Review of: "Design and Realization of a Low-Cost Smart Walking Aid for Visually Impaired and Blind People"

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Potential competing interests: No potential competing interests to declare.

Objective

This paper aims to develop an affordable smart walking aid for the visually impaired and blind. It introduces a novel design comprising a stick and glasses, each equipped with ultrasonic sensors, and additional components like buzzers and a vibrator on the stick, and an extra sensor on the glasses. These are integrated with a microcontroller for real-time feedback on obstacles. The system also features a hand-piece with buttons and a GPS+GSM module for emergency alerts.

Contributions

The work reviews advancements in walking aids from 2005 to 2017 and introduces a new design, detailed through illustrations, schematics, and a prototype image. The authors evaluated the smart stick's error rates in detecting water and obstacles, presenting these findings.

Methodology and results

The article claims comprehensive testing of the ultrasonic and water sensor systems in the walking aid, focusing on their obstacle detection accuracy. The performance metric is the false positive rate, affected by the sensor's distance to obstacles and water height.

The results show a 2% to 8% false error rate for distances of 20 cm to 200 cm between the sensor and obstacle. Additionally, a false positive error rate of 2% to 2.5% was observed, depending on water height.

Suggestions

1. The authors highlight the design's affordability, responsiveness, efficiency, lightness, and water detection capabilities. The paper should assess these features and compare them to current state of the art.
2. The stated power consumption (20-30 watts) seems high considering the used components. This needs verification or discussion on battery life implications.
3. The added components' impact on wearability also warrants discussion.
4. Expanding the 'Performance Evaluation' to include other metrics like true positive and false negative rates could offer a more comprehensive system assessment.

5. Also consider the object movement, size, and the sensors' field of view in the performance evaluation.
6. The flowchart in Figure 4 needs revision. It currently suggests that the GPS module initialization is looped, but sensors are sampled until an obstacle is detected, which then triggers an indefinite alert. This is not a practical application.
7. Potential interference between multiple ultrasonic sensors should be addressed.

Conclusion

This work is significant for potentially improving the lives of visually impaired and blind individuals. However, the design and testing methodology require further refinement to substantiate the authors' claims. Future work should address these gaps and include real-life user tests to evaluate the system's practical benefits.