Bachelor /Master thesis at the Astronomical Institute

Optimization of streak detection algorithm

MOTIVATION
One main research focus of the Astronomical Institute of the University Bern is the characterization of the space debris (defunct artificial satellites or related fragments) environment around the Earth. In the frame of a collaboration with the European Space Agency (ESA) several space debris observation campaigns are conducted. For these survey campaigns, optical observations are performed with the 1m ZIMLAT telescope and the 20cm ZimSMART telescope in Zimmerwald, and the 1m ESASDT telescope in Tenerife. An important step in the processing of the observations is the detection of the observed space debris object in the acquired CCD frame. The object appears in the frame as a spot or faint streak, the latter if the object has a relative motion during the exposure. While the human eye can usually easily identify the streak, the detection with an image processing algorithm turns out to be a challenging problem.

DESCRIPTION OF THE WORK
A very promising detection algorithm was developed at AIUB and possible improvements and optimizations are foreseen. In this work the existing algorithm has to be further analysed. Different parameters depending on the brightness or length of the streaks are used. These parameters have to be possibly justified on a theoretical basis. According to the obtained outcome the parameters will be fine-tuned and optimized.

The work will provide insight into the methods to observe and characterize artificial satellites and space debris. In view of the ongoing ESA and EU Space Situational Awareness (SSA) programs, as well as the current scientific research in the space debris and SSA community, the acquired expertise will provide the candidate an ideal qualification.