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A New Approach for Data Conversion from CAD to GIS

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Data conversion from Computer Aided Design to Geographic Information System is in increasing trend. During this process users are encountered with many different problems and tried to solve these problems with conventional methods. Data conversion problem varies according the type of data and the software used.

Aim of the study

Main scope of this study, analyze the errors which are not so common during conversion Computer Aided Design data's to Geodatabase format in Turkey. This study also includes defining steps which is the first process during conversion Computer Aided Design data to Geographic Information System format and gathered errors under a title and intended to be a guide for users who unaware these kind of problems.

1

Computer Aided Design (CAD) and Geographic Information Systems (GIS) are used to solve problems about the land and resources. On the other hand, CAD and GIS have different perspectives; CAD users have a drawing perspective of layers, symbology, dimension and labels where GIS users have a feature perspective like; attributes data structure, relational tables, connectivity and analysis.

Introduction

Subjecting the data due to the different process, conversion has to be analyzed under 4 main heading which are *point, polyline, polygon and annotation*. This study presents a new approach of converting CAD data into GIS to prevent human based errors. The goal of this study is, detect the possible errors in the vector data sets before using them in GIS as alternative new solutions. Errors only occurred in identify section of 5 steps is considered.

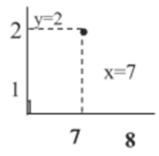
2

Vector Data Structure

Geographic objects with vector geometry are mostly represented with geographic data types which are well suited for representing features with discrete boundaries, such as wells, streets, rivers, states, and parcels. The vector data model uses points and edges to represent basic types of spatial features: ***points, lines and polygons***. All of these types are capable of storing attribute data about the particular feature they represent also in database in GIS. In addition to the three standard vector data types, ***annotation*** feature class represents text in a geodatabase is used in Turkey frequently.

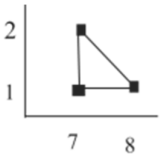
Vector Data Structure

- point (node): 0-dimension
  - single x,y coordinate pair
  - zero area
  - tree, oil well, label location
- line (arc): 1-dimension
  - two (or more) connected x,y coordinates
  - streets, contours, roads, rivers
- polygon : 2-dimensions
  - four or more ordered and connected x,y coordinates
  - first and last x,y pairs are the same
  - encloses an area
  - countries, lakes, and land use zones
- annotation: text
  - Map text including properties for how the text is rendered.
  - not parts of the geodatabase, stored separately
  - labels are more suited
  - name of a street



Point: 7,2

Line: 7,2 8,1

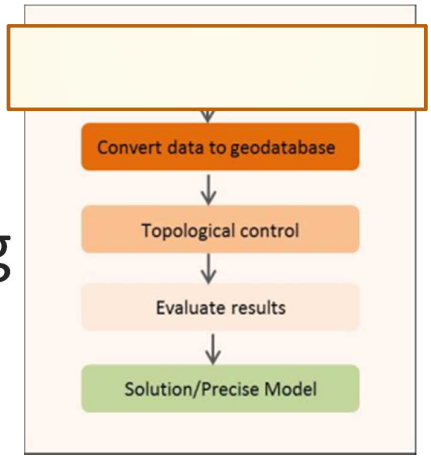


Polygon: 7,2 8,1 7,1 7,2

Building GIS features from CAD drawing is to find a way to preserve and represent the CAD information that including labels, text, blocks, dimensions, styles, and symbols is the key issue of mentioned process.

