

# CREATING FOREST INFORMATION SYSTEM: A CASE STUDY FOR ISTANBUL KURTKEMERI FOREST ADMINISTRATION

F. Kurtcebe

Yildiz Technical University (YTU), Department of Geodetic and Photogrammetric Engineering,  
34349 Besiktas Istanbul, Turkey - filizkurtcebe@yahoo.com

PS YF

**KEY WORDS:** Forestry, GIS, Spatial, Technology, Thematic

## ABSTRACT:

Nowadays technology becomes part of our lives. We can use technology in every kind of profession. Everyday we make lots of decisions and during this period we have to think about all physical conditions, human factors, financial problems, the results of our decisions in long period etc... Technology helps us in different ways. One is Geographic Information Systems (GIS). We can process both spatial and non-spatial data together. We can make queries-analysis or change informations. So we can be faster, more effective and economic in our works.

The aim of the study is creating a forest information system to help problems and duties of forests. Forests are very important treasures for all of the world. They are like world's lungs and ours too. Forests are spread out wide areas. That makes harder to protect and do other duties about them. We need a good system to follow all steps of works or to find where the problem is. Geographic Information Systems help us at the moment. First i decided my working area, it is Kurtkemer Forest Administration. I had some meetings in this place. I took some paper maps (1:5000). I tried to understand their needs, problems, take informations to use in system. I used MapInfo Professional 6.0 version in this study. I decided to use **polygon** for "stand areas" and **line** for "roads". Then the map digitized in AutoCAD and translated to MapInfo Professional 6.0. I enclosed the areas, modified tables for attributes. I entered for all areas these attributes. When you click on the area you can see these informations. I also did some queries on informations. The results of queries can be seen on the screen as a table and we also can see on the map. It is possible to make some thematic maps up to your needs in MapInfo Professional 6.0. So in this study a thematic map about stand areas was created.

As a result after this study in Kurtkemer Forest Administration, if this kind of studies cover all forest areas, it will be so easy to reach informations, realize and solve the problems, see different informations together and it helps us to decide in a right and fast way.

## 1. INTRODUCTION

A geographic information system "GIS" is a computer based information system that enables capture, modelling, manipulation, retrieval, analysis and presentation of geographically referenced data.



GIS has five components as shown in the figure:

- Software
- Hardware
- Data
- Methods
- People

methodology is necessary and it can be summerized in three steps (Figure 1) :

1. Sytem Analysis
2. Sytem Design
3. Sytem Implementation

Sytem Analysis is the most important part that is why you have to analyse the needs, requirements, problems in current system (if exists) of geospatial data users.

Sytem Design is a method for determining what changes must be made to an organization's current environment in order for an information system to achieve its purpose.

Sytem Implementation; the things are in first and second steps, become something that really works in this step. It is easy to understand the missing and mistakes of system and also:

- Geospatial and nonspatial data access
- Topology creation,
- Point, line, surface layers access,
- Controls about system.

It was decided to create a GIS about forests that are treasures of the world. There are so many complicated duties about forests. A useful system is needed to follow all steps of work and to give better and faster decisions. The working area is Kurtkemer Forest Administration-Istanbul. In all steps of GIS, a

