

## Gyrobot

Investigator: Worapat Nukulwuthiopas

Recently, both wheeled and legged robots gain much interest from researchers around the world. Hybrid legged/wheeled robots have been invented to increase their mobility. However, limitation is still exist in term of motion planning which requires intensive calculation and real-time computation such that robots can traverse through obstacles. At present, there are delays in computation due to insufficient performance of computers and therefore robots can not move as fast as they are mechanically able to.

Center of Operation for Field Robotics Development (FIBO) at King Mongkut's University of Technology Thonburi (KMUTT) has initiated a new research project in mobile robotics using gyroscopic effect is to stabilize and control its body and headings. This concept proposed by Benjamin Brown H. and Yangsheng Xu at Carnegie Mellon University. Stabilization is maintained in roll and vertical direction against disturbance from irregularity of terrain. This robot so called Gyrobot has an internal driving unit with a wheel-like cover, and therefore it would not be stuck by any obstacle. Such a robotic geometry simplifies motion planning and enhances reliability in faster motion. Consequently, this new concept is another robotic solution in exploring complicate environment.

The Gyrobot is dynamically stable when speed of its internal gyro reaches the conditioning threshold. The gyroscopic effect leads to not only stabilizing and balancing of the Gyrobot, but also steering to track desired trajectory. Autonomous control can be achieved by further research and study in rolling without slipping. We will formulate equations of motion with nonholonomic constraints resulting from the difference

between the number of generalized coordinates and the number of degrees of freedom.

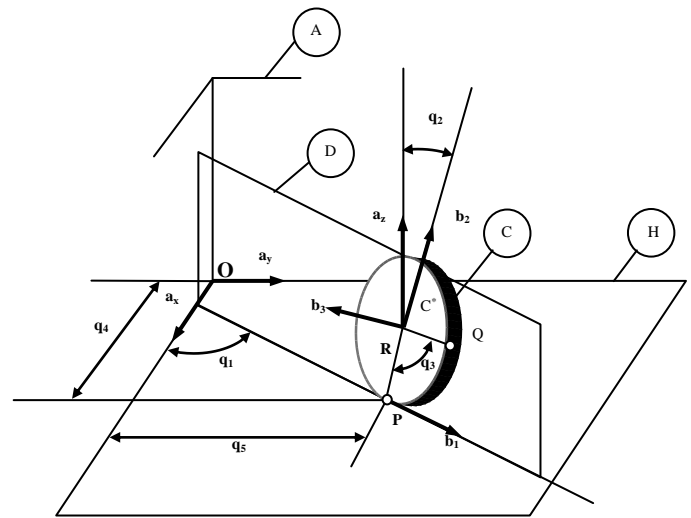


Fig. 1 A uniform disk rolling without slipping on a horizontal plane along a desired trajectory.

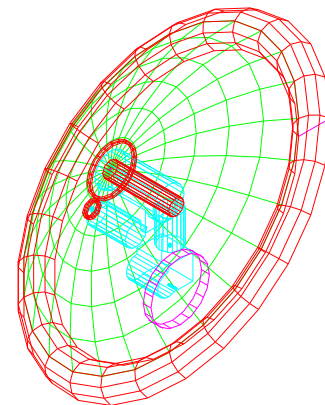


Fig. 2 Mechanism of the Gyrobot has an internal driving unit with a wheel-like cover.