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Original Contribution

IDENTIFICATION OF OBJECTS IN QGIS FROM AN ORTHOPHOTOMOSAIC COMPOSED BY PHOTOGRAMMETRY

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Abstract: *Orthophotomosaics are among the main outputs of processed photogrammetric surveys. By analyzing their elements, we can determine geometric parameters of objects of interest for certain tasks in applied geodesy, geomorphology, agronomy, forestry, ecology, construction, etc.*

Key words: ***P****hotogrammetry, Orthophotomosaic, QGIS.*

1. Introduction

Orthophotomosaics are an essential tool for analyzing a large and diverse set of elements of reality, such as forests, plantations, geomorphological processes, engineering infrastructure, etc. With an accurately georeferenced orthophotophoto, we can analyze with sufficient accuracy both static and dynamic processes and objects [1, 4, 6].

When we talk about identifying and delineating large objects in terms of area and complexity, manual vectorization is laborious and often depends on the experience of the operator, which adds a subjective factor to the analyzed surface. In order to avoid these inaccuracies and minimize generalization in manual mode, the operator introduces criteria to automate the process through the so-called. raster calculator in the QGIS software product. This adds a mathematical approach to the analysis based on color values, which no longer depends only on the personal judgment of the operator [1, 4, 5, 6].

2. Theoretical part

Color orthophoto images are made up of three main RGB color channels – Red, Green, Blue. Each pixel depicts the color mixing of these three colors, and in the image under consideration they are expressed by numbers from 0 to 255 for each main color channel.

Orthophotomosaics can be in different file formats GeoTIFF, JPG, BMP, BSQ, BIL, BIP, PGN, etc. By sifting a captured object in a raster image, we filter with a certain color tolerance to achieve a uniform visualization of the object and subsequent vector design to extract its geometric characteristics – perimeter and area [1, 2, 3, 4, 5, 6].

Schemes of the sequence of the results obtained during processing are shown below.



Fig. 1. Plot without vegetation



Fig. 2. Orthophotomosaic from photogrammetric UAV photography



Fig. 3. An isolated object of orthophotomosaic by color with a certain color tolerance

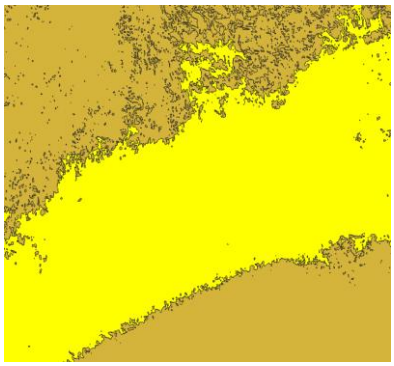


Fig. 4. Automatically extracted vector from a raster image



Fig. 5. Polygon section

3. Methodology for automated isolation of objects based on color features in QGIS

3.1 Preparation of data and their import into GIS [1, 4, 5]

✓ After processing the photographic material and generating an orthophoto mosaic in specialized software for photogrammetric processing, the information is displayed in GeoTIFF format;

✓ The input of the GeoTIFF file is done using the "drag and drop" method, setting the appropriate coordinate system. In this case, it is UTM zone35N;

✓ Setting a recognizable and correct file name is key to post-processing, as it is used in the computational algorithms that are set.

3.2 Color analysis and identification [1, 4, 5]

✓ Visually determine a section of the general image that matches the desired object in color – if we are looking for a grassy area, we look for a green gamma; if we are looking for an eroded area, we search in a cream range, etc. It is searched depending on the needs for which the algorithm is used.

✓ Select a pixel with the appropriate color with the "object identification" tool /Obzor ► object identification. For this particular case, we use a cream-colored pixel because we are looking for bare areas of the earth's surface.

