On-Board Perception System For Planetary Aerobot Balloon Navigation

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NASA's Jet Propulsion Laboratory is implementing the Planetary Aerobot Testbed to develop the technology needed to operate a balloon Aerovehicle Robotic (Aerobot) system. This earth-based system would be the precursor for aerobots designed to explore Venus, Mars, Titan and other gaseous planetary bodies.

The on-board perception system allows the aerobot to localize itself and navigate on a planet using information derived from a variety of celestial, inertial, ground-imaging, and radiometric sensors. This paper discusses the various sensing modalities available to the aerobot, their applicability to different planetary missions, and the outline of a perception architecture suitable for whole planet aerobot operation. The implementation of an initial sensor suite of the Planetary Aerobot Testbed will be discussed in some detail. This initial implementation includes inertial sensors for attitude, attitude rate and lateral motion estimation, as well as a sun sensor for direct attitude determination. It also includes a 1D101 and imaging system for ground-track velocity estimation. GPS and magnetic compass data is used to determine groundtruth information.