CHAPTER 9

Integrated GIS tool
9.1 Introduction

A composite GIS model aimed to process, manage, and analyze spatial and attribute data conceptually related to GIS. However, the capabilities of any information system largely rely on the design of its data models. Data models present the conceptual core of an information system; they define data object types, relationships, operations, and rules to maintain database integrity (Date, 1995). A rigorous GIS data model must anticipate spatiotemporal queries and analytical methods to be performed in the GIS. Information about temporal constructs must be represented by data objects defined in data models to be stored or retrieved for analysis in a GIS. If a GIS based system does not have a good data model, its support for temporal queries and temporal analysis of phenomena will be ineffectual. The conventional GIS data models emphasize static representations of reality. Geographic information for a given area is decomposed into a set of single-theme layers as regular (raster) or irregular (vector) tessellation models (Frank and Mark, 1991). These layers constrain GIS capabilities to represent dynamic information, such as transitions and motion. Raster cells encode attribute values at every given location with no considerations of the spatial characteristics of the theme they represent. Geometrically indexed vector objects, on the other hand, “force a segmentation of the entities being represented into separate layers whenever they interact in time or space: adopting this representational method forces compromises on most environmental modeling” (Raper and Livingstone, 1995, pp. 359). GIS needs a complete and rigorous framework for geographical data modeling (Goodchild, 1992) to overcome the difficulty in handling geographic complexity, scale differences, generalization, and accuracy (Burrough and Frank, 1995). The lack of data representation schemata to integrate GIS data with models for spatiotemporal processes appears to be a major shortcoming in current GIS.

Since a composite model should have all type of GIS feature handling capability, the developed and integrated GIS features as composite GIS model can be said. Rather we say the total developed features as a whole one integrated GIS tool. Some features of GIS such as digitization, thematic map generation, 2D-3D graph generation for attribute data analysis, GIS based change detection and analysis have been developed. By using these techniques a user can perform map based operations. The characteristics of the tool are discussed in section 9.2 and conclusions are drawn in the section 9.3.
9.2 Characteristic of the proposed integrated tool

The total structure of the integrated tool is presented in the figure 9.1. The operations that can be performed by this tool are:

1. Digitization
2. Thematic map generation
3. 2D-3D graph generation for analytical purpose
4. Change detection and analysis

9.2.1 Digitization

Two types of digitization are possible by this tool which are head-up and automatic. The head-up procedure is a complete one discussed in the section 3.2. And the other one is an automatic technique for polygon objects and is discussed in the section 3.3.

9.2.2 Thematic map generation

By this technique any GIS user can produce thematic map by the attached attribute value. The produced map will be generated as a color layer on the main map and easily saved. This technique is described in chapter 4.
9.2.3 2D-3D graph generation
A user has to select locations on the map by clicking the mouse and then he can attach attribute data corresponding to that location. By this technique one can attach data of forty attributes (eight main attributes and five sub attributes for each main) for each location. Not only this technique generates the location base graphs on the map but also the user can view the graphs of each location separately. Separate zoomed view is for better understanding. Graphs based on each attribute are also possible. The technique to generate the 2D and 3D graph is discussed in chapter 5.

9.2.4 Change detection and analysis
The latitude wise, longitude wise and pixel base change analysis is possible by the designed technique. The landuse feature distribution analysis for total map is also possible by the bar graph and line graph generation attribute of the tool. The latitude wise and longitude wise class object distribution is possible by the use of line graph. In case of pixel wise change detection, not only the written information of change of that latitude longitude of the pixel is possible but the change will also be visualized by using the blinking feature of different symbols. The technique of change detection is presented in chapter 7.

9.3 Conclusion
By using this integrated tool one can manage a small GIS project which needs the digitization, thematic map generation and graphical representation of attribute data. Small GIS project on landuse pattern change is also possible for large scale map. These techniques to implement some small projects such as soil management and pruning management of tea garden which are discussed in the chapter 6 are utilized. Sub chapters 7.2 and 7.3 show that the change detection and analysis tool is efficient to handle small project of change analysis for large scale maps.