

## Development of a Three-Dimensional-Flywheel Robotic System

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**Abstract :** In this paper, a new design of spherical robotic system based on the concepts of gimbal structure and gyro dynamics is presented. Robots equipped with multiple wheels and complex steering mechanics may increase the weight and degrade the energy transmission efficiency. In addition, the wheeled and legged robots are relatively vulnerable to lateral impact and lack of lateral mobility. Therefore, the proposed robotic design uses a spherical shell as the main body for ground locomotion, instead of using wheel devices. Three spherical shells are structured in a similar way to a gimbal device and rotate like a gyro system. The design and mechanism of the proposed robotic system is introduced. In addition, preliminary results of the dynamic model based on the principles of planar rigid body kinematics and Lagrangian equation are included. Simulation results and rig construction are presented to verify the concepts.

**Keywords :** gyro, gimbal, lagrange equation, spherical robots

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