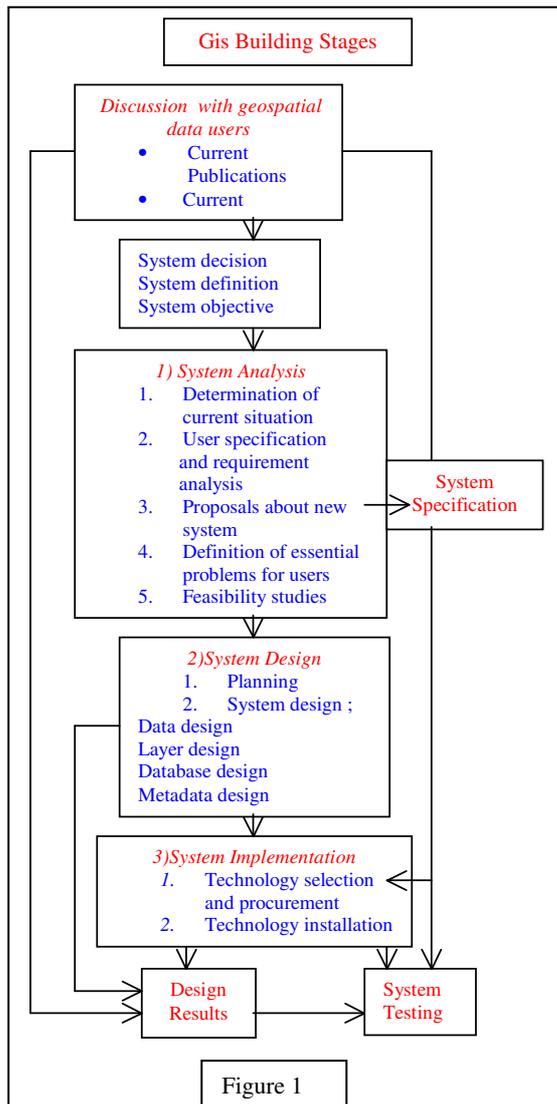


Figure 1

## 2. ABOUT THE CASE STUDY

It is better to tell about some forestry terminology that was used in this case study.

“Forestry plans” are used for management of wide areas that forests cover. These plans are changed in every ten years. According to these plans, forest area is divided into smaller partitions, called “stand”. A “stand” is a group of trees with similar stage of development and structures that enables to produce a local climate in current place. This is the smallest administration part in forestry plans and the minimum area for a stand is accepted as “1.0 hectare”. There are working teams which are responsible for stand areas’ care and the application of forestry plan to each stand.

“Administration period” defines the economic cutting time at stand areas. This period is related to tree type, growing area...It usually takes 50-200 years long. So after this long period, the mistakes or missing of the plan is appeared that’s why the forestry plans are essential and need so much care while creating.

“Canopy closure class”; In a stand area the closure of hillsides at trees which shows the shelter degree on the ground. These degrees are:

- Degreee “0” = canopy closure class is smaller than %10, means widely apart,
- Degreee “1” = canopy closure class is between %11-40, means less closed,
- Degreee “2” = canopy closure class is between %41-70, means middle closed,
- Degreee “3” = canopy closure class is bigger than %70, means closed.

“Stage of development” is the classification by diameter of tree stems. These classifications are:

- Class “a” means the diameter of tree stem is equal or smaller than 7.9cm.
- Class “b” means the diameter of tree stem is between (8.0-19.90)cm.
- Class “c” means the diameter of tree stem is between (20.0-35.90)cm.
- Class “d” means the diameter of tree stem is equal or bigger than 39.0cm.

In a stand area there can be more than one type of tree. It is limited with three types of trees in this case study. All types were entered into database. So the stage of development and canopy closure class are different for different types of tree that were also entered for each type of tree.

“Cutting” means, the area of trees ( $m^3$  : ha) in administration that is going to be cut.

“Care” shows which type of care system is used in stand.

“Planting space”, if any new trees are planning to plant, planting spaces shows in how many meters will be between the new planted trees.

“Cover type”, the danger type such as insects that the stand area will be effected.

“New growth”, is about the study in ecologic factors on new growth plants.

The three steps are used in forest information system, too.

**1. Sytem Analysis** : It is necessary to discuss with geospatial data users before this step. Trying to define the problems, needs, requirements. During this case study, there was no geographic information system in administration. It was better to discuss about GIS and advantages of it, in the beginning of study with the administration staff. Then the requirements and problems were discussed and defined with administration staff. A paper map (1:5000) and relevant documents were obtained. The paper map was about forestry plan. Feasibility study helps whether the concepts about the system is realistic.

**2. Sytem Design** : As it was defined before the administration is divided into smaller partitions, called “stand”. Except the technical benefits on smaller partitions of administration, one more benefit is easy management. There were geometries and attributes in forestry plan. There are usullay has three simple geometry, “point, line, polygon”.In this case study, it was decided to use two layers:

“Stand”, the table name is “mes\_alan”,

“Road”, the table name is “yol\_kod”,

Stand layers’ geometry is “polygon”,

Road layers’ geometry is “line”.

