The Bush administration’s 2004 Vision for Space Exploration launched NASA on a challenging new mission to resume both robotic and manned exploration missions to the celestial bodies within our solar system, including the creation of sustained human habitats on both the Moon and Mars. Tragedies involving Challenger, Columbia, Apollo 7, and the near tragedy of Apollo 13 exemplify that space exploration is a dangerous endeavor, posing extreme environmental conditions on both equipment and personnel. NASA, the National Science Foundation, and numerous independent researchers indicate that predictive simulations have the potential to decrease risk and increase efficiency and effectiveness in space exploration activity. Real-time simulations may improve the quality of the response in a real-time crisis situation.

The US Army developed Layered Terrain Format (LTF) database is a unique architectural approach that provides high fidelity representation of terrain that can be used to conduct simulations using that terrain far more rapidly than existing technologies and in some cases in real-time or near real-time. This dissertation investigates the question; can the unique LTF database architecture be applied to the general problem of celestial body representation? And if so, what benefits might it bring? Due to research limitations, this research investigates these questions through a lunar analog setting involving S-band and earth-bound communication signals as might be needed to conduct manned and/or robotic mission on the moon.

The target terrain data set includes portions of the Black Point Lava Flow in Arizona which will be used for NASA’s 2010 Desert RATS analog studies. Applied Research Associates Inc, the developer of the LTF product, generated Black Point databases and made limited modifications to the LTF Viewer tool used for visualization of the database. The Florida Space Research & Education Grant Program sponsored by FSGC, Space Florida and UCF provided a grant of $31,500 to perform this research.

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The public is welcome to attend.