**Title: Evaluation of deployable Telescopes for Small Satellites on Asteroid Recon Missions**

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Detection of near earth asteroids (NEA) has become increasingly important for scientific and planetary defense applications. Currently most NEA detection is conducted with ground based telescopes due to cost and logistical constraints. However, these stations can be limiting due to atmospheric disturbances, light pollution, and increasing amounts of space debris in orbit. In this work, we propose an orbiting deployable telescope for asteroid reconnaissance. The optical elements will be packaged into a CubeSat for efficiency. The use case for this technology would be to fill a capability gap in detecting NEAs with very low albedo. The objective of the project is to demonstrate the capability to detect NEAs approximately 0.3AU from earth with albedos between 0.05 and 0.1 for scientific and planetary defense applications. This work also aims to demonstrate tensegrity inspired mechanical deployment technologies in volume constrained environments maximizing both aperture and focal length.

The proposed telescope integrates into a standard 12U CubeSat bus, of which 8U are reserved for the payload. Sizing of the optics was synthesized from requirements on sensing the physical parameters and location of the NEAs mentioned above. A 6-inch Schmidt-Cassegrain primary mirror was selected due to its low cost and ease of integration with our mechanical design. The secondary mirror was replaced by a HyperStar lens from Starizona which allows the sensor to be mounted where the secondary mirror would be. This gives the system a F/2 ratio with a focal length of 300mm. A tensegrity inspired design was developed based on a 2-stage deployable structure with rods in compression counteracted by servo actuated strings in tension. Alignment of the optics is achieved through control algorithms prototyped on a raspberry pi single board computer. The mechanical design thus far has been an iterative process with special attention paid to static and dynamic load considerations during launch and deployment of the system.

The results have shown the feasibility of tensegrity inspired deployable structures while maintaining accuracy for optical alignment. If needed, the capability of realignment has been demonstrated. Recent work has seen the prototype validate the optical requirements through earth-based simulation with similar conditions expected in space. Mechanical requirements have been validated through deployment testing, and the alignment of the optics have been demonstrated.