Environmental Text Spotting for the Blind using a Body-worn CPS

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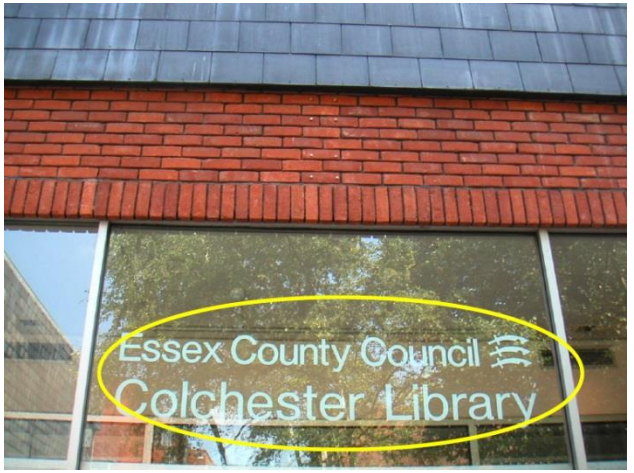
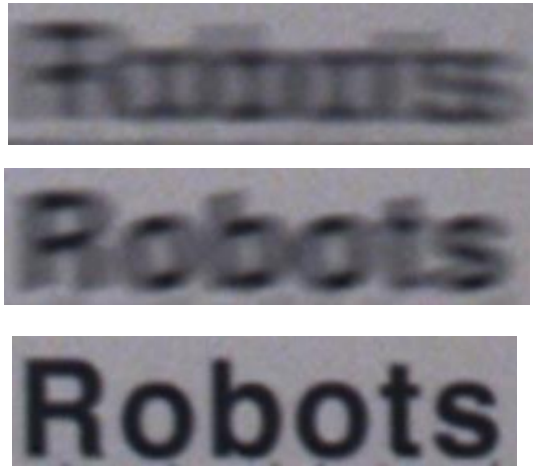
Challenges

- Text Detection:
  - Text often occupies only a tiny fraction of entire field of view (FOV) with very high variability, such as location, scale, font, …
- Text Decoding (OCR):
  - Computationally intensive and resolution demanding
- Develop **efficient** detection methods and **accurate** decoding to support **real-time** and **safety-critical** decision-making.