**Attributes in “mes\_alan” table;**

bolme\_no : stand number

mnc\_tp\_kod : types of trees

mnc\_kapa : canopy closure class

glsm\_cag : stage of development

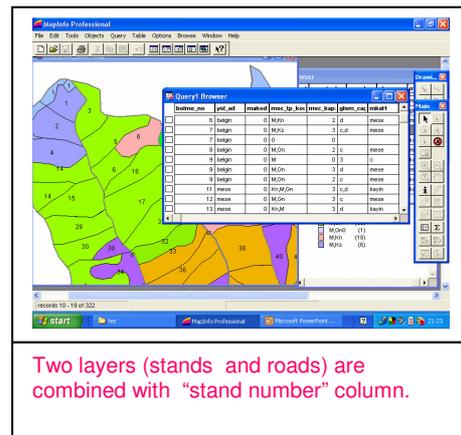
mkat1 : the first type of tree in the stand

- mkat\_2 : the second type of tree in the stand
- mkat\_3 : the third type of tree in the stand
- kesim : defines the cutting style
- bakim : defines the care style
- dikim\_ara : planting space
- koruma\_tur : defines what kind of dangers (insects, fire...) are available in stand
- gencl\_metot : the method about growth that is used for the trees in stand
- kapa\_1 : defines the canopy closure class of first type of tree in stand
- kapa\_2 : defines the canopy closure class of second type of tree in stand
- kapa\_3 : defines the canopy closure class of third type of tree in stand
- cag\_1 : defines the stage of development of the first type of tree in stand
- cag\_2 : defines the stage of development of the second type of tree in stand
- cag\_3 : defines the stage of development of the third type of tree in stand

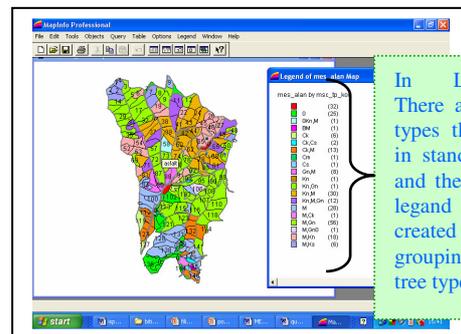
**Attributes in “yol\_kod” table;**

- bolme\_no : stand number (this is the common column with mes\_alan table so it is used to combine two tables)
- yol\_ad : name of road

**3. Sytem Implementation** : The translation of the design into something that really works is the implementation stage. Following that comes usage and maintenance. AutoCAD for digitizing and MapInfo Professional 6.0 as GIS software were used which are available in YTU Cartographic Laboratory. The paper map (1:5000) digitized in AutoCAD and translated into MapInfo Professional 6.0. Stand areas are digitized as lines were then converted to polygon by enclosing. Roads also translated to lines. In usage, some thematic maps were created and some queries were implemented about stand areas and roads. Examples about thematic maps are below:



Two layers (stands and roads) are combined with “stand number” column.



General View of Kurtkemerli Forest Administration

**3.CONCLUSION**

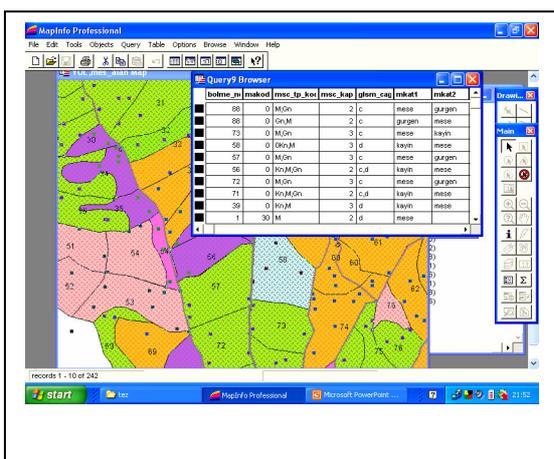
Forests are like world’s lung’s and ours, too. Forest management plans are spread out wide areas that includes complicated graphic and non-graphic data. These plans are long-term plans. So for a succesful result, data must be current and dependable. All works about forests depend on areas. If any mistake happens in these plans, it is so hard to correct it later.

