On Designing an Object Database for Land Information System

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Computerization of land record is a major debate of the recent days. Various action plan has made by Central Government and state Government level for computerization of land records. With information technology approaching closer to the common people, it required to develop a design methodology for computerization of real world problem so that it is perceived by the user for better conclusion. Design of any product in highly influenced by the architecture and design approach adopted, so as software and database. Among various software development approach "Object oriented system development methodology"[3] provides a most suitable tool to communicate with the user and to capture their expectations for the final product. This paper describes approaches to develop software using GUI from prospective of formulating design abstractions. In the discussion we specify the design methodology, data modeling and development process for designing a visual land database. This is realized through application of various GUI tools, Xbase & AutoCAD and other AutoCAD development System. The advance user interface facility and bitmap manipulation utilities has been used effectively to develop a data base using a Relational database at the back end.

1. *Introduction*

Various techniques[2] are used by the designer to design an application software for real world problem. The techniques such as functional decomposition or data flow analysis, work well in some domains but are not broadly applicable. Object oriented design creates a model of real world problem that can be realized in software using various application development tool. Booch defines[1] Object oriented design is a method of design encompassing the process of object oriented decomposition and a notation for depicting both logical and physical as well as static and dynamic model of the system under design. The object provides a mechanism for modeling and representing the information domain.

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The operation on domain describes the processing that is associated with the information domain. This technique is applied to the lands of various villages to develop a visual land data base. Existing land records are available in form of a blue print or that of a hand traced maps. The other related information are available with record of rights(ROR). It is difficult for an individual to access the information related to its own land. Various government and quasi-government agencies and researchers require the land data for various application. The data available presently is neither accessible to the users those are situated geographically far from a site nor presented in a proper format.

2. *Design Methodology.*

2.1 *Design Process Consideration*

Complexity of Software is an inherent property, The Complexity derives from four elements, the complexity of problem domain, the development process management, the degree of flexibility possible through software and problems of characterizing and the behaviour of discrete systems. In addition to the above, the software development cost for a large system is a capital investment. So it is not possible to change or discard an existing system every time with requirement changes. In designing a land database we select object oriented design methodology(OOD) because the user requirement changes significantly with change of Government policy and action plans.

The Object Oriented version of software development life cycle replaces the traditional fountain model[2,5] with classic water fall model[4,5]. OOD viewed the system as a collection of entities that interact with each other to attain a common objectives. These entities are treated as object , which is either a physical object or abstract concepts. A plot object is shown in (Fig.1). with object name, attributes and operations can be performed on it, moreover the plot comes under the class[2] Land. Most complex software applications can be characterized by abstractions that objects and classes capture well i.e. resources, events and the tangibles of the application domain. All phases of OOD approach more closely because of commonality of object model. In one phase it

defines the objects in problem domain, where in next phase additional objects required for a particular solution are specified. The design process is repeated for the implementation level objects. Object approach uses many attributes of both top-down and bottom-up[2] designs.The top-down functional decomposition technique is used to design a individual class[4], where the final system is constructed with the help of class modules using the bottom up approach. In this particular land database, we break the problems in to classes and assembles class hierarchies to form application. Here the Class is the type of land used for different purpose, i.e. cultivation, play ground, cattle field, or public use etc. The design process is carried out through following phases:

(a) Identification of object is application domain.

(b) Identification of behaviour of the objects.

(c) Identification of relationship[4] between objects.

(d) Arrange meant of class hierarchies.

(e) Design of member functions and implementation.

2.2 *Object Analysis and Modeling*

Analysis phase deals with mechanism for identifying objects and building blocks for the applications(software) to be developed. The object oriented analysis[5] is applied to the problem domain to decompose the problem in to component parts and to create logical model of visual land data base and land information system. In object oriented analysis phase it is need to identify the services that each object is expected to provide(interface). All object of the related system are defined in the first phase, that guides to prepare class diagram and object diagram[4] of the system. Booch's[1] design notations has been used to define these object-class relationships. Lastly inter connection between the objects in terms of services required and rendered is established. This leads to the development of system model using various software (Fig.2.).

