Temporary road transport route optimization based on ArcGIS platform conditions

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Abstract: Based on the ArcGIS software platform, the method of digital elevation model (DEM) is established by using the irregular triangulation (TIN) of the "three links and one leveling" project of the Guquan converter station. The calculation principle and the realization steps are discussed. In the clear fill area, site formation and earth temporary transport route design applications. Research shows that the simulation of ground simulation through ArcGIS can be more rapid and efficient land leveling, design optimization route.

1. Introduction

In the earthwork, in order to meet the construction requirements and ensure the smooth progress of the earthmoving project, it is necessary to design and optimize the temporary transport route of the earth. In this paper, based on the design method of temporary transportation route of large-scale field engineering in the past, this paper uses ArcGIS software's powerful spatial analysis ability and modeling ability to solve the complicated geoscience application problem, and comprehensively studies the " "The characteristics of the original topography and geomorphology before the construction of the project are discussed, and a new method for the design of the temporary transport route of the earth and stone in the large level project is discussed.

2. Project overview

± 1100kV Guquan converter station site is located in Xuancheng City, Anhui Province, 8 km southwest of ancient springs, covering 37 hectares as much. The site is dominated by natural terrain, mainly forest land, shrubbery, the original geomorphology complex, potholes more artificial activity is weak, limited to the local valley lowland farmland farming, station area and adjacent non-plant facilities distribution.

3. Based on the TIN model to calculate the principle of earthwork

3.1 On the TIN model

TIN is the abbreviation of irregular triangle net, its principle is by a finite number of points in the area of set (i.e., elevation point) division will be interconnected and overlapping network of triangle surface in the area of irregular distribution of the density of measurement point and location determines the shape and size of the triangle, triangle of continuous surface constitutes the digital elevation [1].

Data structure of TIN advantages: to the resolution of the different code number to simulate the surface morphology. Compared with grid data model, TIN model under a particular resolution can use less space and time said more complex ground contour more accurately. Especially local form

contains a large number of features such as fault lines, lines, TIN model can better take into account these characteristics [2].
In all possible triangle net, Delaunay (Delaunay triangulation of common used in terrain fitting, so is often used in the production of TIN, [3].
Purpose: use this kind of data structure, can more convenient the surface-to-surface shape is analyzed, such as slope and slope to the extraction of information, fill in excavation volume calculation and its region, contour automatically generated and topography of the three-dimensional display, etc. [4].

3.2 On DEM and its generation method
The Digital Elevation Model (DEM) [5], which is a digital representation of terrain surface by finite terrain elevation data, is a digital representation of terrain surface by a set of ordered numerical array Elevation of a solid ground model. DEM is a single-order digital geomorphology model with zero order. Other topographic features such as slope, aspect and rate of slope change can be derived on the basis of DEM [6].
TIN can be generated directly from the contour data, or a raster DEM can be generated directly. The grid DEM can also be interpolated from contour lines to generate TIN. In the past, it has been proved that the efficiency and precision of the TIN model generated by the contour line and the interpolation grid DEM are very good [7].

4. Design temporary transportation routes with ArcGIS
The TIN model can be established in ArcMap using the elevation points and contours of the original terrain. The TIN and DEM can be used to generate the raster map, slope and raster map of the area. , You can also ArcSence the original terrain of the target area of the three-dimensional, can make the site more 3D terrain visualization.

4.1 Use ArcGIS to generate the target area DEM
(1) First open the ArcMap software, through the tool table Arctoolbox in the conversion tool to Autocad in the original terrain file elevation points, contour files from dwg format converted to Shapefile format.
(2) open the Shapefile format in ArcMap point file elevation, in the left content list to find the elevation point file and right-click to open the property sheet to check whether the Elevation field is empty, if empty it will be deleted; Empty, then the elevation value is valid.
(3) created by TIN Arctoolbox>3D Analyst ArcMap tool in >TIN>, click on the input elements to determine the elevation points for Shapefile format and target area, established the TIN model file, the target area, as shown in figure 1.

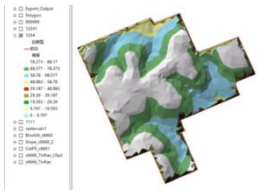

Fig. 1 TIN model of the target area

(4) To know the design height of the target area, draw the same area in the drawing editor as the contour of the target area with the design height. Open the ArcGIS Spatial Analyst tool> Surface Analysis> Filling and Filling, and enter the target area grid Grid model and the design elevation plane, click OK, you can fill in the region of the excavation operation and generate the appropriate fill-digging grid diagram, as shown in Figure 2, the blue area represents the excavation area, the red area represents the fill area.
(5) From the Spatial Analyst tool> Surface Analysis> Slopes in ArcMap, enter the raster model for the target area to generate a gradient raster map for the target area, as shown in Figure 3:

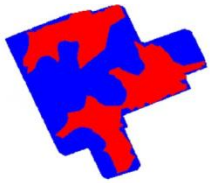

Fig.2 Grid diagram of the target area

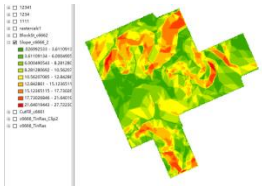

Fig. 3: Raster map of the target area

4.2 The use of ArcGIS raster map for temporary transport route design

temporary road approach: the original central station and station area on the west side of the village road widening to 6 meters, the excavator rolling compaction, flat road, within the scope of such as weak areas or hollows using large stones, gravel replacement. The central station on the west side of the road and the main road transport for the vegetation cleaning stage, temporary support of road transport were laid in the excavation area and fill area, see Figure 4. Clean up the stage of the road to meet the temporary traffic can be temporary traffic road slope shall not be 15 degrees.

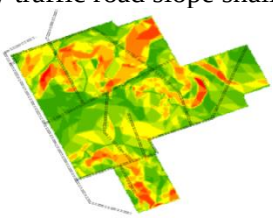

Fig. 4 Based on the slope of the temporary clean-up grid layout of the grid design

5. Conclusion

ArcGIS software by simulating field topography, make elevation points and contour data visualization, and then according to the different situation of the extraction of the key factor of the constraint conditions, such as slope, slope direction, curvature, generates the corresponding grid diagram, get the geography of intuitive, comprehensive data, combined with the traditional design method on the basis of allows designers to more rapid, accurate and reasonable design of earthwork transportation route and scheme. This method through the successful application in the project, earthwork transportation route for large flat engineering design provides a successful case.

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