Transportation Gaps and Disability-Related Unemployment: Smarter Cities and Wearables combating Commuting Challenges for the Blind

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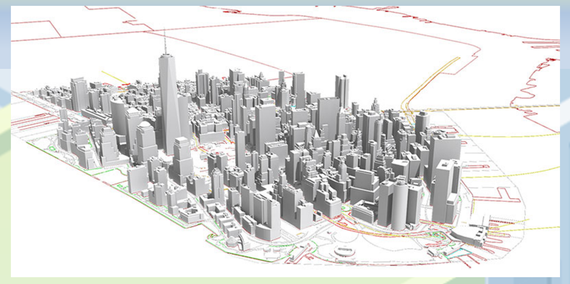
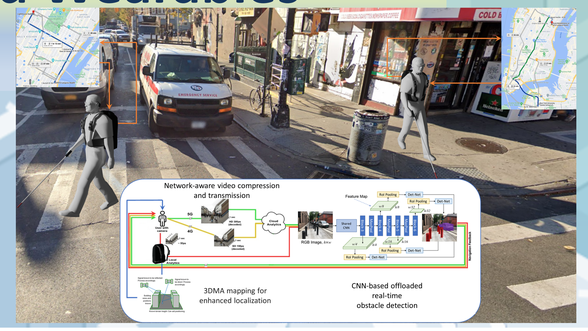
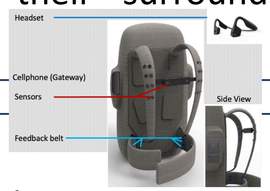
(SCC-IRG Track 2 , FY2020)





• Problem & Goal

- The employment rate is low for persons with visual impairment (VI). Studies have reported unemployment rates at 81%.
- A critical impediment to employment involves difficulties with transportation when commuting to and from work.
- Solving the social problem of unemployment for the VI calls for a convergent research approach focused on commuting challenges.
- Goal: to address these commuting challenges by creating new connections between VI residents and their surrounding environment.



• Intellectual Merit

- Wearables with real-time function in urban environments require computer vision that hinges on rapid scene reconstruction, semantic segmentation, and object detection in an extremely varied and complex setting.
- Cloud-based processing of the visual signals introduces further challenges in video compression and transmission due to the extremely short latency requirement and the highly varying throughput and delay of wireless networks.
- Our research has been conducted at the intersection of science, engineering and smart and connected communities pushing the boundaries of computer vision, machine learning, video compression, wireless transmission, human factors, and spatial positioning, in an effort to improve VI navigation and mobility.

• Project activities to date

- We were informed by the community that commuting challenges are particularly important around anchor locations. One such location is Lighthouse guild (LG). Thus, we have collected a robust series of navigation videos from our wearables that detail challenges encountered when traveling between transportation access points and LG. The outcome is a video database.
- We have also reviewed videos with orientation and mobility instructors and the DOT, resulting in a scorecard for behavioral responses during commuting.

• Broader Impacts: Immediate impact

Our work will increase the safety profile and ease-of-use of the **VIS⁴ION** platform toward 'connected' dynamic navigation in complex urban environments, providing a new level of security to the end user and breaking down significant barriers to employment and social interaction. Simultaneously, end users will serve as data collection nodes, aggregating spatial information that is uploaded to city agencies.

• Broader Impacts: Sustainability

As the platform scales, VI users will be capable of more fully participating in social activities, increasing their physical activity and social well-being. These gains will enhance agency and substantively improve quality of life.

• Next steps (from many)

- ➢ Transform building models into skymasks (satellite visibility relative to building geometry) → pilot localization approach with data in NYC → minimize computational load for real-time execution → deploy for initial testing
- ➢ Develop wireless network simulation in realistic environments → integration of **VIS⁴ION** in the COSMOS (5G) testbed
- ➢ Collect an expanded video dataset for commuting → review this information with experts in O&M and behavioral ecology

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Award ID#: **1952180**