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Plan Execution, Monitoring, and Adaptation for Planetary Rovers

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Abstract

Planetary rovers must perform their missions in unknown environments with limited communication to ground controllers. To endow a rover with the capability for robust autonomous operation, we have designed an on-board executive architecture that incorporates robust flexible operation, monitoring of system and environmental state, and limited plan adaptation. The rover executive receives a plan with flexible time and resource contraints along with local and global contingency plans to handle deviations from the nominal plan. It internally monitors plan execution for communication and execution failures; through sensors and models of its operation it determines its internal state, its resource usage, and its interaction with respect to the environment. Based on the information it gathers from the sensors, it chooses the most appropriate course of action, potentially inserting contingency plans into its current plan, thus adapting its plan to fit the current situation.

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