

Control of Spherical Robot with Sliding Mode

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Abstract : A major issue with spherical robot is its surface shape, which is not always predictable. This means that given only the dynamic model of the robot, it is not possible to control the robot. Due to the fact that in certain conditions it is not possible to measure surface friction, control methods must be prepared for these conditions. Moreover, although spherical robot never becomes unstable or topples thanks to its special shape, since it moves by rolling it has a non-holonomic constraint at point of contact and therefore it is considered a non-holonomic system. Existence of such a point leads to complexity and non-linearity of robot's kinematic equations and makes the control problem difficult. Due to the non-linear dynamics and presence of uncertainty, the sliding-mode control is employed. The proposed method is based on Lyapunov Theory and guarantees system stability. This controller is insusceptible to external disturbances and un-modeled dynamics.

Keywords : sliding mode, spherical robot, non-holonomic constraint, system stability

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