

AN ADDRESS BASED INFORMATION SYSTEM DESIGN AND APPLICATION

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Information systems, which are one of the effective data management tools of the modern societies, are a very important element to manage urban activities for local governments. To get optimum benefits from such systems, base components should be prepared. Address information defining the exact locations of property objects is one of the main components in urban information management. On the other hand, the base of the address information is formed with numerating building function which is organized by local governments. So, deficiencies of the numerating buildings works in urban areas should be eliminated and thus the tasks should have been corrected and based on an updateable address system. In this study, firstly, the numerating buildings instructions which is applied in Turkey were examined whether the system sufficient or not for an urban information system. In this perspective, a standard address format was suggested for Turkey. Then, for city of Trabzon which is selected as pilot area, road network and numerating buildings information were applied and examined. With the components of address format which are district, avenue, street and building id, address codes and finally an address information system based on the standards were developed. In this system, the GIS analysing function with determination of best route and location, address matching, address geocoding, finding the closest facility etc. queries were provided.

1. INTRODUCTION

When examining of the address formats used in Turkey, it seems that there is not a standard system. Because majority of address components, lack of needed sensitivity of numerating studies, different addresses formats used by different societies and lacking of awareness of societies about changes in address components, address chaos is lived in Turkey [Yıldırım, V., Yomralıoğlu T., 2002]. Eliminating of this address chaos dependent on construction of address based information systems using by standard address format. The working principle of these systems is depending on representing with address of geographical objects. Address information is position information of geographical objects, on map.

2. NUMERATING SYSTEM

2.1 Examine of Regulations

With the Law dated as 04.10.1927 and numbered as 1003 regarding “Numbering buildings and naming street”, numbering buildings and naming streets are compulsory. Respect to same law’s fifth item, dated as 03.21.1963 and numbered 11361 “Numerating Instruction” published in official gazete. In this instruction, what kind of buildings are numbered, what kind of streets are named, how are these streets numbered or named, how are numbers and names showed in signboard, how is determined responsibility and authority and which standards should be respected when buildings are numbered are pointed out clearly.

It is not attached needed importants to numerating buildings studies dependent on dated as 1927 law and dated as 1963 instruction. Besides, numerating instruction does not include some concepts such as urbanization vision nowadays, importance municipality obtain, the order by “Housing Property” law dated as 1965, and opportunity which developing information technologies provide. Local authorities feel the need for address based information systems which are based on numerating systems. So, a instruction which is extends the numerating concept, targets address information system, includes usage information technologies, systematizes graphic and nongraphic information relate is necessary [Köktürk, 2002].

2.2 Forming of Numerating Systems

Firstly, the numerating systems prepared accurately, updateable and related to maps should be formed for address based information system design. Building numbers and street names which are basic two components of address format are specified with numerating process. These components constitute standard address format. This format is basic data in address information system. On the other hand, building numbers and street names are used to every kind of query and analysis in address information systems. Societies, responsible for numerating process, should pay needed sensitivity while determining of these components. Address information system constituted by numerating works is useful not only for address queries but also for urban information system applications.



Figure1. Numerating Map

In this study, firstly numerating system of Trabzon City was examined and then address based information system design is constituted. At the end of the study, it was seemed that numerating instruction's rules were not applied completely in the city. Basic cause of the problems which are come across during the study is that numerating studies are not related to maps and updateable. In the application, it was seemed some mistakes from repeated street name to wrongly numbered building numbers. These problems result from lack of expert and trained personnel about numerating in local authorities, deficiencies on control mechanism of GSI (Government Statistics Institute).

For accurate and updateable numerating system;

- Responsible personnel for numerating studies should be trained in local authorities,
- Urban maps or satellite images which are high resolution should be obtained,
- Zoning planes should be provided and subdivided for numerating,

- Streets (or avenue, road, boulevard) should be named according to existing situation and duplicated street names should be eliminated,
- Buildings should be numbered according to the instruction,
- Building numbers should be written on urban maps or satellite images according to allocation numbers,
- Numerating updating forms should be prepared.

3. DETERMINING OF ADDRESS STANDARD

Address formats should be in a standard system for address based information system works. Using standard address format supplies some benefits like working of the system, sending documents to related person, increasing of work speed between the societies and adapting to Europe Union (EU) countries's address standard. In this study, the address formats which are used in fourty countries are examined and according to sequence of components in address format, an address format was specified for Turkey (Table 1).

