

Title: Robust Targeting for the Smartphone Video Guidance Sensor

Abstract (250 word): The Smartphone Video Guidance Sensor (SVGS) is a miniature, self-contained autonomous rendezvous and docking sensor developed using a commercial off the shelf Android-based smartphone. It aims to provide a miniaturized solution for rendezvous and docking, enabling small satellites to conduct proximity operations and formation flying while minimizing interference with a primary payload. Previously, the sensor was limited by a slow (2 Hz) refresh rate and its use of retro-reflectors, both of which contributed to a limited operating environment. To advance the technology readiness level, a modified approach was developed, combining a multi-colored LED target with a focused target-detection algorithm. Alone, the use of an LED system was determined to be much more reliable, though slower, than the retro-reflector system. The focused target-detection system was developed in response to this problem to mitigate the speed reduction of using color. However, it also improved the reliability. In combination these two methods have been demonstrated to dramatically increase sensor speed and allow the sensor to select the target even with significant noise interfering with the sensor, providing millimeter level accuracy at a range of two meters with a 1U target.