Technology of selection and recognition of information objects on images of the earth's surface based on multi-projection analysis

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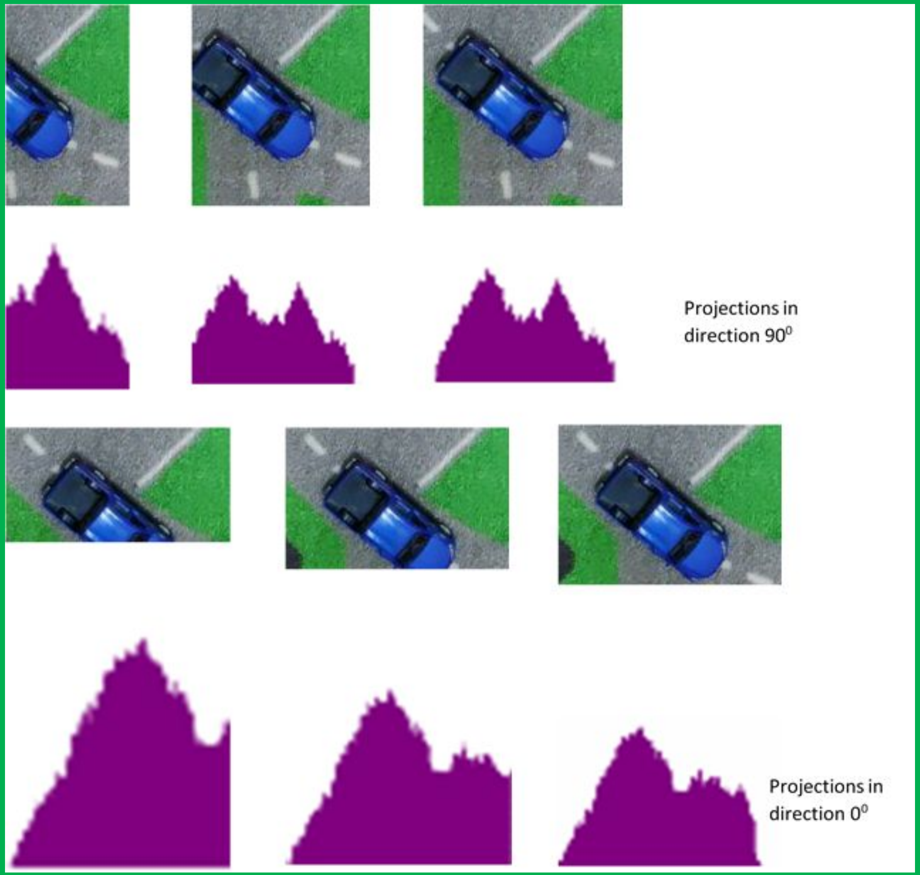
The selection of an object on the image of the earth's surface is carried out using the following sequence of operational steps.