3. *Implementation*

3.1 *Database Design Issues*

Selection of a DBMS software is an crucial because of present and future application requirement. The Open data base connectivity(ODBC) available with various Graphics user interface (GUI) tools facilitates the type of database that can be accessed through the GUI at client site. We have used Fox Pro-2.6 (for Windows) that supports object linking and embedding(OLE) facility which is crucial for storing the scanned land maps in BMP format of Individual plots.

The data base are to be created in a server and DBMS use must have multi user support as well as it an be implemented under a client server application. On identification of object and their attributes the data is subjected to normalization. After normalization the database is created from the information recorded in ROR. The highly redundant data in ROR and hierarchical relationship among the individual and plot(a piece of land) makes the representation complicated.

The required data to create the land data base can be made available from Record of Right at block level from district/ block administration. The land map are to scanned either in TIFF/BMP format to store in database. As a result two database are created with relation of key field as PLOT-ID, with one contains only data and other stores the maps.

3.2 *Land Map Preparation*

We make the extensive use of OLE capabilities under windows, which treats FoxPro as an OLE client, An OLE client has property that receives data using the rules of object linking and embedding. Digitized land maps (in TIFF/BMP format) of individual object (plot) with reference are stored to database in a general field. If the maps are to be used for modification(editing) the maps are to be created under AutoCAD. The maps of individual plots then accessed along with details of land data stored in data base using data extension facility with Auto CAD.

3.3 *Data Linking*

AutoCAD data extension (ADE)[7] has a power full structured query language(SQL), which provides the access to database tables for viewing, editing and filtering subsets of data. Database access takes the help of ASI drivers associated with AutoCAD. Link between the graphical data and database is possible by defining a table link key and an intermediate table link file. A table link key is a special ADE defined Extended Entity Data(EED) variable. It associated with the application name PID (Plot identification number) at the time of creation of database. Fig.3. shows the relational diagram for linking CAD drawings with data base. ADE provides additional entity editing facilities. The various functions that can be performed are breaking and joining of plots, deleting duplicate plot drawing, deleting dangling plots , generalizing complex lines, defining reference point(Centre point), routing and scaling of plots and rubber sheeting[7].

3.4 *User Interface Design Models*

Realization of users perception about a system is crucial for design of an interactive software application. Human computer interface(HCI) suggested[2], four different type of model: the designed model, the user model , the system perception and the system image. For designing user interface for land database Microsoft Visual basic is being used. The interface standard used is based on extension of X window interface standard[10]. The front end used

supports both programing and non programming users the faster development of applications.

4. Conclusion

The visual land database is designed keeping in view the requirement of various agencies such as revenue department, Irrigation department, District/state administration, Agriculture scientists, and Survey of India and others. This can be used as information base by various users[8]. The designed methodology used provides high degree of flexibility to designer/ Data base administrator for incorporating the new requirements without disturbing the existing data model[2]. Object data base is more informative to the users that stores information as viewed by users.