Nowadays, an adapting process continue for membership to EU in Turkey. In this process, Europe Union Countries's standards will be applied in Turkey. The address formats used in Europe Union Countries are same. So, This format will be used in near future in Turkey. But, it is seemed that there is not any study about address standard. This research have been made in three societies: Society of GSI, EU adapting committee, TSI (Society of Turkish Standard Institute).

Table 1. Determining of address standard

COMPONENTS	1.(%) Comp.	2.(%) Comp.	3.(%) Comp.	4.(%) Comp.	5.(%) Comp.	6.(%) Comp.	7.(%) Comp.	Absent (%)	Total (%)
Society, Organization, Company Name	92	-	3	-	-	3	2	-	100
Buildings Number and Buildings Name	2	52	36	5	5	-	-	-	100
Street Name	-	36	52	5	5	2	-	-	100
Zip Code	-	7	5	61	10	17	-	-	100
District Name	-	-	5	22	51	5	-	17	100
County Name	-	-	-	-	17	27	-	56	100
City Name	6	-	-	-	-	42	52	-	100

According to percentage in Table 1, the address formats are specified for Turkey.

1. Society, Organization, Company Name	For Foreign Countries;	For Turkey;
2. Buildings Number and Buildings Name	Mr. J. Public	Sn. Mehmet ÇETE
3. Street Name	123 Church Street	27 Gül Sokak
4. Zip Code	61857 Colloyn	61250 Yomra
5. County Name	PRETORIA	TRABZON
6. City Name	SOUTH AFRICA	TURKEY

4. A CASE OF TRABZON ROAD NETWORK

Road is the most important covarege for address based information systems. Various kind of query and analysis about address information can make on the existing road network. The arrangement that is formed by relating building numbers with road starting number and ending number constitutes base of address based information system. Informations of road network should be formed with update data. Thus, query and analysis which make on road network give the most accurate results.

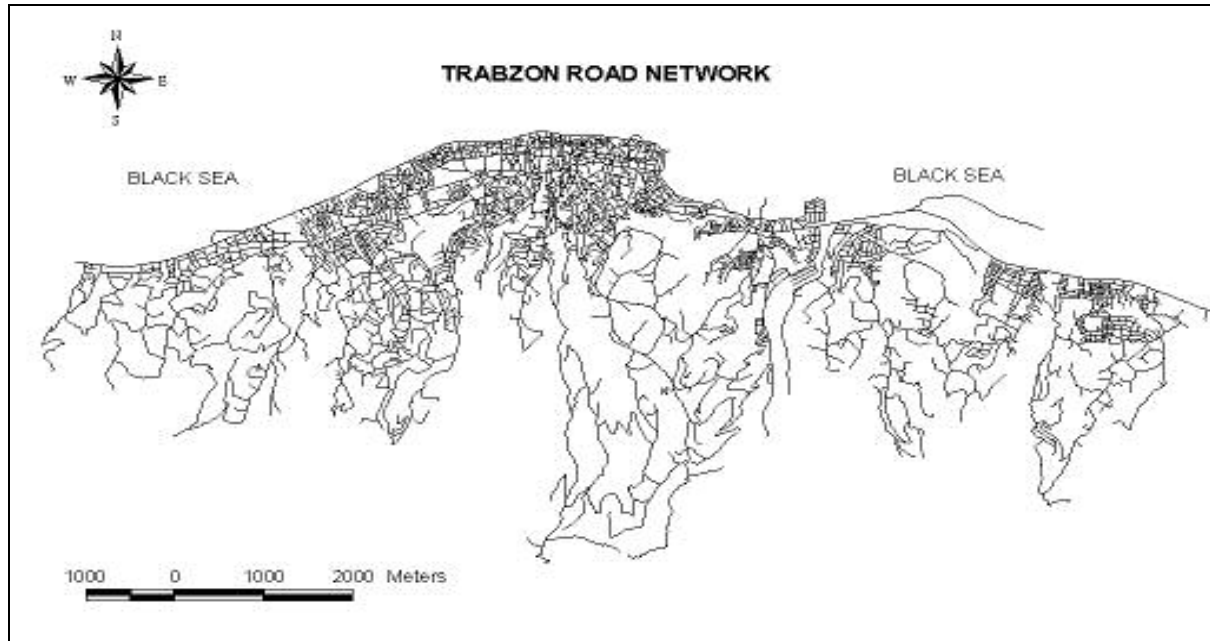


Figure 2. Road Network of Trabzon City

Road network's database which used network analysis include nongraphic informations such as road width, road cover type, road name, road type, drivetime, road starting building number and road ending building number. In addition to this, although turn informations is not represent in the arc attribute table, turn tables were constituted for this informations and related to databases.