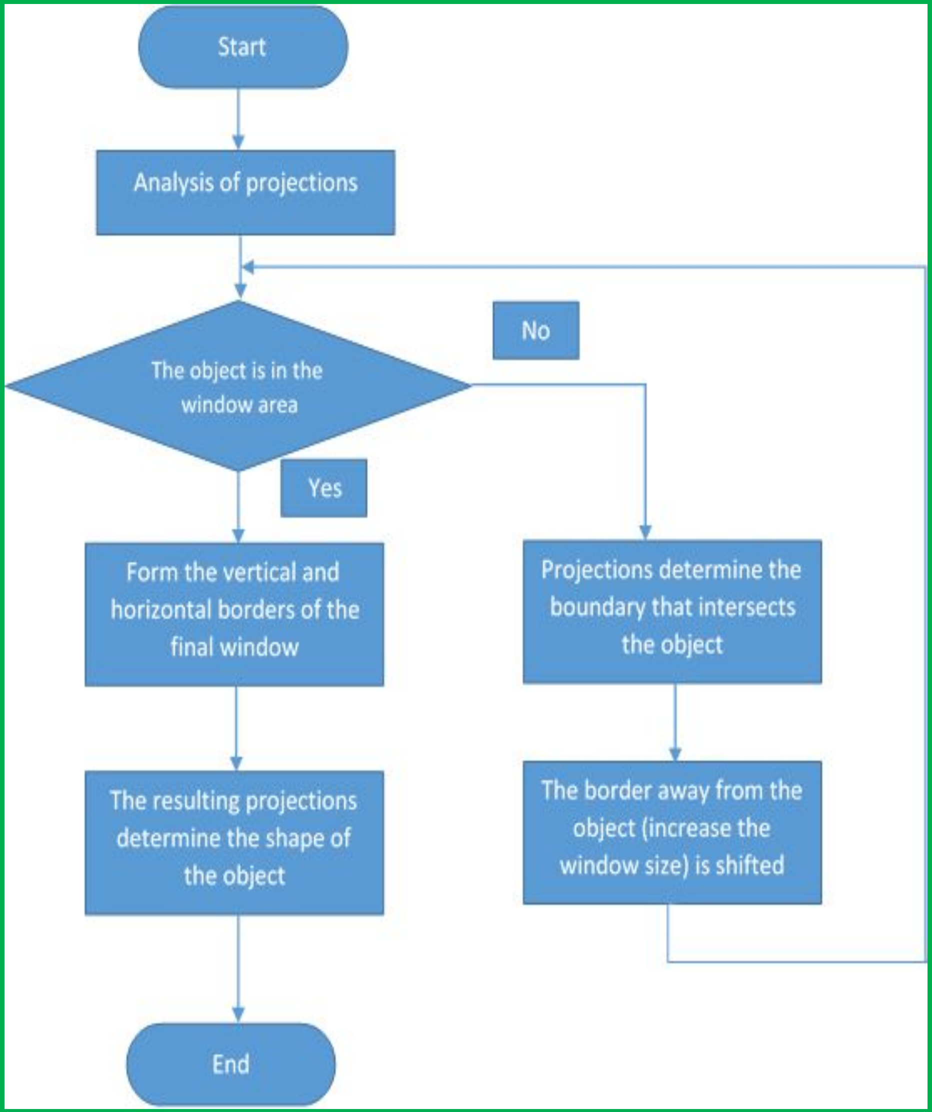
1. An image of the earth's surface using aircraft or probes are formed.
2. With the help of the selected operator, edge pixels are selected in the image.
3. The number of selected pixels in the image by applying thresholding are reduced.
4. The resulting image is converted into a binary one, where the selected pixels correspond to the logical code "1", and the background pixels correspond to the logical code "0".
5. The resulting binary image is divided into regions of predetermined shapes and areas. As a rule, they are divided into four rectangular areas that have a common vertex in the center of the image.
6. For each selected area of the image, projections are formed in the direction of 0^0 and 90^0.
7. The resulting projections are analyzed and, based on the analysis, a new shape of the selection window is determined.
8. The sixth and seventh steps are repeated until there is one selected object in the image in the window.
9. When the projections show that one object is selected in the generated window, the projections are analyzed and the geometric shape of the object is determined. The geometric shape of an object is determined by searching for the nearest reference set of projections.

An example of selecting individual parts of objects in an image

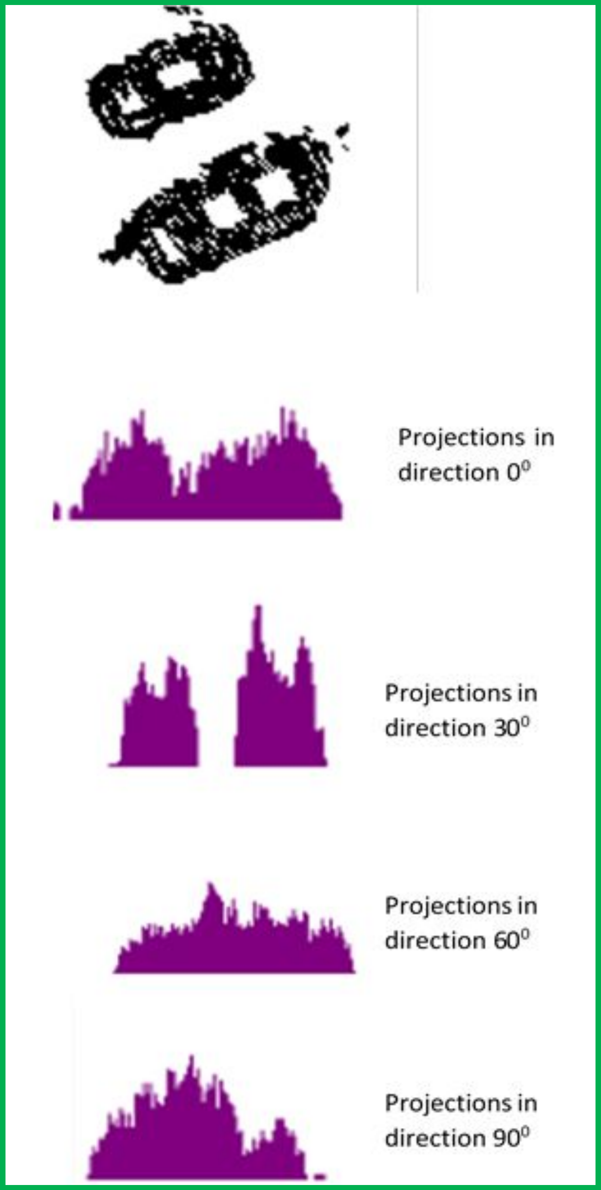
Examples of shifting and increasing the selection window towards the border that intersects the object in the image



