail extracted from the used map services
	(2) The field of view (area) of the displaying screen
	(3)The values that we have calculated for every feature in the network.

The expected Results

The composed formula will be expected to provide us the significantly important road labels considering the previous mentioned elements at every LOD.

The composed formula will be compared with the radical law equation of Topfer and Pillewizer (1966) to predict the suitable number of features needed to be shown at the target scale.

The formula is expected to be more accurate and suitable for the online multi-resolution map production.

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Cartographic labeling in multiresolution maps using web services.

1. ~~A research in Cartographic Labeling to predict the suitable amount of labeling in Multi-Resolution maps.~~

2. (No name assigned yet) but it should be about modeling and visualizing cartographic maps

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