ABSTRACT

The thesis contains the work to design and implementation of GIS based tools using Java swing language. Digitization, Thematic map generation, 2D-3D graph generation, tools and techniques for soil management and pruning management and GIS based change detection and analysis techniques have been generated. One head-up and an automatic polygonal segment digitization technique have been designed and implemented. The head-up digitization technique have been generated using database management system which calculates the necessary coordinates of object constructing points from the raster map and stores into the database along with the assigned colors of the objects. A mapping technique has been generated to retrieve the attributes from the database effectively to regenerate the digitized objects of the vector map for visual display/interpretation. Provisions have also been made to edit digitized objects for correctness or future up gradations.

In case of automatic polygon object digitization, a technique has been proposed where a whole border of a closed section of a black and white map is digitized using a single click inside the section instead of moving the mouse pointer along the border of the section. Since the boundary points of a segment contains similar RGB values (black, RGB value -16777216 in java swing), when one inner point of a closed segment is selected using the mouse, the program calculates the RGB values of the inner pixels and store in an array say inner array. The coordinates of the boundary pixels are stored into another array say boundary array. The array elements of boundary array are arranged in a cyclic order to generate the proper boundary of the polygon object.

The head-up digitization technique for polygonal segments is integrated with the thematic map generation tool. Based on various attribute values, thematic maps will be generated by filling the polygons with the program generated assigned colors to the sub range of the attributed values. With the thematic map the legend also show the sub range of the attribute values and assigning colors for those sub range.

The 2D and 3D graphical representation tool generates the graphs on desired locations of a RS/GIS image/map depending upon the attached data. Selecting the image and attributes all the attribute data is to be attached by the user for the selected locations. This tool also provides
extended view of the pictorial representation separately for better visualization and understanding.

GIS based decision support system for soil management of tea garden stores the soil test results in the database, and retrieving them from the database generates the graphical and textual representation for decision making and report generation. On the other hand, retrieving stored data from the database the GIS based decision support system for pruning management provides the information about pruning for a segment of the garden. The segments of the garden under a particular pruning type can be visualized with a particular color over the digitized map. One segment filled by a particular color can be selected from the visualized garden map by the mouse click operation. The selection of a segment provides the future pruning decisions about that segment along with the current and previous pruning information. The selected segment will be blinked and zoomed view of that segment will be generated along with the entire pruning related information of that segment.

The changes of the landuse/landcover features of satellite image by using maximum likelihood supervised image classification technique and the logical operation between the classes of different session images by using the GIS software TNTmips are shown. The satellite images of LISS 3 sensor is classified using the maximum likelihood supervised image classification technique. The classes are obtained with the help of training sites of interest and statistical characterization of the reflectance for each information class. Then the main classes of the image in different frame are extracted. Each class under each satellite images is extracted separately and the change of each class is shown individually by help of logical operation between the classes of different session. Area wise change is also presented to visualize its effect.

The techniques to detect and analyse the change of the feature distribution of landuse pattern over a particular period of time are designed and implemented by using Java swing language. The changes of the landuse classes are calculated in terms of RGB values between landuse/landcover images and output generated with variation of colors. The technique provides the changes location wise i.e. if a particular location (point) of the output image or the input image is selected, the information of latitude, longitude and the type of change of that location is generated. The tool also calculates the total area for each class of the two input images providing the graphical representation class wise and overall changes. Session wise feature distribution line graph is also integrated. Observation of changes of landuse pattern will reflect the changes.
periodically (few years interval) over a particular area. This technique will identify the change-prone locations depending upon the detection of variation of clustered pixel values among sessions of a location leading to predict future distribution of landuse classes of a desired location. The technique to visualize the change with the use of graphics is also developed by the candidate. Different symbols are used for different features of the landuse/landcover map. For a particular change from one session to other the corresponding symbols will blink to indicate the change.

The GIS software are very costly and are not application specific. An attempt has been made to design and implement the application specific GIS software using database software and programming language. The thesis presents different techniques to develop the GIS based tools and some new concepts.