CPS: Synergy: Image-Based Indoor Navigation for Visually Impaired Users

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Challenge:

- Severe visual impairment preclude independent navigation in unfamiliar indoor spaces without assistance
- Existing approaches require deployment of tags or access points, which is impractical in many settings

Solution:

- Develop new CPS technology for PERCEPT-V, a vision-driven, smartphone-based indoor navigation system
- User can navigate in open spaces without requiring retrofit of the environment.

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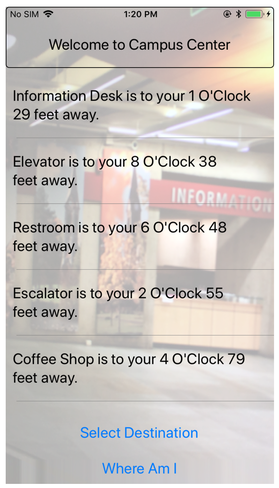
Image-Based Localization and Orientation

- Background Extraction via Low-Dimensional Models
- Keypoint Foreground/ Background Classification
- Confidence Measures for Image-Based Localization

Design of Customized Navigation Instructions

- Graph and Path Generation
- Computation of Navigation Instructions
- Orientation and Mobility Considerations



Scientific Impact:

- **Image-based indoor localization** under limited control of image capturing, reduced availability of localization features.
- **Customized navigation instructions** for users with diverse levels of confidence, visual acuity, capability
- **Validation** via two-part usability study with ~10 visually impaired participants

Broader Impact:

- Increased independence of sight-impaired population
- Increased awareness and applicability of wearable technologies
- Additional applications for scenarios in disaster management and crowd control
- Related efforts in smart & connected cities, IoT