

University of Calcutta, Department of Applied Optics and Photonics

PH.D. PUBLIC VIVA-VOCE EXAMINATION

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Registered under the MoU between Calcutta University and Indian
Institute of Astrophysics
Title of the thesis: Development of UV astronomical instruments for balloon and space
payloads
Research supervisor: Prof. Jayant Murthy, IIA, Bangalore.
External examiner: Prof. S. Ravichandran , Christ University, Bangalore.
Date and Time: **Monday, 19 October 2020, at 14:30 hours**

Abstract

At Indian Institute of Astrophysics, we conduct high altitude balloon experiments for atmospheric and astronomical observations in UV wavelengths. To carry out observations of astronomical sources from a balloon platform, a fine pointing system is usually required. One of the prime requirements for such a pointing system is a precision attitude determination sensor. As part of this thesis, I have developed a sensor which determines its orientation with respect to a fixed inertial coordinate system using bright stars which are fixed in the sky and act as reference points, and hence called a star sensor. We estimated the requirements for the imaging system of the sensor and simulated the sky coverage of the sensor. We also made a MATLAB tool to evaluate the performance of various algorithms required to obtain orientation information from images. Such a sensor has wide application on satellites carrying telescopes, earth observation cameras and high gain directional antennae. The system was designed keeping in mind its applications on a balloon platform as well as its portability to a satellite platform. Calibration and testing of such a high accuracy sensor are critical to use it efficiently as a part of a pointing control system. In this thesis presentation, we describe the development, calibration and validation of the star sensor from block diagram to fabrication and the methods we used for its calibration. The electronics subsystem designed for the star sensor could be used to readout other image sensors and carry out native low level image processing tasks.

Meeting link:	Development of UV astronomical instruments for balloon and space payloads
Meeting number:	158 297 3000
Password:	td1910 (831910 from phones and video systems)
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All are welcome