Table 2. Nongraphics informations where road network's database

FROM NODE	TO NODE	LENGTH	L_F_ADD	L_T_ADD	R_F_ADD	R_T_ADD	NAME	TYPE	METERS	SPEED	MINUTE	DRIVE TIME	ONE WAY	KAPLAMA
13	15	165,066	39	55	20	20	DEVLET_SA HİL_YOLU	CADDE	165,066	40	1,000	4,000		Asfalt
16	11	62,638	73	81	24	24	DEVLET_SA HİL_YOLU	CADDE	62,638	40	1,000	4,000		Asfalt
15	16	120,010	57	71	22	22	DEVLET_SA HİL_YOLU	CADDE	120,010	40	1,000	4,000		Asfalt
13	34	36,667	7	1	4	2	CUMHURİYE T	CADDE	36,667	30	1,200	5,000	N	Beton
30	34	43,377	15	13	20	16	KAZANCILA R	SOKAK	43,377	25	1,300	5,500		Parke

5. SOCIETIES AND ORGANIZATIONS WHICH NEEDED POSITION INFORMATION

In this study which made for Trabzon city, firstly, some centres's graphic and nongraphic informations were obtained such as health, education, police, fire brigade. Because, these centres are important and every time these centres's position informations are necessary. These societies and organizations were classified and building numbers and street names specified by land works. Thus, every societies were represented with standard address format in databases. On the road network, these addresses were queried and checked. These databases were composed of address informations, type, usage type, and phone number.

CLASSIFIED IMPORTANT SOCIETIES AND FOUNDATIONS

- Education (School and dormitory)
- Worship (Mosque and church)
- Official Societies (Whole official building)
- Health (Hospital, dispensary and drugstore)
- Arrival (taxi stop, dolmush stop, route, Turkish Airlines office)
- Tourism (tourist place, hotell, tea garden)
- Security (Police station, gendarme)
- Sports (Swimming pool, tennis court and football area)
- Market (Whole Super Markets)
- Entertainment Centre (Fair area, disco, cafe, internet cafe)
- Insurance (Insurance organization)
- Bank (Bank and ATM)
- Fuel Station
- Florist
- Real Estate Agent
- Cargo

6. ADDRESS BASED INFORMATION SYSTEM

The coverages which are in address based information systems were specified and then graphic and nongraphic informations of these coverages were acquired. Respect to this informations, databases were designed and related with each other. After needed controls had been done, queries and analysis were done in the system. By this system, addresses of important societies and organizations can be queried and displayed in the graphic screen, and also these societies and organizations can be coded on the map via their addresses.

