Constellation Cube Satellite Avionic Systems Test Platform

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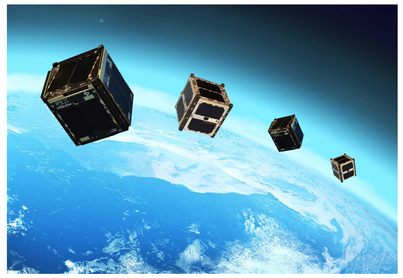
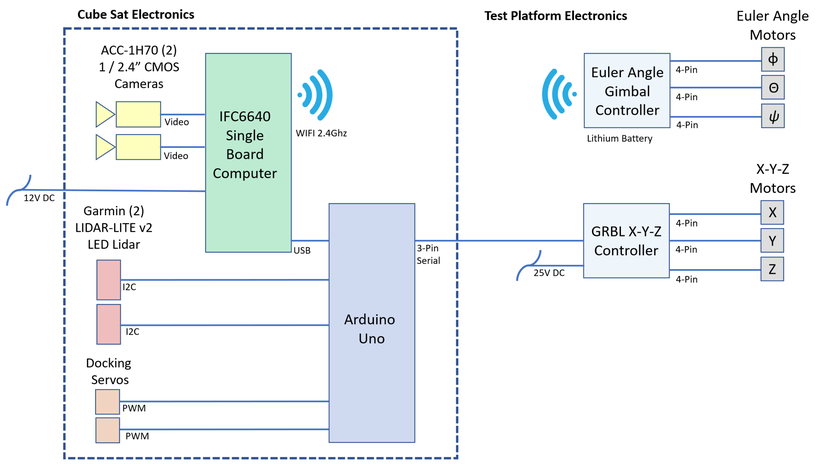
ABSTRACT

Constellation Cube Satellites require a wide suite of integrated avionic systems for constellation flight. By use of a Test Platform, critical segments can be developed, programmed, and physically tested individually on the ground before space flight. Optical systems including cameras and LIDAR are used as inputs to drive "navigational system" XYZ translation and Euler angle motors based on preprogrammed functions. Functional testing includes optical tracking, distance detection, navigational flight controls, and rendezvous docking sequencing. This work provides the University of Nevada Las Vegas with means to progress Cube Satellite research.



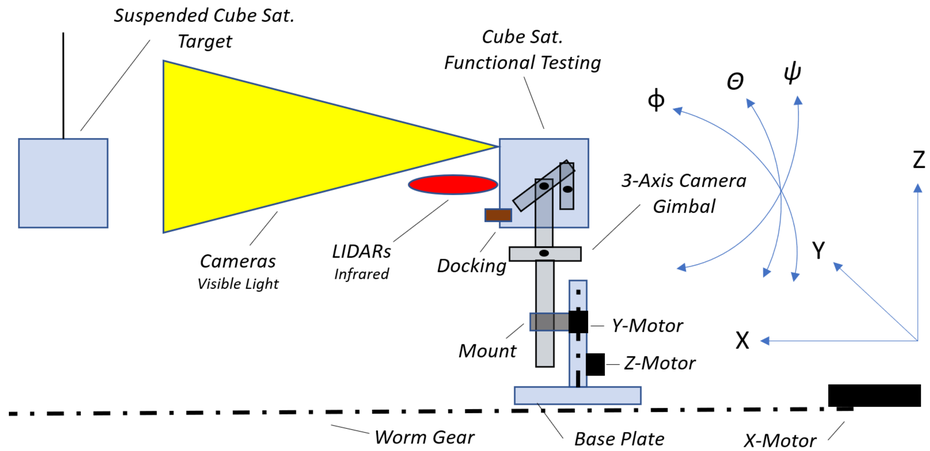
OBJECTIVES

- Single Board Computer – IFC 6640 (Linux, Android 9)
- Optical Tracking
- LIDAR Distance Detection
- Arduino Interface
- 3-Axis Camera Gimbal Control
- XYZ – Translation Control
- Docking



