



भारतीय ताराभौतिकी संस्थान
INDIAN INSTITUTE OF ASTROPHYSICS
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स्नातक अध्ययन मंडल **Board of Graduate Studies**

IIA - CU - PhD (Tech) Public Ph.D viva-voce examination

वक्ता **Speaker:** Deshmukh Prasanna Gajanan

शीर्षक **Title:** MODELING, SIMULATION AND IMPLEMENTATION OF PRIMARY MIRROR CONTROL SYSTEM FOR THE PROTOTYPE SEGMENTED MIRROR TELESCOPE

सार Abstract

The next generation large astronomical telescopes are primarily made of segmented mirrors and construction of such a telescope is a big challenge. It requires enormous amount of work to conceptualize various sub-systems, design, analysis, planning and execution. It also demands to prototype various critical subsystems like actuators, edge sensors, segment support, drive and control system, etc. To build a 10m class Segmented Mirror Telescope in India, several activities have been initiated at the Indian Institute of Astrophysics. As a first step towards realizing bigger telescope, development of a Prototype Segmented Mirror Telescope (PSMT) has been proposed. Design and development of the few critical subsystems linked with the control of segmented primary mirror of the PSMT are part of this Ph.D. thesis.

The focus of the thesis is primary mirror control system, which comprises local and global control systems. The first task undertaken is design and development of a soft actuator, based on a voice coil motor. Before realizing it, detailed modelling and simulation have been conducted to make sure that the concept is feasible. Then after a prototype actuator has been built. A customized precision controller has also been developed to control the actuator in closed loop mode. Varieties of experimentation conducted show that indeed the prototype actuator meets most of stringent requirements. Further to check the performance under dynamically varying disturbances such as wind force, a novel test equipment named Dynamic Loading Assembly has been developed. Through the tests conducted with the DLA, we ensured that the actuator is capable to reject wind induced disturbances.

In order to understand working of global control system of the PSMT and any other segmented mirror telescopes, we have developed a simulation tool called as the codeSMT. Creating the control matrix for any telescope made of many segment rings is cumbersome task. We have come up with an innovative generic scheme which can be used to generate the control matrix for any size SMT's. As a case study, the codeSMT is successfully tested in the PSMT active control simulation. It is also used to understand the effect of edge sensor noise/error on various deformation modes, expected to be present on the surface of a segmented primary mirror. Finally, an integrated local and global control system of the PSMT has been designed, implemented and tested in the laboratory.

बुधवार Wednesday 6, जनवरी January 2021

Time: 2:30 PM

Remotely online

सभी का स्वागत है All are welcome

Join Zoom Meeting

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