DEVELOPMENT OF A LUNAR ASTRONAUT SPATIAL ORIENTATION AND INFORMATION SYSTEM (LASOIS). R. Li[1], B. Wu[1], B. Skopljak[1], S. He[1], A. Yilmaz[2], J. Jiang[2], M. Banks[3], and C. Oman[4], [1]Mapping and GIS Laboratory, The Ohio State University Dept. of Civil & Env. Eng. & Geodetic Science, 470 Hitchcock Hall, 2070 Neil Avenue, Columbus, OH 43210-1275 [li.282@osu.edu], [2]Photogrammetric Computer Vision Laboratory, CEEGS, The Ohio State University, [3]Visual Space Perception Laboratory, University of California, Berkeley, [4]Man Vehicle Laboratory, Massachusetts Institute of Technology

In future manned lunar missions, the ability of surface-based astronauts to remain spatially oriented on the lunar surface could have serious impacts on mission success and safety. It is highly desirable to develop technologies to enhance the spatial-orientation capabilities of astronauts on the Moon. With funding from NASA's Human Research Program and the National Space Biomedical Research Institute (NSBRI), the Mapping and GIS Laboratory at The Ohio State University is developing a Lunar Astronaut Spatial Orientation and Information System (LASOIS) collaborating with University of California, Berkeley, NASA Glenn Research Center, and Massachusetts Institute of Technology. The LASOIS system is based on an integrated sensor network and advanced spatial information technologies. It will provide astronauts with a "GPS-like" system with "continuous" navigation information.

This paper presents the initial efforts and results in development of a prototype of the LASOIS. Input measurements from all available sensors including stereo cameras, MEMS IMUs, step sensors, beacons, and orbiter imagery will be integrated using an extended Kalman filter. The optimized spatial information and derivatives will be provided to Lunar astronauts through a wrist-mounted OLED (Organic Light-Emitting Diode) interface. A set of tests of the LASOIS prototype system were performed at The Ohio State University. For example, a trajectory was derived using a MEMS IMU and a step sensor. Comparing the derived trajectory to a trajectory determined using GPS, a disclosure of 11 m for a traverse of 122 m was obtained (9%). By incorporating additional observations from stereo cameras and beacons, we expect that an improved localization accuracy of less than 2% can be achieved. This paper will also present the results from a systematic field analolog test for the LASOIS prototype in a moon-like environment at Moses Lake, Washington.