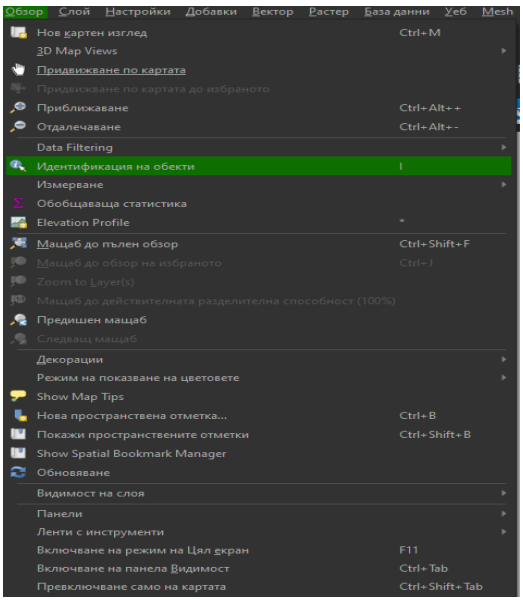


Fig. 6. Menu

✓ Color set with : R: 252, G: 254, B: 241

3.3 Raster analysis [1, 4, 5]

✓ Through the "Raster Analysis" module /Raster ► Raster Calculator/ in Qgis, the color we are looking for as a characteristic is isolated. A tolerance of 30-50% of the color is set so that the nearby shades can be covered. As a result of this analysis, we get a black/white image, with all the searched color shades in white;

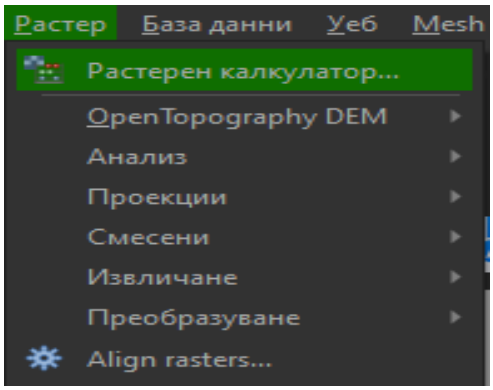


Fig. 7. Color isolation

✓ The process of isolating the color range is based on the following logic matrix entered into a "raster calculator";

✓ ("Raster Name @1" >= 124 AND "Raster Name @1" <= 255);

✓ AND ("Spreader Name @2" >= 126 AND "Spreader Name @2" <= 255);

✓ AND ("Spreader Name @3" >= 113 AND "Spreader Name @3" <= 255);

✓ Vectorization and generalization;

✓ The resulting raster image is transformed into a vector through the "polygonizing" function /Raster ► Transform ► Polygonizing/;

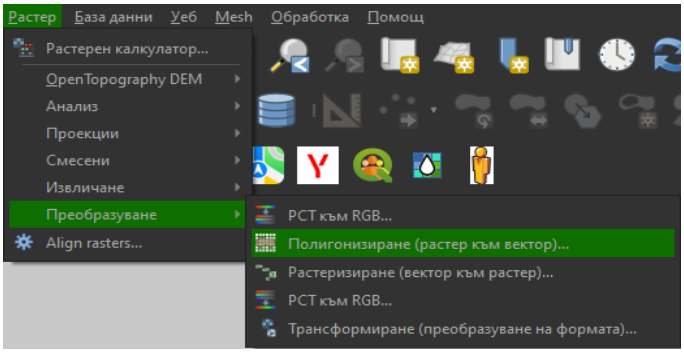


Fig. 8. Polygonization

✓ On the resulting vector, the fill color is removed and roughly generalized with the function "Simplify", /Vector ► Geometry Tools ► Simplification/, by which we remove the unnecessary fracture of the lines;