**As a result :**

- It is better to use hybrid GIS because some geospatial data can be collected from satellite images. It is important to use raster format except vector format.
- It is possible to develop data collection methods in GIS. So the system becomes more economic and it helps users to be more careful use of time and work.
- It is possible to store and access all kinds of digital data in a database so thematic maps can easily be created from the database.
- The analysing and querying talent of GIS can be used in different kinds of projects (example; against forest fires GIS helps in defining the fire risk areas; with overlaying satellite images that are taken from different dates, it is possible to find the temporal differences-changes in forests).

**References**

Alkis, A., 1995, Urban Information System Implementation in Turkey. TUFUAB (Turkish National Photogrammetry and Remote Sensing Union), pp 1307-1314.  
 Alkış, Z., 2001, Notes about GIS lesson, YTU, Istanbul, Turkey. (in Turkish)



In which stand areas “insects” causes problems on development of the stand?

Antenucci, J. C., Brown, K., Croswell, L. P., Kevany, J. M., Archer, H., 1991, Geographic Information Systems, New York.

Banger, G., 1994, Microcomputers and Basic Programming, Publication of Karadeniz Technical University, Trabzon, Turkey. (in Turkish)

Basaraner, M., 1997, The Creation of Touristic-Purposed GIS, Yildiz Technical University Science Enstitute, Istanbul, Turkey. (in Turkish)

Baskent, E., Z., 1996, What kind of GIS can be created for Turkish Forestry? Preliminary Study and Conceptual Approach. (in Turkish)

Batuk, F., G., 1995, Creation of Urban Information Sytem and Implementation for Reconstruction Activity. Yildiz Technical University Science Enstitute, Istanbul, Turkey. (in Turkish)

Batuk, F., G., 2000, Information Systems and Database Management Lesson Notes. Yildiz Technical University, Istanbul. (in Turkish)

Bill, R., Fritsh, D., 1991, Geo-Information System, Herbert Wichman Verlag GmbH, Karlsruhe.

Cepel, N., 1990, Dictionary about Ecological Terms. Publication of Istanbul University, Forest Department, Istanbul. (in Turkish)

Dabanlı, A., 1998, MapInfo Users' Guide, Ankara. (in Turkish)

Eraslan, I., Sad, C. I., 1993, Forestry Plan, Publication of Istanbul University, Forest Department, Istanbul. (in Turkish)

ERDAS, 1995, ERDAS Imagine<sup>R</sup> Field Guide, 3<sup>rd</sup> Edition,

Erdin, K., 1984, Forest Map Making with Digital Photogrammetry, Istanbul University Forest Department Magazine, Volume 34. (in Turkish)

ESRI, 1990, Understanding GIS, Self-Study Workbook-PC Version. ESRI Environmental Systems Research Institute Inc., Redlans, California, USA.

Gumusay, U., 2000, Information Systems and Database Management Lesson Notes, Yildiz Technical University, Istanbul. (in Turkish)

Izbirak, R., 1992, Dictionary About Geography Terms, Republic of Turkey Ministry of Education Publications, Istanbul. (in Turkish)

Oluc, M., 1969, Organization and Management of Administration, Istanbul. (in Turkish)

Ozbalmumcu, M., 1996, Research of Data Resource Methods and Systems for Creating GIS, GIS Symposium, Istanbul. (in Turkish)

Sarbanoglu, H. 1998, GIS Development and Implementation Method, Map Magazine, Ankara. (in Turkish)

Selcuk, M., 1999, Information Systems and Database Management Lesson Notes, Yildiz Technical University, Istanbul. (in Turkish)

Star, J., Estes, J., 1990, Geographic Information Systems: An Introduction Englewood Cliffs, New Jersey, Prentice Hall.

Seker, D. Z., 1996, "G" in GIS, GIS Symposium, Istanbul. (in Turkish)

Tosun, K., 1974, Administration Management, Volume 1, Istanbul. (in Turkish)

Yilmaz, O. Y., 1993, Forest Information System, Istanbul University Science Institute, Istanbul. (in Turkish)

Worboys, F. M., 1997, GIS:A Computing Perspective. Keele, UK, p 1