
Contour analysis-based identification of nature objects at processing data of Earth remote sensing

© A.B. Domracheva, M.A. Basarab, A.L. Medvedeva

Bauman Moscow State Technical University, Moscow, 105005, Russia

The possibility of using the computer vision technology for solving problems of orientation, navigation, and control of unmanned aerial vehicles (UAV), as well as the problem of identifying the locations of the observed object by comparing its shape with the reference image on the digital map is described. The problem of extracting contours of objects in the processing of Earth remote sensing data is solved. The approach for isolation and comparison of contours of an object based on the contour analysis is proposed. The methodology for selection and comparison of contours is presented and parameters of the similarity of contours are defined. The problems arising in the construction and comparison of the isolated and reference vectors are analyzed and their solutions are specified. The choice of numerical methods for solving the given problems is justified. To close the contours, the method of cartographic generalization, based on the theory of fractals, is used and for simplifying the circuit, the method of de Berg is applied, allowing us to obtain circuits without self-intersections. The results of testing the contour analysis method to a fragment of satellite imagery, including, in particular, natural objects are presented.

Keywords: navigation, orientation, control, data of remote sensing of Earth, cartographical generalization, contour analysis.

REFERENCES

- [1] Krasilshchikov M.N., Serebryakov G.G. *Control and Guidance of Maneuver Unmanned Aircraft Vehicles on the Base of Modern Information Technologies*. Moscow, Fizmatlit, 2005 [in Russian].
 - [2] Ivanov D.V., Karpov A.S., Kuzmin E.P., Lempitskii V.S., Khropov A.A. *Algorithmic Foundations of Raster Computer Graphics*. Moscow, Internet-Universitet Informatsionnykh tekhnologii, Binom. Laboratoriya Znaniy, 2007 [in Russian].
 - [3] Gonzalez R.C., Woods R.E., Eddins S.L. *Digital Image Processing Using MATLAB*. Dorling Kindersley, 2004.
 - [4] Lobanov A.N. *Photogrammetry*. Moscow, Nedra, 1984 [in Russian].
 - [5] Furman Ya.A., Krevetskii A.V., Peredreev A.K., Rozhentsov A.A., Khafizov R.G. *Introduction to the Contour Analysis. Application to Image and Signal Processing*. Moscow, Fizmatlit, 2003 [in Russian].
 - [6] Berlyant A.M., Musin O.R., Sobchuk T.V. *Cartographic Generalization and Fractal Theory*. Moscow, Moscow State University, Institute of Environmental Geoscience RAS, 1998 [in Russian].
 - [7] De Berg M., Van Kreveld M., Schirra S. A New Approach to Subdivision Simplification. *Scientific research*. 1995.
-

Domracheva A.B. (b. 1970) graduated from Bauman Moscow State Technical University in 1993. Ph.D., Assoc. Professor of the Information Security Department at Bauman Moscow State Technical University. Author of more than 30 publications in the fields of mathematical modeling, digital signal processing, geoinformatics, and information security. e-mail: annd70@mail.ru

Basarab M.A. (b. 1970) graduated from the Kharkov Aviation Institute (Aerospace University) named after N.E. Zhukovsky in 1993. Dr. Sci. (Phys.&Math.), professor of the Information Security Department at Bauman Moscow State Technical University. Author of more than 100 publications in the fields of applied mathematics, informatics, digital signal processing, and radiophysics. e-mail: bmic@mail.ru

Medvedeva A.L. (b. 1989) student of the Theoretical Informatics and Computer Technologies Department at Bauman Moscow State Technical University. Scientific interests: artificial intelligence, computer vision. e-mail: keng_di_en@mail.ru