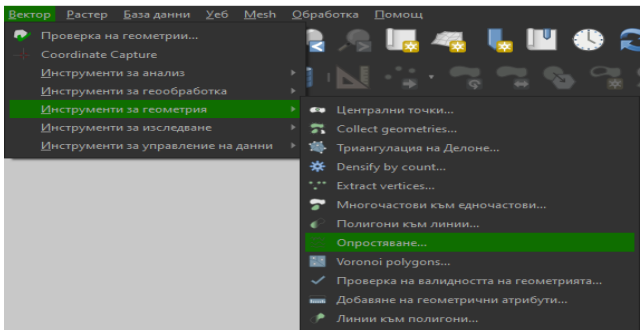


Fig. 9. Simplification

✓ Once we get a simplified vector, artifacts are often formed that are not related to our work. They are usually in the form of small polygons and are removed manually after the

vector layer with "explode lines" is disintegrated /Machining ► toolbox ► Vector geometry ► Explode lines/. The resulting contour is applied to the orthophotomosaic and, if necessary, generalized further. This additional simplification is entirely at the discretion of the operator and is strongly related to his experience, knowledge of the terrain and the specifics of vegetation, soils, etc.

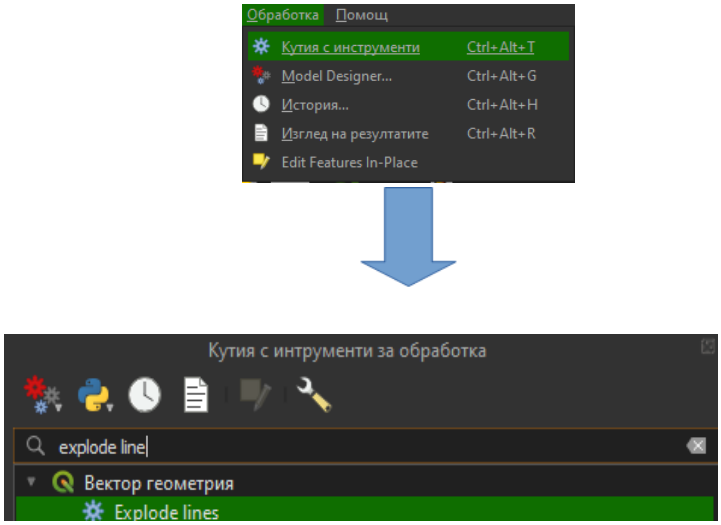


Fig. 10. Processing

3.4 Calculation of geometric indicators of the site – perimeter and area [1, 4, 5]

✓ The resulting contour is converted from a vector line to a polygon using the "lines to polygon" function /Vector ► Geometry Tools ► Lines to polygons/;

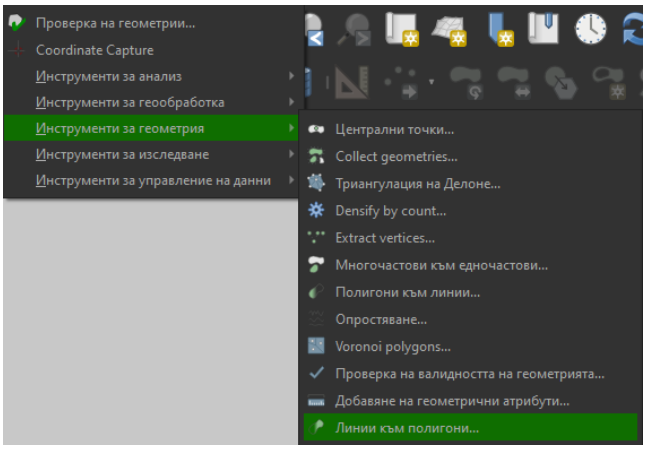


Fig. 11. Obtaining a polygon

✓ We create columns "perimeter" and "area" in the attribute table, which must be of the "decimal number" type, and the number of numbers after the decimal point depends entirely on the target precision. In the column "perimeter" we enter the expression for execution "$perimeter" and in the "area" "$area". Thus, in the attribute table we have already calculated the parameters that we need.

4. Conclusion

With this method of isolating and vectorizing an object from reality, photographed by UAV or classical photogrammetry, we can obtain geometric indicators with a minimized

human factor. Thus, the subjective judgment of the operator is minimized, which is a prerequisite for repeating the process with minimal deviations for the different identified objects.

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