

DIGITAL MODELING OF TREE AND SHRUB VEGETATION OF ACCUMULATIVE SEASHORE BASED ON AIR LASER SCANNING DATA

Evgeny S. Boyko

Kuban State University, 149, Stavropolskaya St., Krasnodar, 350040, Russia, Ph. D., Associate Professor, phone: (918)120-10-21, e-mail: boykoes@yandex.ru

Arsen V. Karagyan

The Southern Branch of the P. P. Shirshov Institute of Oceanology of the Russian Academy of Sciences, 1, Prostornaya St., Gelendjik, 353467, Russia, Bachelor Student, Technician, phone: (906)435-94-12, e-mail: karagyan.arsen@yandex.ru

This article is devoted to the study of tree and shrub vegetation of the Anapa-bay bar, which has a direct impact on the formation of landscape, and affects the processes of accumulation and transfer of matter. The materials of air laser scanning made it possible to perform automated calculation of all trees and shrubs. Their quantitative and qualitative analysis was performed. The study area is divided into sections depending on the nature of the landscape and vegetation. By processing laser scanning data and digital aerial photography, digital models of each tree and shrub above 0.7 m were constructed. For the selected areas, the number of all elements and the area of vegetation is calculated up to each tree. As a result, of the study, the method of software selection of tree and shrub vegetation with automatic receipt of attribute information about the height and diameter of vegetation crowns was tested.

Keywords: Anapa bay-bar, aerial laser scanning, digital modeling of vegetation, laser reflection points, accumulative seashore

REFERENCES

1. Danilin, I. M., Medvedev, E. M., Kapralova, E. N., & Pestov, K. A. (2008). Use of modern aerial survey technologies in the interests of forest management. In *Sbornik materialov GEO-Sibir-2008: T. 2, ch. 1 [Proceedings of GEO-Siberia-2008: Vol. 2, Part 1]* (pp. 209–213). Novosibirsk: SSGA Publ. [in Russian].
2. Pogorelov, A. V., Brusilo, V. A., & Granik, N. V. (2018). Modeling of urban landscaping objects based on mobile laser scanning data. *InterKarto. InterGIS*, 24(2), 5–17 [in Russian].
3. Kravtsova, V. I., Falaleeva, A. A., & Chalova, E. R. (2014). Morphologically contrasting areas of the Blagoveshchensk section of the Anapa Bay-bar using high-Resolution satellite images. *Geodeziya i kartografiya [Geodesy and Cartography]*, 10, 25–36 [in Russian].
4. Mikheeva, A. A., Yaltykhov, V. V., & Paradnya, P. F. (2018). Aerial photography from an unmanned aerial vehicle. *Vestnik Polotskogo Gosudarstvennogo Universiteta. Seriya F. Stroitelstvo. Prikladnye nauki [Bulletin of Polotsk State University. Series F. Construction. Applied Sciences]*, 16, 135–142 [in Russian].
5. Popov, R. A., & Altyntsev, M. A. (2013). Influence of point density airborne laser scanning in the selection of individual trees. In *Sbornik materialov Interekspo GEO-Sibir-2013: Mezhdunarodnoy nauchnoy konferentsii: T. 1. Distantionnye metody zondirovaniya Zemli i fotogrammetriya, monitoring okruzhayushchey sredy, geoekologiya [Proceedings of Interexpo GEO-Siberia-2013: Remote Sensing Methods of the Earth and Photogrammetry, Environmental Monitoring, Geoecology]* (pp. 83–87). Novosibirsk: SSGA Publ. [in Russian].
6. Boyko, E., Krylenko, V., & Krylenko, M. (2015). LIDAR and airphoto technology in the study of the Black Sea accumulative coasts. *3rd International Conferences on Remote Sensing and Geoinformation of the Environment. Book Series: Proceedings of SPIE*, 9535, P. 95351Q. DOI: 1117/12.2192577.
7. L3 Harris Geospatial documentation center. (n. d.). Retrieved from https://www.harrisgeospatial.com/docs/using_envi_lidar_Home.html.
8. TERRASCAN USER GUIDE. (n. d.). Retrieved from <http://www.terrasolid.com/guides/tscan/index.html>.
9. Tkacheva, A. A., & Favorskaya, M. N. (2015). Modeling of three-dimensional scenes of forest areas based on laser scanning data and aerial photographs. *Informatsionno-Upravlyayushchie Sistemy [Information and Control Systems]*, 6(79), 40–49 [in Russian].
10. Danilin, I. M., Danilin, A. I., & Svishev, D. A. (2010). Laser location and digital aerial photography – subsatellite component in the system of information support for inventory, monitoring and cadastre of forest

