EPSC Abstracts
Vol. 12, EPSC2018-29-1, 2018
European Planetary Science Congress 2018

"Digital Moon": information system for distribution, visualization and analysis of lunar data

I.P. Karachevtseva, A.S. Garov, A.E. Zubarev, E.V. Matveev, N.A. Kozlova
Moscow State University of Geodesy and Cartography (MIIGAiK), MIIGAiK Extraterrestrial Laboratory (MExLab), Moscow, Russia (i_karachevtseva@miigaik.ru)

Abstract

In the last decade, there has been a sharp increase in the amount of data obtained by planetary missions, as well as the rapid growth of existing planetary data archives, for example, a lot of spacecraft from different countries have been exploring the Moon lately. Remote sensing data of the Moon, like any spatial planetary data, include arrays of images and digital relief models, which are characterized by diversity, significant volumes and high complexity. Processing and analysis of such data requires specialized approaches, including online processing, various methods of categorizing and data integration. For decision of these tasks we developed a distributed communication environment using new software architecture [1]. The proposed approach is based on ensuring the possibility of a comprehensive use of heterogeneous data within a single unified information environment. This is of great importance for establishing planetary research at a qualitatively new level, where expert analysis and automated approaches to data processing are complementary and are based on the use of existing standards used in planetary studies.

The Moon exploration is essential for the Russian space program. During next few years several launches are planned: the landing missions Luna-Glob (Luna-25, 27, 28) to the sub-polar areas [2] and an orbital mission Luna-Resource (Luna-26) [3], which is aimed at a global topographic mapping of the Moon. So, we also expect large amount of data: for example, a spacecraft in the quasi-polar circular orbit at an altitude of 50-100 km above the surface makes 12 flights around the Moon during the earth's day, obtaining about 5,000 images per day or about 150,000 images per month, assuming typical lunar data transfer rate [4].

To solve the problems of joint analysis of heterogeneous lunar data obtained from different sources we have proposed concept of "Digital Moon" for the integration of existing information as well as new data to be obtained in future. We are developing information system, including solutions for storage, archiving, joint processing, access, distribution, visualization and analysis of lunar data that can be used for implementation of an advanced front-end for Russian segment of the planetary archive to plan, to collect and to manage data from future missions [5]. Using proposed software architecture, we have developed a various applications for the processing, analysis, and three-dimensional visualization of lunar data. For example, to support image shooting planning we have developed web instrument "OrbitCalc" (http://cartsrv.mexlab.ru/orbitcalc/). Another applications for interactive terrain modeling, translation of spatial context in teleconferencing mode, intelligent search of lunar data in external sources) will be presented at the conference.

References

[1] Garov A.S., Karachevtseva I.P., Matveev E.V., Zubarev A.E., Patratiy V.D. (2016) Development of heterogenic distributed environment for spatial data processing using cloud technologies. 2016. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Vol. XLI-B4, pp. 385-390, XXIII ISPRS Congress, 12–19 July 2016, Prague. doi:10.5194/isprs-archives-XLI-B4-385-2016.

[2] Zeleny, L. (2012) Lunar Program of Russia for 2011-2020 and 2020-2025., Potential cooperation, The 3rd Moscow International Solar System Symposium, Oct. 8-12, 2012.

[3] Petrukovich A., Zelenyi L., Anufrejchik K., Korablev O., Mitrofanov I., Polyansky I. (2016) Russian Lunar orbiter mission., 7th Moscow Solar System Symposium, 2016, Space Research Institute (IKI), 7MS3-MN-20.

[4] Polyansky I., Zhukov B., Zubarev A., Nadejdina I., Brusnikin E., Oberst J., Duxbury T. Stereo topographic mapping concept for the upcoming Luna-Resurs-1 orbiter mission, Planetary and Space Science, 2017, doi: 10.1016/j.pss.2017.09.013.

[5] Batanov O., Nazarov V., Korotkov F., Markov Ya., Konoplev V., Melnik A., Tretiakov A., Mischenko A. (2017), Russian Science Ground Segment and IKI activities on receiving ExoMars 2016 Science Data., 6th European Ground System Architecture Workshop (#ESAW2017) at the European Space Operations Centre, 2017, Darmstadt, Germany, 20-21 June.