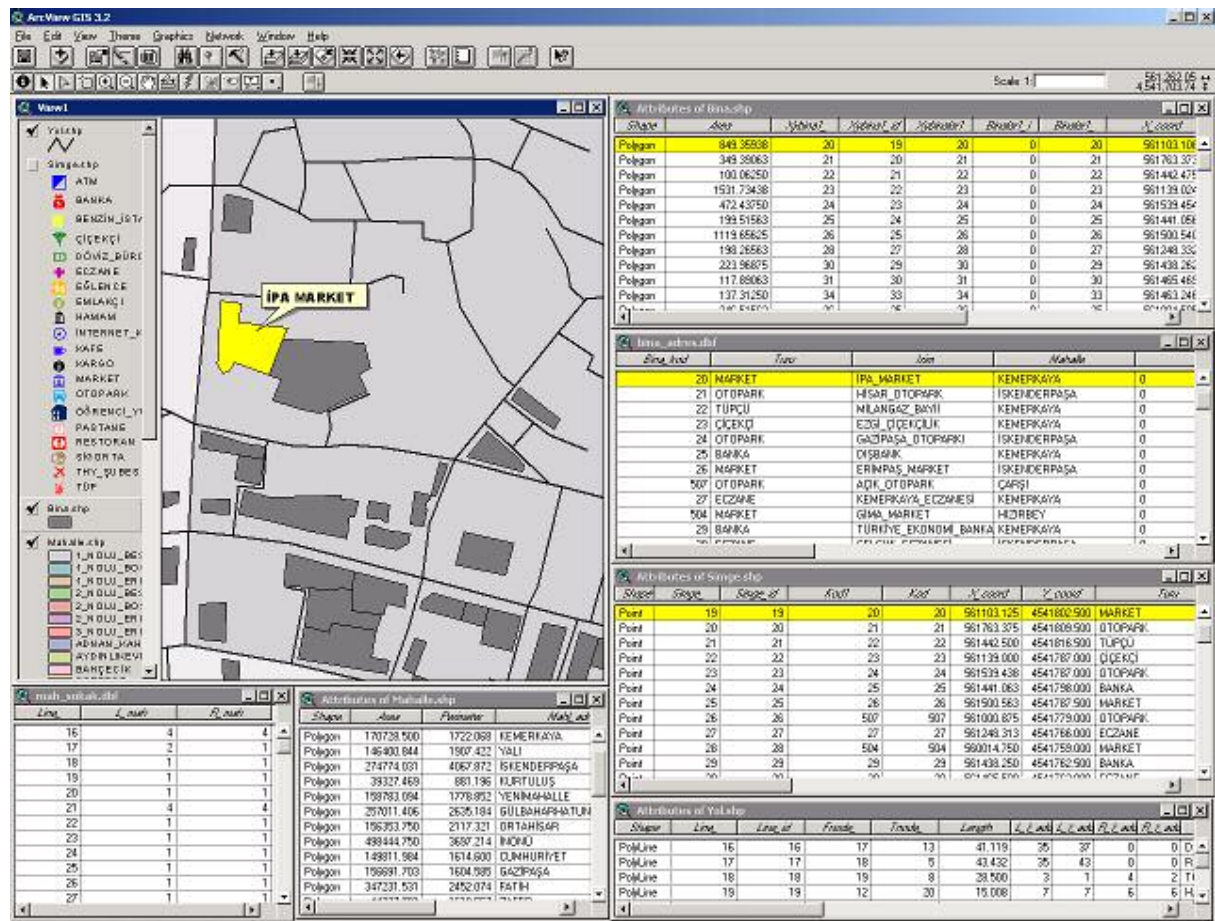


Figure 3. Address queries in the system

7. QUERIES AND ANALYSIS ON ROAD NETWORK

Any system of interconnected linear features, sets of roads, railway, rivers, pipelines, telephone and electric lines, is a network. Queries and analysis done on these systems for optimum decisions are named as network analysis in GIS. Specially in urgent cases, like arriving to target area in minimum time of ambulance, fire brigade and police vehicles, deciding fire brigades centre's location, deciding which houses's electricals are cut off in breakdown cases, network analysis are used [Yomralıoğlu, T., 2000]. These queries and analysis are the most effective methods for optimum deciding.

7.1 Finding The Best Route

It is specified shortest road between two points which are determined via their addresses or marked their approximate locations on road network. For example; between two points, according to wanted criterion (cost, length, time and drivetime), the shortest route is specified by this analysis.

