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**Use of a Telerobotic Simulation System (TSS) for Testing Limitations of Explorability due to Frame Rate**

The use of low-latency surface telerobotic vehicles has the potential to be a game-changing method for inexpensive and efficient scientific exploration of our solar system. Low-latency surface telerobotics involve a fleet of vehicles located on the surface of planetary bodies that are operated by astronauts in orbit. The key component of this method is that the operators are in orbit which significantly reduces the latency that would otherwise occur due to operating from Earth. This creates a low-latency virtual human presence on a planetary surface regardless of how far the planetary body is from Earth. As a result, scientific discovery can be achieved at similar speeds to a human-surface mission with reduced costs. The use of low-latency telerobotics will be most beneficial for scientific exploration of Mars due to the limitations imposed by the distance from Earth to Mars; however, there are also many immediate applications for low-latency telerobotics on the Moon. The Orion program intends to send astronauts to cis-lunar space early in the next decade as part of the “Proving Ground” phase of NASA’s Journey to Mars. The use of low-latency surface telerobotics on these missions serve as an excellent method for scientific exploration of the Moon while also demonstrating the ability for humans to operate and survive in deep space. We developed the Telerobotics Simulation System (TSS) to test the feasibility of low-latency teleoperations on the lunar surface from the Orion crew vehicle (and a potential habitat). The TSS is capable of varying the connection conditions between a station or deep space gateway and a remote rover to test the limits of the rover’s operability under different conditions. We designed an experiment using the TSS to test how variability in frame rate affects an operator’s ability to explore an unfamiliar environment using low-latency surface telerobotics. In this experiment, operators remotely controlled a rover in search of “interesting objects” at different frame rates. We measured the time to discovery against frame rate and determined there is a statistically significant difference when decreasing the frame rate. This indicates that 5 frames per second (FPS) is the minimum frame rate required for effective telerobotic exploration using rovers traveling at approximately 3 mph.