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Advanced Navigation for Dynamic Robot-Environment Interactions

This invention enables a wheeled mobile robot to physically interact with dynamic environments. Thus, unforeseen collisions are sensed and mechanically dampened by novel motion control architectures, which elegantly circumnavigate detected obstacles, such as humans or objects. Finally, directional changes are indicated by sophisticated turn maneuvers that decisively improve robot-human interactions.

BACKGROUND

Latest robotic applications under real-life conditions require the safe intuitive performance of autonomous and human-guided tasks, such as material handling, patrolling, rescue operations, disaster relief, and others. Therefore, mobile robots must be capable of cautiously navigating in different static and dynamic environments, which include people and vehicles in motion.
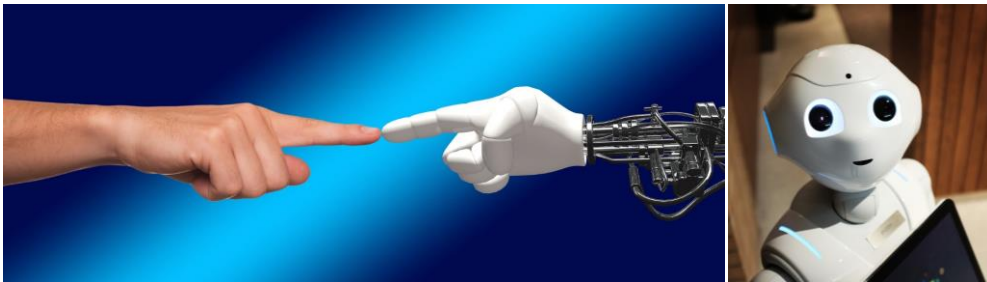
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The proposed technology facilitates the direct physical interaction of a holonomic mobile robot with its environment by specific collision detection and absorption. Typical operations require at least two actuated independently steerable driven wheels with offset. Given that the impact of the collision determines the proper steering angle, the vehicle is precisely navigated to actively steer away from the obstacle. However, irrespective of the driving direction, the robotic body can turn around the vertical rotation axis of the device and thereby signal intended directional changes beforehand. This is especially useful for human-robot interaction.

ADVANTAGES

- o Collision reactive robot navigation in dynamic environments
- o Early signaling of directional changes
- o Enhancement of human-machine interaction