Project Cosmotron

Mars Rover Competition

University of Moratuwa - Team G_Mora Cosmotron

COMPREHENSIVE DOCUMENTATION

1. Project Overview ■

The Cosmotron Competition simulates a Mars exploration mission. Our autonomous rover must navigate from the Verdant Outpost (Green Zone), follow AprilTag Pathfinder Flags, reach the Crimson Impact Site (Red Platform), retrieve the Argentis Asteroid, and store it in the cargo compartment.

2. Hardware Components ■■

2.1 Six-Wheel Differential Drive

Component	Specification	Rationale
Drive Type	6-wheel differential	Better traction on Martian terrain
Suspension	Rocker-bogie	Maintains contact over obstacles
Max Velocity	0.6 rad/s	Precision control
Motors	6x DC Motors	Redundancy if one fails

2.2 Sensor Configuration

Thresh

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OBSTACLE_CRITICAL = 300 # Emergency stop
OBSTACLE_WARNING = 600 # Slow down
OBSTACLE_PASSABLE = 350 # Drive over small rocks
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3. Software Architecture ■

The robot runs on a Finite State Machine (FSM). Key states include:

State Name	Function
INITIAL_SCAN	360 rotation to find first flag
FOLLOW_FLAG	Track and approach detected flag
STOP_AT_RED	Arrived at Crimson Impact Site
PICKUP	13-phase arm pickup & store sequence
AVOID_OBSTACLE	5-phase avoidance algorithm

4. Future Modifications ■

• Hardware: Add wheel encoders for odometry.

• Hardware: Add Force/Torque sensors for grip feedback.

• Software: Implement Kalman Filter for sensor fusion.

• Software: Upgrade to SLAM for unknown environment mapping.