lands. *Vestnik Sibirskogo gosudarstvennogo aerokosmicheskogo universiteta imeni akademika M. F. Reshetneva [Bulletin of the Reshetnev Siberian State Aerospace University]*, 3(29), 55–59 [in Russian].

11. Starikov, A. V., & Baturin, K. V. (2015) Application of laser scanning in wood accounting technology. *Lesotekhnicheskii zhurnal [Forest Engineering Journal]*, 4, 114–122 [in Russian].

12. Kosyan, R. D., & Krylenko, V. V. (2014). *Sovremennoe sostoyanie morskikh akkumulyativnykh beregov Krasnodarskogo kraia i ih ispolzovanie [Current state of marine accumulative coasts of the Krasnodar territory and their use]*. Moscow: Scientific World Publ., 256 p. [in Russian].

13. Shirokova, T. A., & Antipov, A. V. (2010). Method of creating orthophotoplanes using air laser scanning data. *Vestnik SGUGiT [Vestnik SSUGT]*, 2(13), 24–30 [in Russian].

14. Kravtsova, V., Tutubalina, O., Krylenko, V., Krylenko, M., & Chalova, E. (2015). Mapping the Anapa bay bar geosystems on the basis of satellite remote sensing and ground data. *3rd International Conferences on Remote Sensing and Geoinformation of the Environment. Book Series: Proceedings of SPIE, 9535*, P. 95351X. DOI: 10.1117/12.2193682

15. Kravtsova, V. I., & Chalova, E. R. (2015) Mapping the landscape morphological structure Vityazevsky of the sand bar on satellite images of high resolution. *Izvestiya vuzov. Geodeziya i aerofotos"emka [Izvestiya Vuzov. Geodesy and Aerophotography]*, 1, 65–73 [in Russian].

16. Danilin, I. M., & Favorskaya, M. N. (2013) Description of software modules for the use of laser location data and digital aerial photography of forest territories. *Issledovanie Zemli iz kosmosa [Exploration of the Earth from Space]*, 2, 62–73 [in Russian].

17. Zherdev, V. N., Baranovich, D. A., & Cheremisinov, A. Yu. (2014). Quantitative approach to forest mapping based on earth sensing data. *Nauchnyy zhurnal Rossiyskogo NII problem melioratsii [Scientific Journal of the Russian Scientific Research Institute of Land Improvements Problems]*, 3(15), 149–157 [in Russian].

18. Novakovskiy, B. A., Kovach, N. S., & Entin, A. L. (2014). Geoinformation technologies for using air laser scanning for solving geographical and cartographic problems. *Geodeziya i kartografiya [Geodesy and Cartography]*, 7, 44–48 [in Russian].

19. Melnik, I. V., & Drozdova, A. E. (2018). Silver Loch as an indicator of environmental quality. In *Ekologicheskie problemy prirodnykh i urbanizirovannykh territoriy [Environmental Problems of Natural and Urbanized Territories]* (pp. 38–42). Astrakhan: Astrakhan State University Publ. [in Russian].

20. Volkova, T. A., & Kondrashina, M. K. (2020). Sovremennoe current state of the Bugaz Spit. In *Regionalnye geograficheskie issledovaniya [Regional Geographical Research]* (pp. 339–343). Krasnodar: Kuban State University Publ. [in Russian].

Received 01.10.2020

© E. S. Boyko, A. V. Karagyan, 2021