TOWARDS DIGITAL RUSSIAN FIREBALL NETWORK FOR METEORITE RECOVERY

N.A. Kruglikov[1,2,5], V.V. Krushinsky[1], S.V. Nazarov[3], O.E. Kutkov[3], V.I. Grokhovsky[1], A.D. Borbolin[1], N.N. Kruglikov[4], [1]Ural Federal University, Ekaterinburg, Russia, [2]Institute of Metal Physics, UB of RAS, Ekaterinburg, Russia, nick@imp.uran.ru, [3]Crimean Astrophysical Observatory, Nauschny, Russia, nick@imp.uran.ru. [4]Moscow State University, Moscow, Russia, [5]Ural State University of Economics, Ekaterinburg, Russia

A systematic search for meteorites with a minimum degree of weathering and known trajectory has become possible in the recent decades because inexpensive digital CMOS and CCD cameras appeared on the market [1, 2]. Fireball observation helps to determine the fall area quite correctly. Creation of the Russian fireball network in the Ural Federal University was officially announced in early 2016. There are two types of network stations in the proposed design of the fireball network: "professional" and "amateur". Professional stations are to be located on the territory of educational or scientific organizations. These stations require separate buildings, stationary computers, high-quality digital cameras and fast and stable Internet connection. City buildings or astronomical observatories are good locations for the stations. The Kourovskaya Astronomical Observatory, the Sirius Educational Center and the Crimean Astrophysical Observatory were selected to host the professional stations for the first time.

Amateur stations are inexpensive, lightweight, located within 200 km of the main (professional) station and are served by amateur astronomers. Installation of fully automatic stations in Russia is not feasible due to the cold climate, high annual precipitation, insufficient illumination for solar cells and absence of the good Internet connection. In addition, the search for the meteorites in the remote locations, especially in the northern parts of the Russia, is difficult due to the lack of settlements and transport infrastructure there, even if the fall area was determined precisely enough.

In addition to the data from the stations, photos and videos provided by eyewitnesses are still used to analyze the trajectory. This allowed us to develop the network with minimal costs and in a short time.

In 2017, a specialized cloud service was created to gather and store data coming from cameras. The service had eased the task of data gathering, but the increased amount of the incoming data had led to a new task of the automatic fireball detection. The detection must occur on a client side in order to avoid the server overload. Therefore, the development and implementation of the appropriate detection algorithms had started. At the moment, we are developing adaptive self-learning algorithms. Considerable attention is being paid to the portability of the algorithms to different platforms, which will allow anyone to use the solution. We had also started developing a method for calculating fireball trajectories [3]. We use other objects (e. g. satellites, planes, meteors) to calibrate the method. At the moment, we are able to determine a fall area of a fireball within a day.

Due to the wide network coverage, we regularly receive information about events and eyewitnesses' footages. During the last two years, we detected a dozen fireballs that might have reached the Earth surface and calculated trajectories for all of them. Unfortunately, most of these fireballs were observed over the locations difficult to reach (e. g. taiga, marsh, remote areas). Nevertheless, one of the recent events was registered on March 6, 2018 at 22:58 local time near the city of Kataysk [4], which is quite convenient for searching. At the moment, the search expedition exploring the possible fall area. The fireball was registered by the All-sky camera of the Ural segment of the network, at the station located in the Irbit city. The detection allowed us to quickly calculate the fireball trajectory and send an expedition to the area. Eyewitnesses' evidence confirmed the correct choice of the search area and, thus, it can be argued that the Russian fireball network is actively functioning.

Acknowledgements: This work was supported by Act 211 of the Russian Federation, contract N02. AO321.00006 and the PROTOPLANETS Project. (K.N.A.) by State Task of the FASO of RF (Theme "Pressure" № AAAA-A18-118020190104-3).

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