

**APPLICATION OF GEOSPATIAL TECHNIQUE'S IN
CADASTRAL MAPPING**

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1.1. Introduction

In order to understand the range of applicability of GIS it is necessary to mention few of them. Some important areas of GIS application are described below.

The GIS software conforms to information technology standards adapted to a variety of cadaster systems. GIS software like Arc GIS helps for a variety of services, from producing specialized maps to providing complex schemes for integrating and delivering spatial data services.

- ✓ GIS software gives surveyors the tools to capture and create new data to improve field data collection, inventories, and integration with GPS measurements as well as easily making of any necessary changes.
- ✓ Spatial applications are based on ArcInfo, ArcView®, and other ESRI GIS products and relational database management system technology, surveying packages, and computer-aided design.
- ✓ The integration of survey data in GIS using ArcGIS Survey Analyst has made it possible for cadaster agencies to integrate survey data, cadaster data, and other layers of spatial data.

LIS is the management of information about land ownership and taxation. It consists of:

- Legal description of land (spatial);
- Title to land (ownership);
- Easement on land;
- Valuation (taxation)

1.2. Cadastral records in a GIS environment

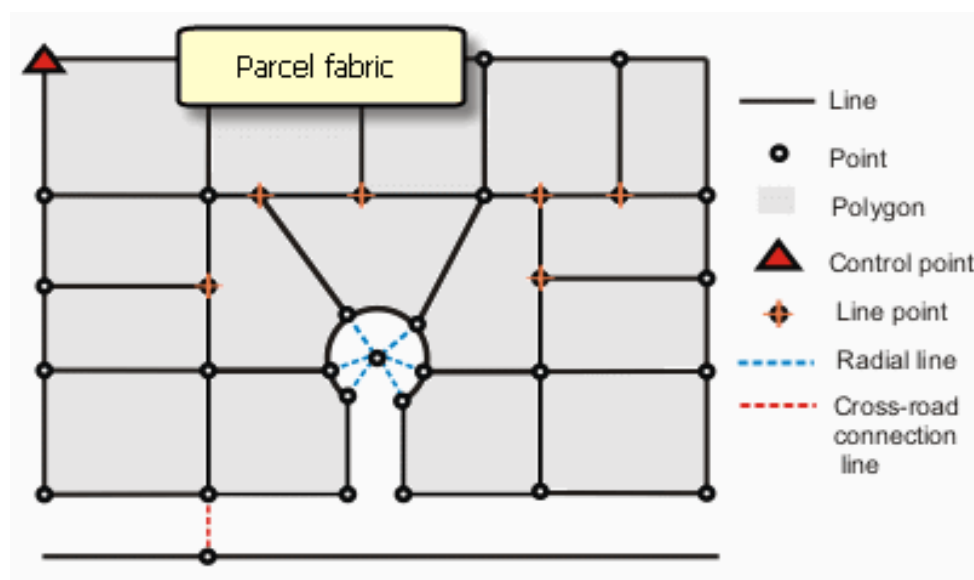
Cadastral measurements of a parcel (plot) of land are managed by LIS and the records are maintained by:

- Large government organizations;
- Cities/municipalities;
- Infrastructure companies /departments;
- Utility companies. Easements & right off ways

1.2.1. Cadastral or Parcel Editor

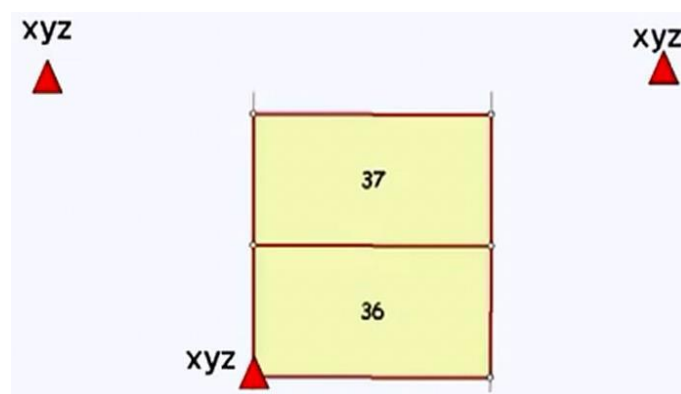
Parcel Editor is the extension of Survey Analyst in ArcGIS. The goal of cadastral or parcel editor is to develop:

- New dataset to manage land records;
- Accurate spatial framework for LIS;
- Improves accuracy of boundary geometry;
- Productive editing environment
- Improve the accuracy of associated GIS layers;



What is a cadastral fabric?

