

Based on ArcEngine Technology to Achieve the Same Type of Disconnection Elements and Carry out Preliminary Merger

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Abstract: After the wire-loaded data in AutoCAD is converted into GIS line data, there is a wire break problem, which brings a lot of trouble to the processing and application of the data later. This paper takes AutoCAD road data into shapefile line data as an example. According to the geometric judgment, the road breaks are merged, and the whole technical process is realized based on ArcEngine and C# programming language. At the same time, the technology is applied in the form of plug-ins in ArcGIS. The problem of disconnection is solved to the utmost extent.

1. Introduction

As a common data production tool, AutoCAD is active in many industries such as land, surveying, geography, architecture, planning, etc. due to its powerful drawing function and ability to process vector graphics, but AutoCAD is weak in the description and analysis of spatial data information^[1]. With the continuous popularization of GIS technology in recent years, its powerful geographic data display, editing, management and spatial analysis capabilities have been recognized by all walks of life^[2]. Converting the CAD result data into GIS data and then into the database, and establishing a GIS database, can further tap the potential of existing data resources, and thus carry out more in-depth application^[3].

AutoCAD achievement data is the source data of basic geographic information data of various industries and has great application value. For example, there are more than 50 kinds of earthquake emergency related data (including spatial data and attribute data) in the earthquake emergency basic database formed by the earthquake industry. The road data is important data that needs to be updated continuously, so the update is obtained from the AutoCAD result data. The source is one of the important means to maintain the vitality of the earthquake emergency basic database. However, there are various technical problems of various sizes in this process. If they are not effectively solved, the workload will increase dramatically. This paper mainly solves the disconnection problem that occurs after AutoCAD road data is converted to shapefile format.

2. The data description

After AutoCAD road data is converted to shapefile format, a road is divided into segments. Such as straight roads, turning roads, and separate short roads.

(Shown in Figure 1) What is needed now is to connect the roads based on geometric judgment.

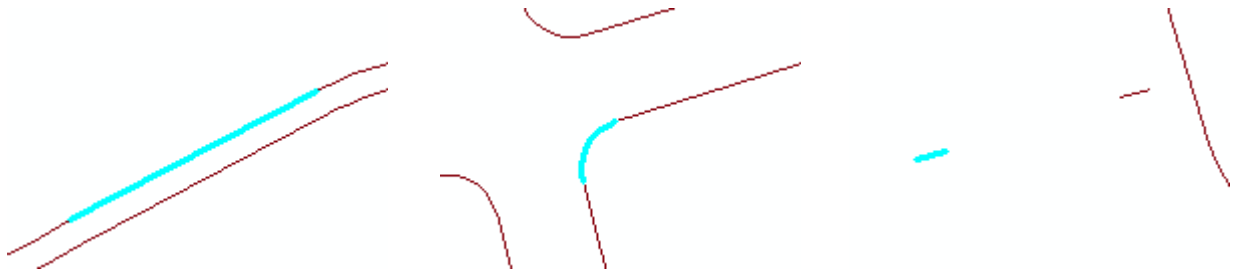


Fig. 1 shows the disconnection situation

3. The solution ideas and implementation process

The spatial relationship in GIS mainly includes direction relationship, topological relationship and measurement relationship, among which topological relationship is the most basic and most important relationship^[4]. Topological relations and geometric information are indispensable components in GIS. Topological relations are a mathematical method for clearly defining spatial relationships. GIS uses it to describe and determine the relationship between points, lines and faces in space, and then to achieve correlation. Spatial query and retrieval, often have spatial relationships such as "adjacent", "intersecting", "containing" and so on. The geometric information is the direction, angle, coordinate position, distance and area of the geometric target^[5].

For the existing disconnection problem, the combination of the same disconnection elements is completed based on the line node (coordinate point). The whole technical process is as follows:

1) Read the line feature layer, first determine whether the layer type matches and fix the geometric errors existing in the layer, such as empty geometry, self-intersection, etc.^[6], first perform geometric error repair on the features in the layer, The program invokes a geoprocessing tool implementation;

2) traversing each line element, obtaining a line set list, and storing it in List<IFeature>;

3) Divide the line elements into two categories that need to be merged and do not need to be merged (the end or start point is the "node" line and the end point, the starting point is the "node" line, the independent line), respectively stored in two In the list of line sets;

4) Next, you only need to merge the set of line features that should be merged. First, select the first line segment of the line set list, and then find the same line element in the remaining line features of the list as the end point or starting point of the first line segment (Here, the same condition is determined according to the coordinates of the line element nodes, but the fractional part of the node coordinates may be inconsistent. Therefore, the coordinate integer part is used as the judgment basis, and the judgment code is as shown in FIG. 2, if such a line exists. The feature combines the two and removes the merged line features from the list of linesets, and then continues to find and merge the end points of the new line features or the same starting line segment to continue merging until the line set list does not exist The combination of the line features of the currently merged line features, and the merging of the first line elements;

5) Select a line segment from the remaining line features in the line set list to start a new round of merging until the line set list is empty, and the entire break line merge operation ends.

