Vision-Based Mobile Robot Navigation for Vibro-Tactile Human-Centered Guidance

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We present a system prototype for assisted indoor navigation. It relies solely on portable vision-sensors and its implementation is based on established robotic concepts for autonomous localization and navigation. Our system takes advantage of state-of-the-art computer-vision methods and is realized within the robot operating system (ROS). To utilize the methods for human navigation assistance, we employed a vibro-tactile belt to serve as guiding device. Vibro-tactile guidance by directional signals via vibration motors placed equidistantly around the waist have been shown to be intuitive and even circumvent the bottleneck of attention, making them a primary choice for non-vision guided navigation and orientation. We investigated with blindfolded participants several feedback stimulation profiles that were derived from a real-time motion planner for optimal user-guidance. Our prototype system demonstrates that a purely artificial vision-based system can assist human navigation tasks in indoor scenarios, and in combination with a suitable information output unit can potentially even support the visually impaired on an everyday basis in a human-centered way.