# Dynamic Modeling and Analysis of Omnidirectional Wheeled Robot: Turning Motion Analysis

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*Abstract*—This paper presents the dynamic modeling of four-mecanum-wheeled mobile robot (4MWMR) to be assessed for frequent turning motion. Overdriven factor in this kind of vehicle motion is one of the issues that need to be tackled for safety and energy efficiencies reasons especially in its turning region. Therefore, this study has taken initiative to analyzing 4MWMR through a structure of mathematical model starting from the inverse kinematic calculation. Moreover, the dynamic model of 4MWMR was calculated using Euler Langrange approach as a part of the model for torque and force assessment. The analyses are done by using the data history of the experiment of an actual 4MWMR platform as trajectory input to kinematics and dynamics model that connected with 4MWMR transfer function plant. Finally, the performance of 4MWMR parameters; wheel velocity, torque and vehicle axial forces; are demonstrated. From the sample of turning point input the results shows that 4MWMR performing different speed of wheels at different poles during turning session as well as torques. Vehicle longitude force shows the highest since the vehicle is holonomic system used more force on longitude and latitude axes instead of rotational force on body.

*Index Terms*—Omnidirectional Wheeled Robot; Mecanum Wheels; Kinematics Model; Dynamic Model; Turning Motion.