

16th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Interactive Presentations - 16th IAA SYMPOSIUM ON SPACE DEBRIS (IP)

Author: Dr. Jiri Silha

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, jiri.silha@fmph.uniba.sk

Mr. Stanislav Krajčovič

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, s.krajcovic93@gmail.com

Dr. Juraj Tóth

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, Juraj.Toth@fmph.uniba.sk

Dr. Leonard Kornoš

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, Leonard.Kornos@fmph.uniba.sk

Dr. Jozef Világi

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, freevily@gmail.com

Mr. Pavol Zigo

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, Pavol.Zigo@fmph.uniba.sk

Mr. Jaroslav Šimon

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, Jaroslav.Simon@fmph.uniba.sk

Mr. Dušan Kalmančok

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, Dusan.Kalmancok@fmph.uniba.sk

Mr. Michal Hamara

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, michal.hamara@fmph.uniba.sk

Ms. Danica Zilkova

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, danizilkova@gmail.com

Mr. Ladislav Novak

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, novaklaci1996@gmail.com

Mr. Matej Zigo

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, matisak3@gmail.com

Dr. Frantisek Duris

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak Republic, fduris@dcf.fmph.uniba.sk

Mr. Viktor Nagy

Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak

Republic, viktor.nagy1995@gmail.com
Prof. Roman Durikovič
Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia, Slovak
Republic, durikovic@fmph.uniba.sk
Prof. Thomas Schildknecht
Astronomical Institute University of Bern (AIUB) / SwissSpace Association, Switzerland,
thomas.schildknecht@aiub.unibe.ch
Dr. Emiliano Cordelli
Astronomical Institute University of Bern (AIUB), Switzerland, emiliano.cordelli@aiub.unibe.ch
Dr. Alessandro Vananti
Astronomical Institute University of Bern (AIUB), Switzerland, alessandro.vananti@aiub.unibe.ch
Mr. Christophe Paccolat
Ecole Polytechnique Fédérale de Lausanne (EPFL), Swiss Space Center (SSC), Switzerland,
christophe.paccolat@epfl.ch
Mr. Abdul Rachman
Astronomical Institute University of Bern (AIUB), Switzerland, abdul.rachman@aiub.unibe.ch
Ms. Harleen Kaur Mann
Astronomical Institute University of Bern (AIUB), Switzerland, harleen-kaur.mann@aiub.unibe.ch
Dr. Maite Trujillo
European Space Agency (ESA), The Netherlands, maite.trujillo@esa.int
Dr. Tim Flohrer
European Space Agency (ESA), Germany, tim.flohrer@esa.int

SLOVAKIAN OPTICAL SENSOR FOR HAMR OBJECTS CATALOGUING AND RESEARCH

Abstract

In 2015 Slovakia became the 9th ESA European Cooperative State and the first calls were announced by ESA for the Plan for European Cooperating State (PECS). Within this call the Department of astronomy which is part of the Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava, Slovakia (FMPI CU) won an activity with a main goal to transform a 0.7-m Newton telescope (AGO70) dedicated to amateur astronomical observations to a professional optical system for regular support of the space debris tracking and research. This transformation includes the necessary H/W and S/W modifications. The presented activity is performed in cooperation with the Astronomical Institute of University of Bern (AIUB) and the foreseen end of activity is summer 2018. The AGO70 has been installed at the FMPI's Astronomical and Geophysical Observatory in Modra, Slovakia (AGO) in fall 2016. There are several objectives to be accomplished within the activity. It was necessary to adapt the low-level telescope control to the needs of space debris tracking. For the image processing software we have chosen a modular design. It contains several individual elements performing tasks such as objects search on the frames, centroiding, astrometric reduction and tracklet building. The observation planning has been developed according to the AGO70 system's H/W limitations with focus on GEO, GTO and GNSS like orbits. The output products delivered by the system are astrometric positions in international formats (CCSDS TDM and MPC), light curves and relative color indices obtained by using Johnson-Cousins BVRI filters. To proof the system capabilities, the whole activity is concluded with an observation campaign measuring AIUB's HAMR (High-Area-to-Mass-Ratio) objects and public TLE objects. The quality of the system's products is monitored by the AIUB via its state-of-the-art epoch bias and astrometric accuracy analysis routines. In this work we describe the AGO70 system's parameters before and after H/W and S/W modifications are performed. We will discuss our modular image processing pipeline and its components and their validation. We will also present the adapted observation planning, as well the detail description of the system's products. We will analyze the results of the observations campaign performed for several HAMR and GEO/GTO objects with a focus on the orbit determination (orbital elements and their change over time), the light curve analysis (apparent period extraction and change over time) and the description of surface properties trough the relative color indices.