- ✓ Is a composite layer (lines, points, control points, parcel);
- ✓ Contain a series of attributes;
- ✓ It is built on parcel plan;
- ✓ Editing is done on parcel plan;
- ✓ It is surface of connected parcels with overlapping boundaries and share common points.
- ✓ We can also think cadastral fabric as a network of connected parcel lines.
- ✓ The legal descriptions bearings and distances are stored in these lines.
- ✓ Used to maintain the original records of the parcel and improves the spatial accuracy of the whole layers.
- ✓ Cadastral/ Parcel Fabric is explicitly store Topology defined by common parcel corners and neighbours.
- ✓ Parcels 36 and 37 stores 4 lines for each parcel.
- ✓ It stores two points which are shared by boundary parcels.
- ✓ Connection lines create ties to control points.
- ✓ Control points are not always directly tied to parcel corners; for example, there are street intersections,
- ✓ Connection lines allow us tie parcel corners to these control points.
- ✓ This connection information is only with in the original records represented by street width.



During editing session, each parcel has its own plan and each plan can have one or more parcels and is not vice versa. *Cadastral editor is the new part of survey analyst extension product built with Leica. It is brought with Geodeta, Australia software development technique released with ArcGIS 9.2, SP3.*

1.2.2. Plans

Surveyors prepare legal documents to reflect the findings of their fieldwork. These documents are referred to as plans or plats. There are different types of survey plans depending on the type of survey being performed, for example, subdivision plans, site plans, and topographic survey plans.

- Plans contain legal descriptions of the surveyed parcels.
- Legal descriptions convey instructions on how to locate the physical corners defining the parcel boundaries in the field.
- A legal description describes a parcel of land in a way that is unique and unambiguous.
- Legal descriptions can vary by type, with the two most common types of legal descriptions being
 1. A legal description by area reference, for example, "Lot 3, of Block 6 of a Subdivision"
 2. A legal description by perimeter description, for example, a meters (bearings and distances) and bounds (physical monuments) description.

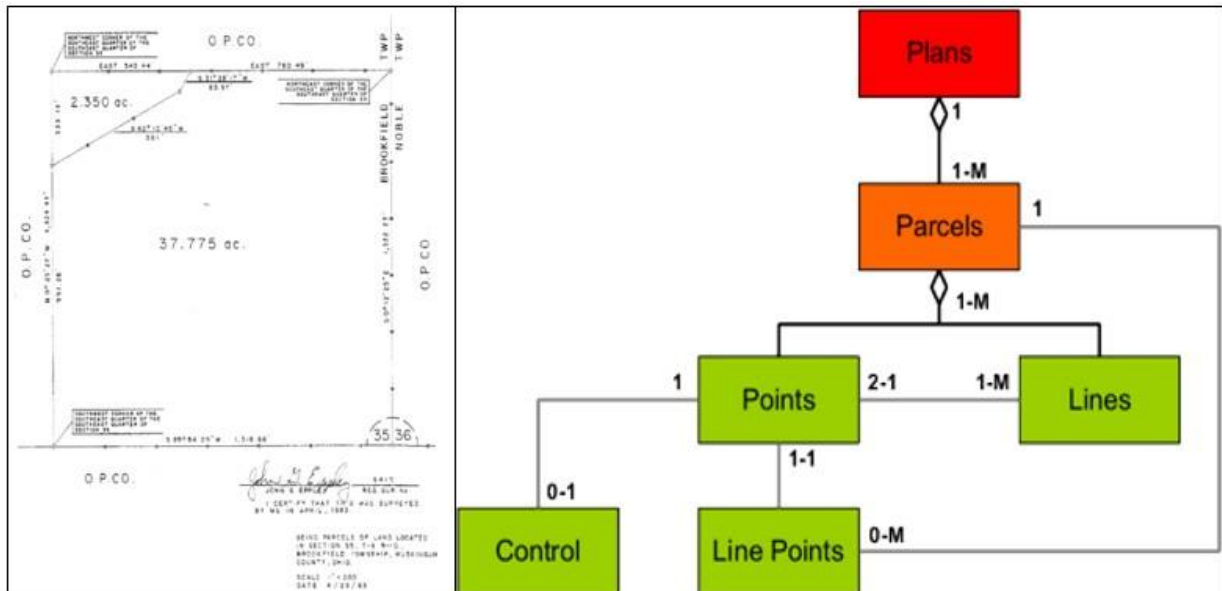
Recorded dimensions from the plan or record of survey are stored as coordinate geometry (COGO) attributes on the parcel line in the parcel fabric.