Converting

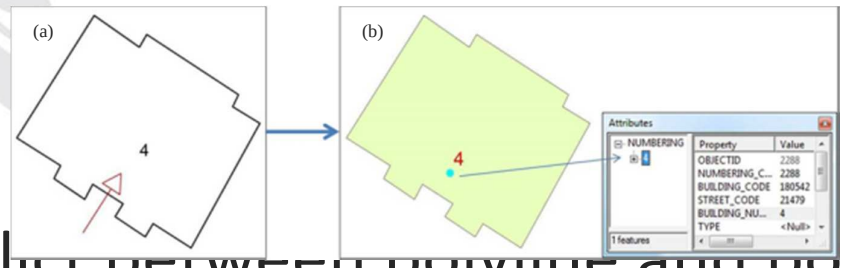
4



Steps in a successful conversion

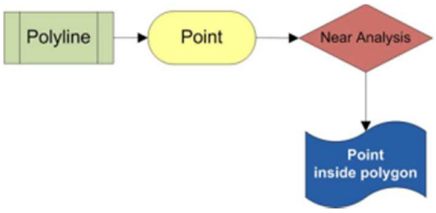
The identification step is the objective of this study during the conversion of CAD data to GIS.

In this case the feature class was created polyline which must be point. The reason of this error is users have no idea about logic of Geographical Information System. The aim is only showing the related object without any GIS function and analysis. For example; a door for a building can be is illustrated with arrow figure.



Conflict between polyline and point

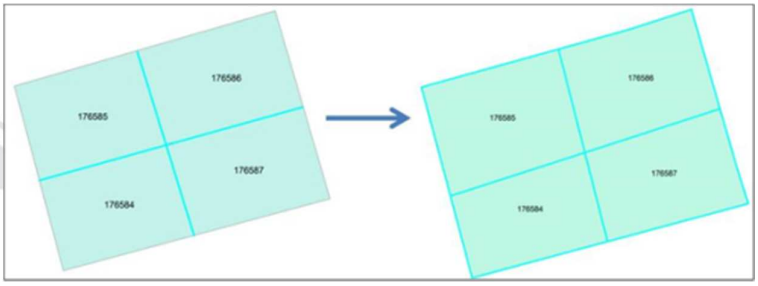
a) Polyline in CAD b) point in GIS



Workflow for conversion polyline to point

4

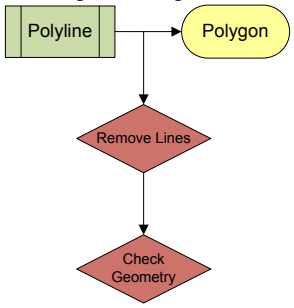
In some cases polyline feature data type is using to create a closed area by snapping first and last point of a line. If data doesn't converted to a geodatabase to realize these kinds of errors is not possible



Polygon divided by polylines

Conflict between polyline and polygon

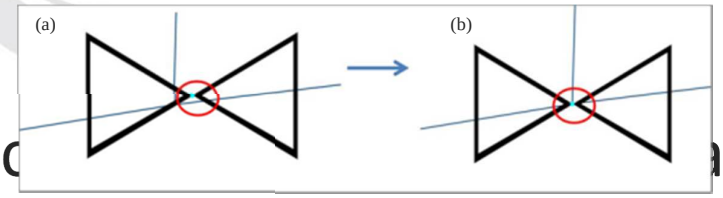
4



Polylines conversion flowchart

Conflict between polyline and polygon

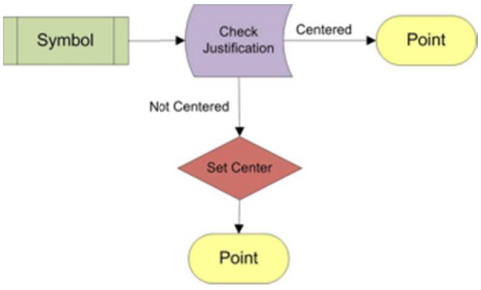
Often CAD software's have their own symbology/cell/block and library defined by a large number of formats attributes. It can be very time consuming to create database table fields to store all of these attributes. Symbology need to be converted to point in order to be able to analyses vector data with procedures like network analysis. For a successful conversion for symbology user need to ***check the justification of symbology*** whether centered or not.