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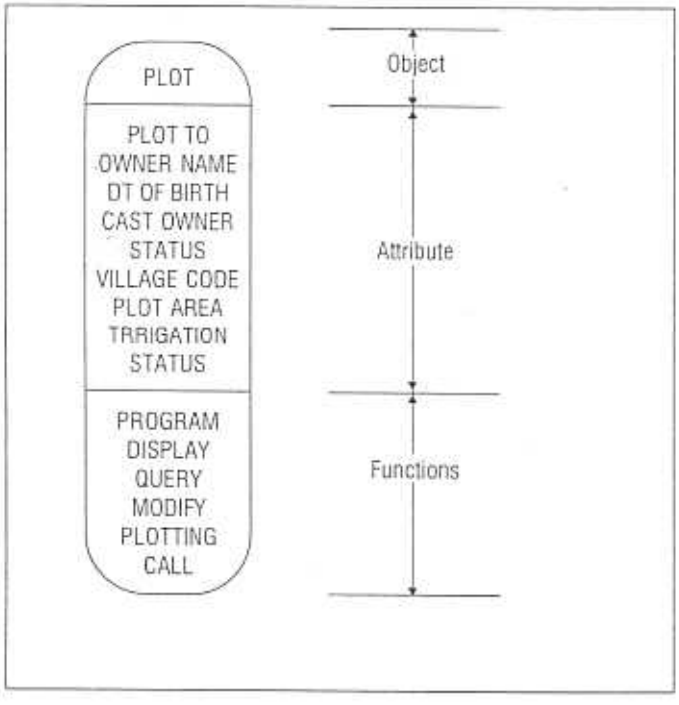

Fig. 1 : Object Presentation (Plot)

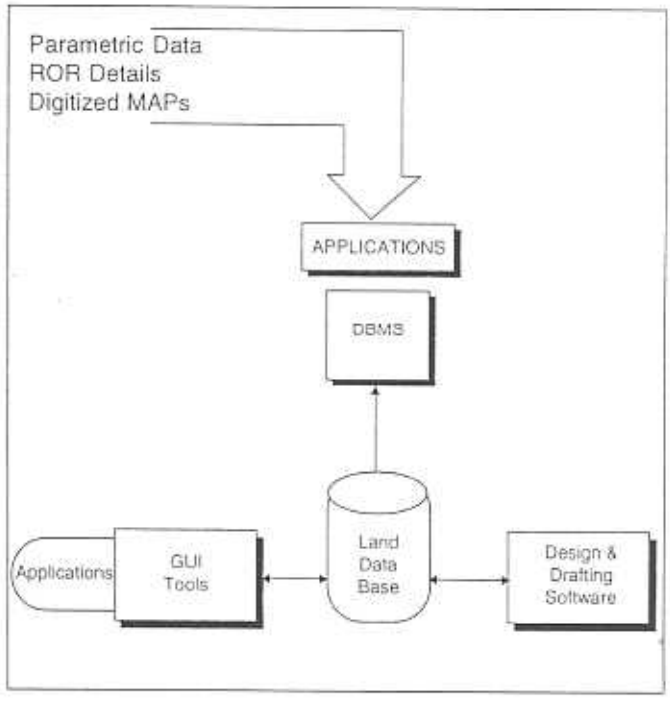

Fig. 2 : Software Interface with Land Database

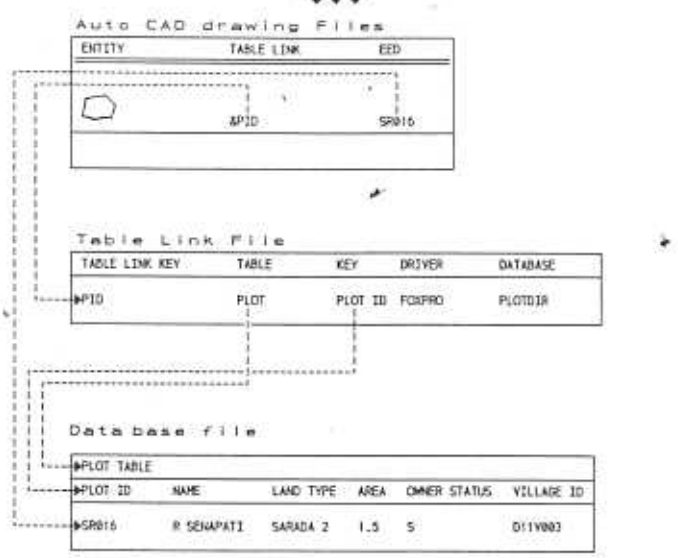

Fig. 3 : Relation diagram among, Table Link File, Drawing File and Data base