- ✓ Recorded dimensions are derived from original raw survey measurements taken in the field.
- ✓ Dimensions include bearings, distances, and parameters for curved lines.
- ✓ Since dimensions are derived from survey measurements, they can have an associated accuracy.
- ✓ Accuracy can be derived from surveying equipment, date of survey, and so on.
- ✓ Each parcel line in the parcel fabric can have an associated accuracy.

1.2.3. How cadastral fabric data is stored?

The colored boxes in the Parcel fabric parcel data model are representation of tables from the cadastral fabric.

- ✓ Plan table: - the plan table stores the whole legal document information.
- ✓ Every legal document represents one or more parcels and can be stored as a single record in the plans table.
- ✓ The table holds information about the date of the survey, the name of the surveyor, and so on of the whole legal document.
- ✓ Parcel can only have one or a single plan and store information in its table.
- ✓ Each plan can represent one or more parcels.
- ✓ The record of the parcel is referenced by the plan's table.



Line table: - each parcel is defined by a set of recorded lines. The lines table will hold the lines for many parcels. The parcel fabric provides a way to enter and organize parcel data based on the manner in which it was originally recorded (record of survey).

Point table: - each line is also defined by points, store attributes in the points table.

Control table: - stores coordinate attributes control points linked to the points of the parcel in order to be used and updated point coordinates, the control points needs to be linked to a point.

- ✓ As cadastral fabric stores survey control points (such as monuments, parcel corners), connection lines tie points with control points.
- ✓ These values use GPS to provide very accurate coordinates of projected coordinate system.
- ✓ The cadastral fabric technology allows data to be integrated with the older land record data that contains bearings and distances.

Line points: - a parcel point (line points) sits on the boundary of an adjacent parcel, but does not split the boundary line. Line point table stores information associated with the neighboring parcels.

Generally, the more recent the recorded survey information (plan), the higher the accuracy of the parcel line and the higher the accuracy of the parcel. The dataset used as the base map in other GIS layers improve updating and the accuracy of associated GIS layers by keeping them spatially sink with the base map data sets. The so-called base map is the cadastral fabric. Only cadastral editor is used to edit parcels in the parcel fabric.

References:

Duckham, M., Goodchild, M. F., & Worboys, M. F. (2003). *Foundations of Geographic Information Science*: Taylor & Francis.

ESRI. (1999). *Modeling Our World: The ESRI Guide to Geodatabase Design* (M. Zeiler Ed.): Environmental Systems Research Institute, Inc.

Fazal, S. (2008). *GIS Basics*. New Delhi: New Age International (P) Ltd.

Goodchild, M. F., Longley, P. A., Maguire, D. J., & Rhind, D. W. (2005). *Geographic Information Systems and Science* (Vol. 2): John Wiley and Sons, Chichester.

Heywood, I., Cornelius, S., & Carver, S. (2006). *An Introduction to Geographical Information Systems* (3rd ed.): Pearson Education Limited.

M. Anji Reddy. (2008). *Textbook of Remote Sensing and Geographical Information Systems* (3rd ed.): BS Publications

Maguire, B., Miller, A., & Gienko, G. (2008). *Elements of Geographic Information System*. Training Material. Malaspina University-College.