

# Robotics and Autonomous Systems Thesis Defense

## Optimal Control for Lunar Tumbling Robot

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### Abstract

The Cubebot is a hermetically sealed, cube-shaped lunar robot that locomotes via three orthogonal, internal flywheels and three solenoid brakes. The sudden braking causes discontinuities in the Cubebot's dynamics that are best described using a hybrid system framework. Due to the irregular methods of locomotion, the limited resources on the lunar surface, and the mission objectives, optimal control profiles are desired to minimize cost functions such as time, energy, and impact velocity during different maneuvers. This paper details the modeling of the robot's hybrid dynamics, the construction of an optimization tool, and an analysis of the optimization results.



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Zoom Link: <https://asu.zoom.us/j/83289223939>