Leveraging Street Cameras to Support Outdoor Navigation for Blind Pedestrians
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Abstract
In this work, we are exploring the use of street cameras to leverage support for outdoor navigation for blind low vision (BLV) pedestrians. BLV people use GPS-based apps such as BlindSquare, but these apps do not give users real-time, precise information which is crucial for safe navigation. We hope to address the common challenges that BLV pedestrians face when navigating in urban environments by developing a street camera-based navigation system using computer vision that provides real-time auditory feedback.

Research Questions
RQ1. What aspects of outdoor navigation is challenging when using GPS-based assistance?
RQ2. How can a street camera-based system be designed to address these challenges?
RQ3. To what extent do street camera-based navigation systems address these outdoor navigation challenges?

Methods
Formative Study
- Computer Vision System
- IOS Development
- Identify pain points in outdoors navigation for BLVs
- Use object detection with street cameras for veering and obstacle avoidance
- Develop mobile app to deliver navigation

IN PROGRESS

Pilot Study
- Test out system with small group of participants

User Study
- Structured study with system

Results
From our formative studies, we found that there are three main challenging aspects of outdoor navigation for BLV pedestrians: 1) anticipating environment layouts, 2) avoiding obstacles, 3) crossing street intersections safely. Therefore, we have designed a system to address these challenges by using street cameras to aid BLV users as they navigate.
1) Implemented map scrubbing feature
2) Street camera obstacle detection
3) Audio/haptic feedback for safety

Conclusion
In conclusion, our research team addressed major challenges that BLVs face when navigating outdoor environments by developing an app using street cameras and computer vision. In upcoming weeks, user studies will be conducted to attain insightful findings on our overall system, by identifying technical issues and necessary improvements to be made. We will compare our system to baseline navigation techniques. Our aim is to understand the extent to which street cameras can be used to support precise and real-time outdoor navigation.

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