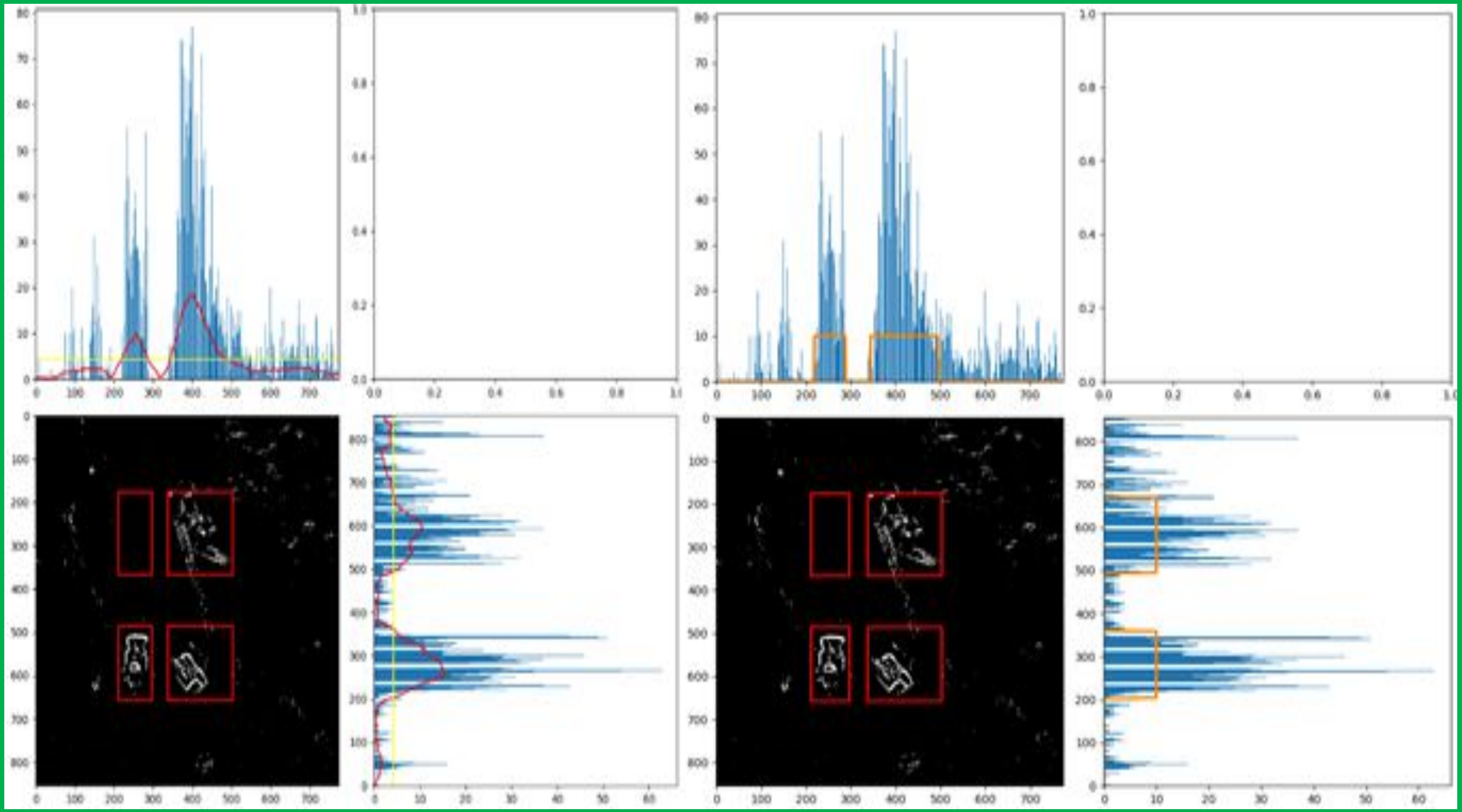
Graph diagram of the algorithm for searching for an object in the image