Conflic[illegible]nd polygon

a) Symbology with wrong justification b) point data with symbology

4



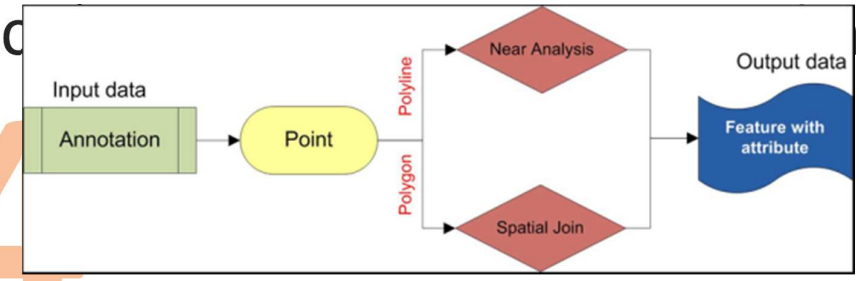
Symbology conversion flowchart

Conflict between symbology and point

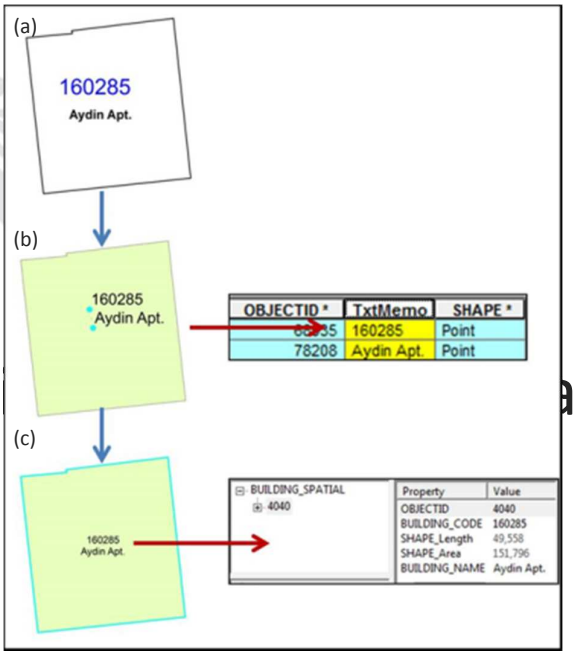
Annotation class is the most confused data type in Turkey because of the CAD structure and user behaviors having to tendency to produce annotation instead of point, polygon or polyline.

The annotation process differs according to the type of data to be converted. If annotation will be converted to attribute which is stored in polyline class it can be preserved by transferring them to the nearest line or polygon. When annotation will convert to a polygon attribute, spatial join function should be preferred

Conflic ttribute



Annotation conversion flowchart



a) annotation in CAD

b) point data (with attribute)

Confl ation and attribute

c) polygon data (with attribute)

Conflict between annotation and attribute
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Conclusions

- The conversion between CAD and GIS strategies described in this study is an approach for the users.
- Data need to be corrected before storing in database in order to be able to analyses vector data with procedures like network analysis, attribute and locations queries.
- Conversions between CAD and GIS developments are significant for another reason as well: Geographical Information Systems are contributing to the migration away from the other software's/ systems which have dominated the GIS market for so long.

Conclusions

This approach provides;

- a collection of helpful methodologies and techniques for converting CAD data to GIS format.
- an early step for accurate conversion and a key for conversion between two systems without losing any structure and geometry.
- converting data with eliminating these kinds of errors
- to success the subsequent steps especially topology controls.
- solutions for identify step allows to data getting up quickly conversion.

Conclusions

The errors mentioned in this study are the well-knowns in Turkey and depends on the CAD data and user behavior. To prevent errors which will be increased in the future, data and data structures used in Turkey should be examined and studied carefully.

Users may use this approach in complementary ways, as appropriate for specific environments or data serves. They may develop different conversion tools among their own data and requirements.

As increasing third-party systems which are using GIS data and as the underlying technology mature, high quality GIS data are expected.

Working with CAD data, it's often needed to enhance a CAD drawing with GIS information and attributes.

Let's meet in Istanbul

FIG2018

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Thanks..

Any questions ??????

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