VisionGuard: Control Hardware-Based Autonomous Driving for Enhancing Walking Safety and Mobility of the Visually Impaired

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Visually impaired individuals encounter numerous challenges while walking. Navigating unfamiliar paths without a caregiver's assistance is daunting, and despite various walking aids, the risk of near-fracture injuries from collisions, occurring about 4 times per year, remains unaddressed. Moreover, visually impaired individuals' walking time is nearly 6 times longer due to incorrect path selection and slower speeds. By incorporating autonomous driving concepts into walking aids for the visually impaired, we have effectively tackled these issues. We made two significant contributions during this process. First, we developed an efficient autonomous driving algorithm based on Bird's Eye View (BEV), enabling cost-effective implementation. Second, we introduced unique hardware for Active Intervention, making direct walking control, previously considered unattainable, possible. We conducted tests under various conditions, including 50 indoor trials, 10 outdoor trials, and 10 trials in unique situations, yielding the following results: For less than $120, we reduced collision risk tenfold and cut the time to goal by 4 times, enabling visually impaired walkers to navigate with 80% of the performance of normal individuals. Furthermore, we effectively responded to previously unmanageable situations, such as sudden appearances. Additionally, introducing autonomous driving and Active Intervention resulted in a 50% reduction in collision risk and a threefold increase in time to goal compared to traditional methods relying on audio or vibration feedback.

Awards Won:
Fourth Award of $500