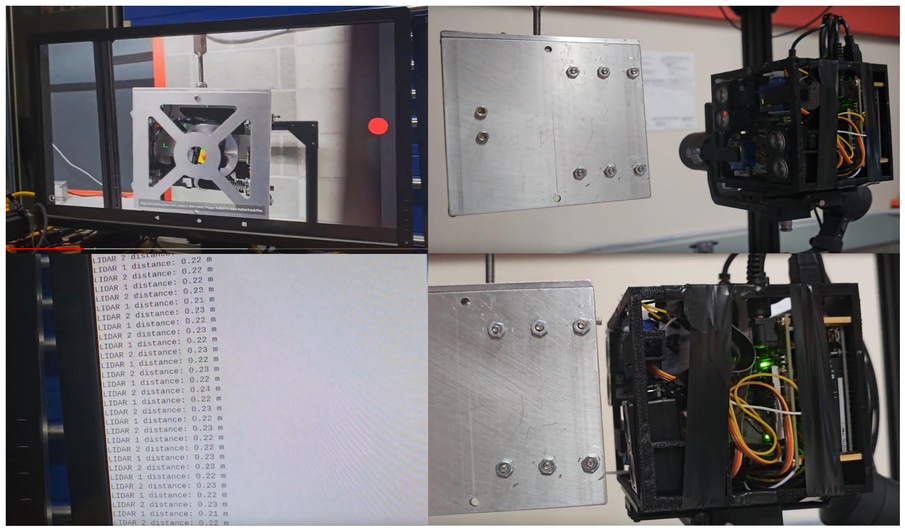
METHODS

The approach used to develop proof of concept systems are integrating working consumer systems. The XYZ translation motion is derived from a 3D printer assembly and a GRBL Controller. The Euler angle motion is provided by a 3-Axis camera gimbal and DJI Ronin Software. Central computer, IFC6640, handles image processing and interfaces to all systems on the Cube Satellite. An Arduino Uno is used to drive GRBL controllers.



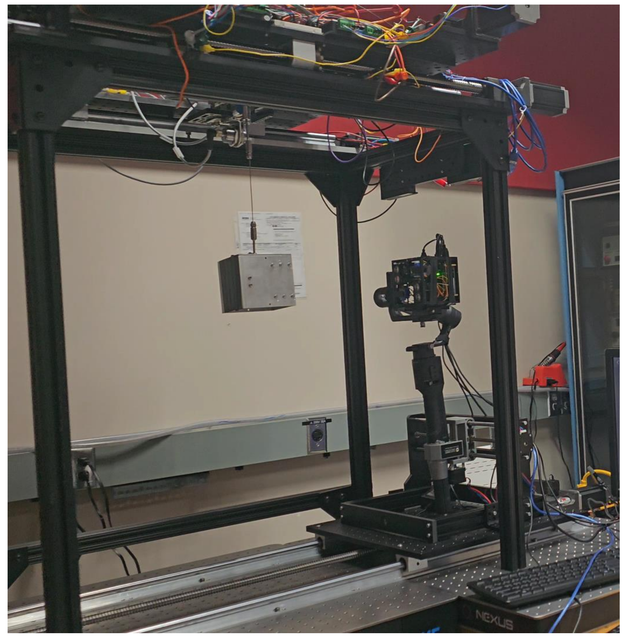
RESULTS

The team was successfully able to develop, program, and test all critical avionic systems collimating to a docking sequence with test mechanical servos. Successful tests of optical tracking and LIDAR distance detection have been achieved up to 2 meters. Successful docking sequencing has been observed at 100-millimeter LIDAR accuracy.



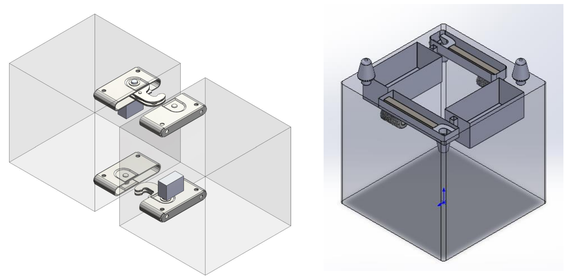
CONCLUSIONS

Further Cube Satellites developments are now possible at UNLV thanks to a function integrated test platform. Further planed functionally include dual docking Cube Satellites and system specific calibration tests. Additional pieces of equipment, sensors, and systems will be easily integrated to current setup.



FUTURE

Integrated docking mechanisms will be the next system added to the test platform. This will require specific functional programming and reporting requirements.



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