

MOBO 2.0 An Omnidirectional wheeled Mobile Robot

Investigator: Rawichote Ch., Kamol J., Panet C., Pattanapong T.

Mobo-2 is a wheel-type mobile robot, which can move to any direction using “omnidirectional wheels”. Mobile robots are always categorized into two groups: wheeled-robots and legged-robots. Legged-robots have advantage over wheeled-robots for moving on very rough surface. For smooth surface, wheeled-robots are always quicker than legged-robots. Wheeled-robots have no problem of stability or balance as always occurred in legged-robots. Mobo-2 was designed for moving on smooth factory floors. It can avoid obstacles on the floors with high mobility using omnidirectional wheels. Mobo-2 can be effectively used for investigation or maintenance of hazardous areas such as nuclear power plants.

Each wheel of Mobo-2 has small passive rollers aligning 45 degrees around its large wheel as shown in the picture below. When Mobo-2 moves forward or backward, wheels rotate as normal wheels. When left and right wheels move in opposite directions, Mobo-2 move to left or right directions immediately.

This is a result of screw motion. Mobo-2 has four independent drive systems for moving its wheels. Velocity of each wheel is controlled by a motion control processor. When Mobo-2 performs a complex trajectory, the main processor will compute velocities of each wheel. Set points will be subsequently transferred to each motion control processor.

A challenge problem of this research is the kinematic redundancy. Mobo-2 has four degrees of freedom (four independent motor drive systems), while only three degrees of freedom are required for manipulating things in two-dimensional plane. Then the degrees of freedom of Mobo-2 exceed degrees of freedom of manipulation in plane. Sophisticated mathematical equations of motion in plane and wheel velocities have been derived as an important step leading to efficient control of this mobile robot



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