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if (((int)startPt1.X == (int)startPt2.X && (int)startPt1.Y == (int)startPt2.Y) || ((int)startPt1.X == (int)endPt2.X && (int)startPt1.Y == (int)endPt2.Y))
{
    bStart1++;
    if (bStart1 > 0)
    {
        currentMergeLineList.Add(featureSecond);
        toUnionLineList.Remove(featureSecond);
    }
}
if (((int)endPt1.X == (int)endPt2.X && (int)endPt1.Y == (int)endPt2.Y) || ((int)endPt1.X == (int)startPt2.X && (int)endPt1.Y == (int)startPt2.Y))
{
    bStart2++;
    if (bStart2 > 0)
    {
        currentMergeLineList.Add(featureSecond);
        toUnionLineList.Remove(featureSecond);
    }
}

```

Fig. 2 determines whether the end point or starting point of the two line elements is the same code fragment

4. Application and results analysis

Following the above technical process, the ArcMap Add-in plugin was completed based on ArcEngine secondary development and will be loaded into the ArcGIS desktop system. The plug-in is used to process the consolidation of road breaks after the conversion of the AutoCAD road data of a city's urban land to the Shapefile. The interface of the plugin works is shown in Figure 3.

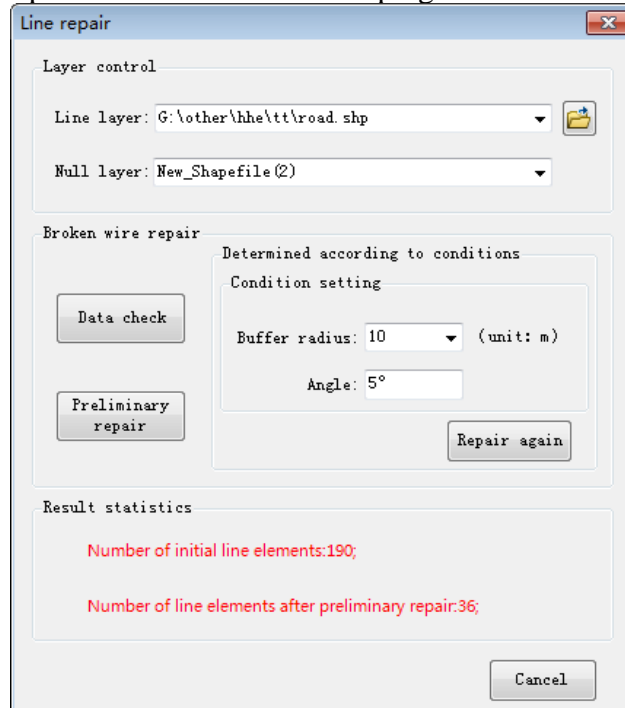


Fig. 3 Plugin work interface

When the plugin works, you need to specify an empty line layer file to save the merged line features. Then check the data, delete the elements with geometric errors, click the preliminary repair button, and complete the preliminary merge by disconnection. In the result statistics, the line layer has a total of 190 line elements. The number of line elements after the combination is 36, greatly reducing the number of disconnected lines, reducing the difficulty for the later application of data. Figure 4 is a comparison of the number of line elements after the initial merge. The left line layer attribute table shows 191 initial line features, indicating that one of the initial line features has a geometric error, and the right side is the merged line layer attribute. The table shows 36 line elements, indicating that the actual situation and statistical results match. The next work is to further repair the line layer based on the shortest distance and minimum angle of the topological relationship [5], and remove unnecessary elements to obtain more accurate data.

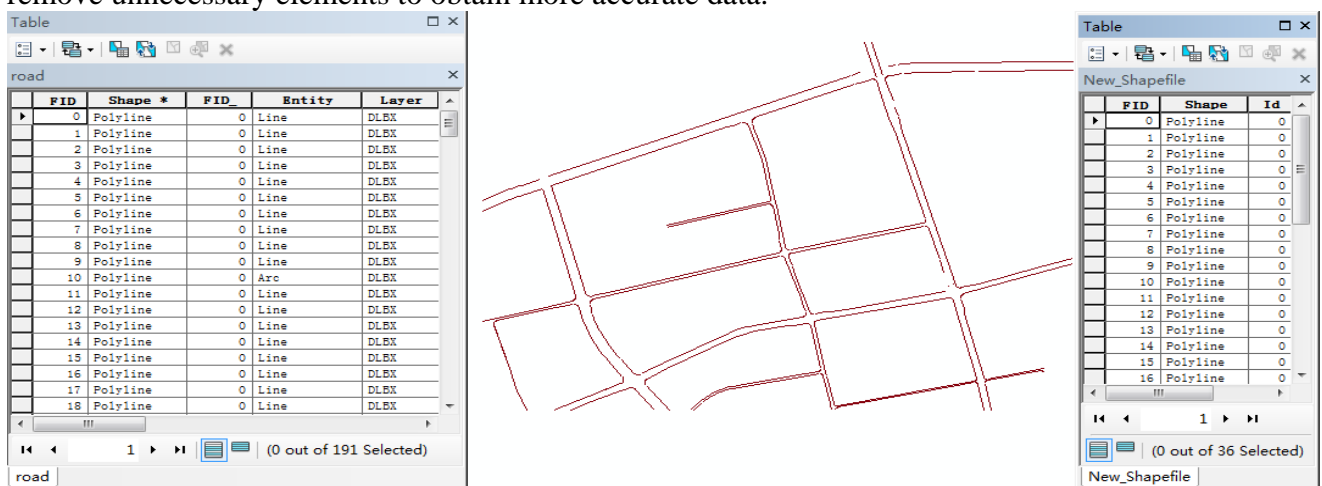


Fig. 4 Comparison of the number of line elements after the initial merger

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