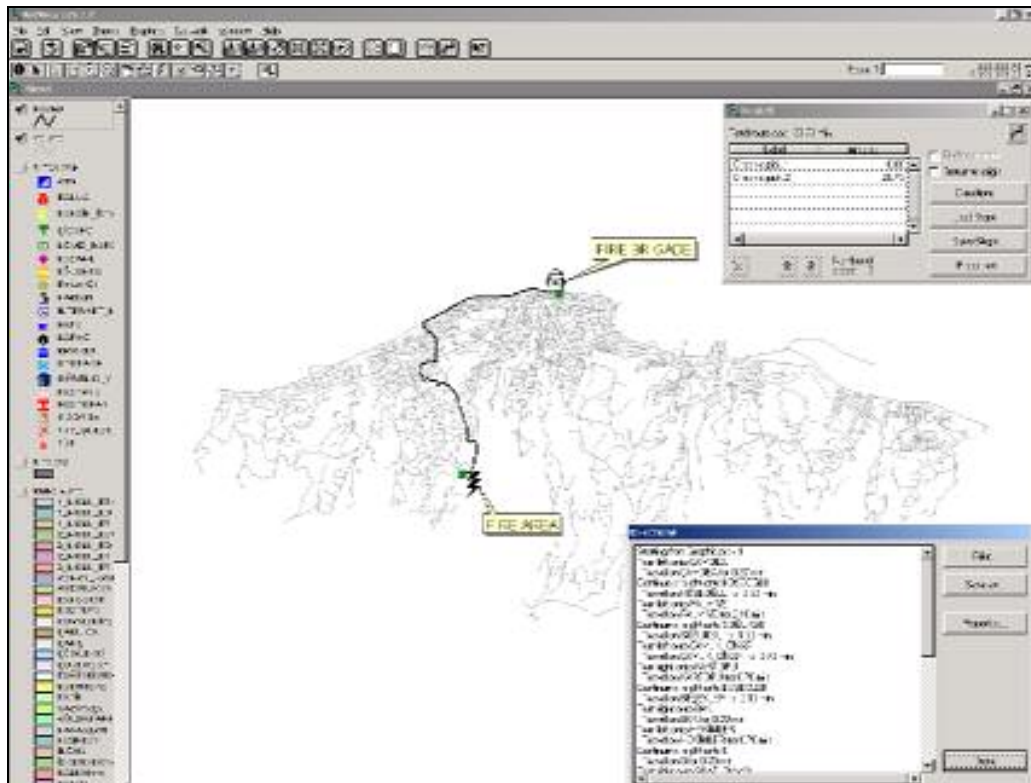


Figure 4. Specifying the shortest route from fire brigade centre of Trabzon City to the fire area

7.2 Finding The Closest Facility

Closest facility refers to anything providing a certain type of service that is closest to a given location, known as an event. It can be the closest fire hydrant to a fire, or the closest drug store to your house.

7.3 Finding a Service Area

Finding a service area is specifying of the best convenient location, doing analysis of Geographical entites in network structure. For example; a movie theater might have 7235 customers living within a 10 minute drive. A convenience store might have 671 customers living within a half kilometer walk [ESRI ArcView Network Analyst,1996 and ESRI ArcInfo Network Analyst, 1976].

7.4 Address Matching

By this feature, addresses are showed on the map. “Locate address” command is used for this future. Notice that defination address format is important. Operator showed any centre that know its address and specified the shortest route. Societies and organizations in Trabzon City are showed on road network via this future [ESRI Using ArcView GIS, 1996].

7.5 Address Geocoding

Geocoding is the process by which you add point locations defined by street address, or other address information, to your map. It’s the computer equivalent of pushing pins into a street map on your wall. When you geocode tabular data containing addresses, software reads the address, finds where they are located on your map, an creates a new theme containing a point for each address it was able to find.

Address are probably the most commonly used form of geographic data. By geocoding address data you can perform a wide range of applications, from showing where students live in relation to their schools, to mapping your customers to help you decide where to locate new branch offices, to analyzing a city's crime patterns [ESRI ArcInfo Address Geocoding 1976]. Societies and organizations in Trabzon city were coded on the road network via their addresses and then eliminated errors.

8. CONCLUSIONS

Numerating studies are constitute the base of address information systems in Turkey. The instruction regulate these studies is not enough for information system requirements. So, there is a need for numerating instruction which is consist of graphic and nongraphic information relationships for meeting information system requirements. On the other hand, in this process, municipalities should acquire needed information for address information system.

Nowadays, Turkey is living an adapting process for EU. In this process, the address format used in EU's countries should be adapted to Turkey. In this study, the address formats used in EU's countries were examined and the best convenient address format were specified for Turkey.

Network analysis used in various areas like health, security, education, etc. have some benefits with respect to time and cost. For applying of these analysis in Turkey, required base maps should be formed and databases should be designed. In urban information system applications are needed to network analysis for various analysis like determining of the best route for ambulance, fire brigade, police vehicle and tracking school buses, subway, garbage truck etc. Preparing of vehicle tracking systems and databases is important for successful network analysis applications.

9. REFERENCES

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