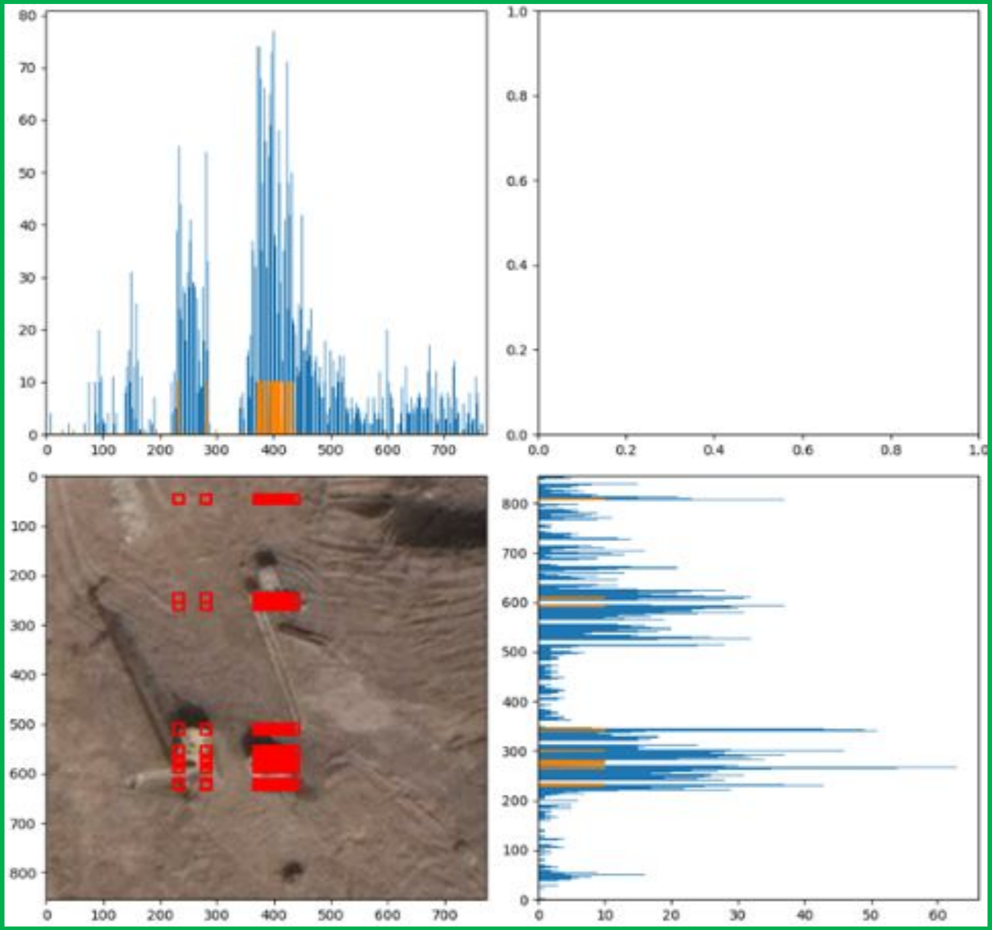
Examples of projections when rotating an image of a selected area by discrete rotation angles



Analysis of the distribution density of single pixels in an image



An example of the selection of informative objects based on the analysis of the density of the distribution of pixels on the projections



Conclusion

A system for recognizing objects on satellite images has been successfully implemented in the work. The results of the experiments confirmed the effectiveness and advantages of the developed method in comparison with other neural network approaches. One of the key advantages of the implemented system is its speed. Compared to other approaches that require significant computational resources for training and direct work, the developed method offers an effective solution that allows you to increase the processing speed. This is important given the volume and complexity of such images. As a result of the experiment, the threshold for deleting an informative area is determined if the proposed area contains non-zero pixels less than a given value, which allows you to select several objects at the same time in one image. The developed system for recognizing objects on satellite images has demonstrated its efficiency and speed advantages. Given the limited computing resources, the developed method is an attractive option for the implementation of systems for processing and recognizing satellite images.