Body-worn CPS with Human-in-the-loop

Physical-Component

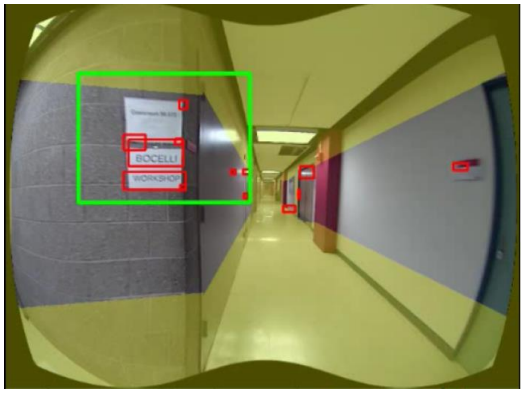
Pan/Tilt/Zoom Camera

KINECT

IMU

LIDAR

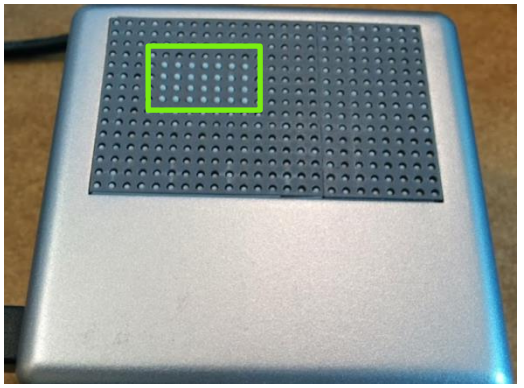
Algorithms



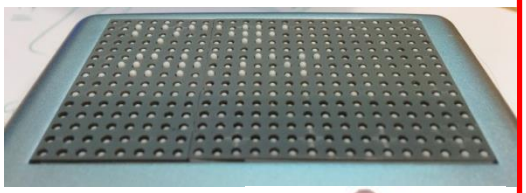
Text Detection with SLAM

Text Decoding

BVI Users



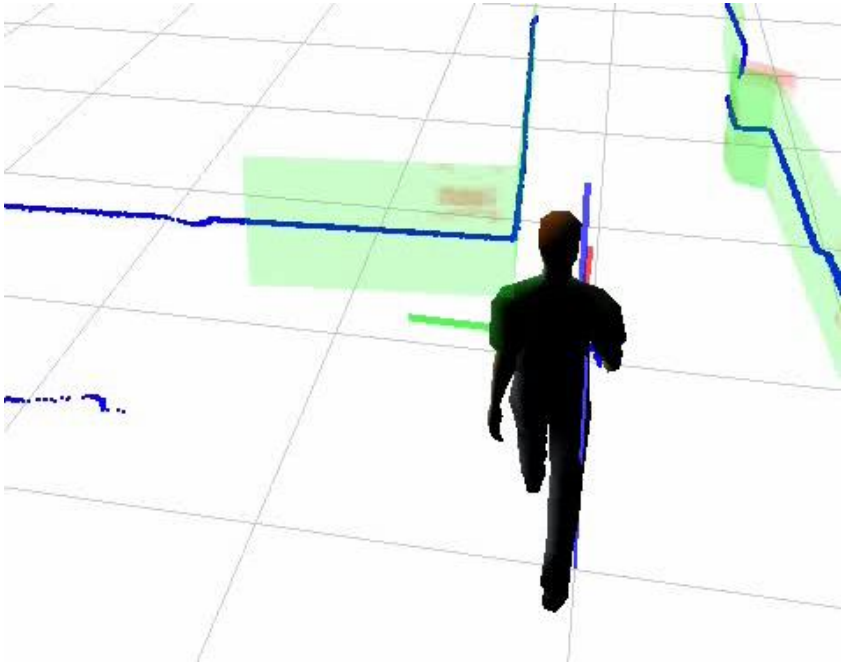
24 x 15 Braille Display

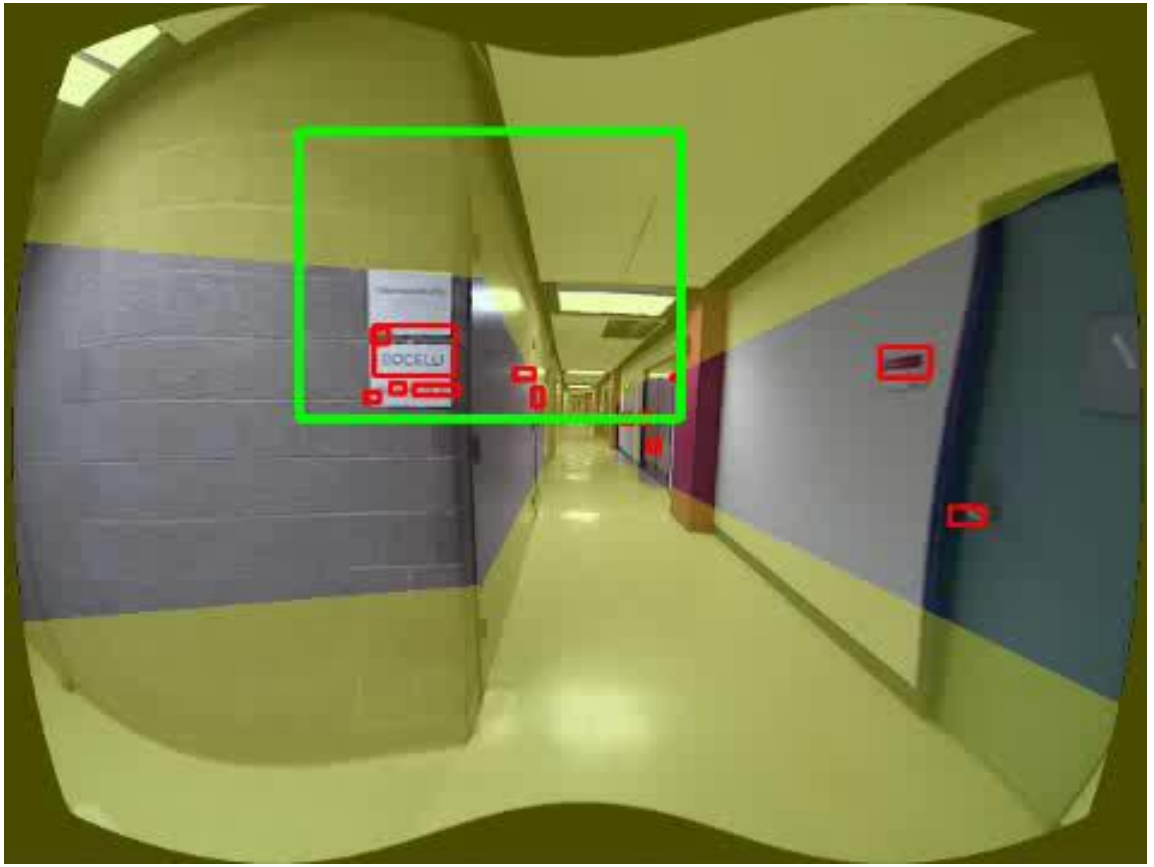


Braille Characters

Improve Efficiency by Spatial Prioritization

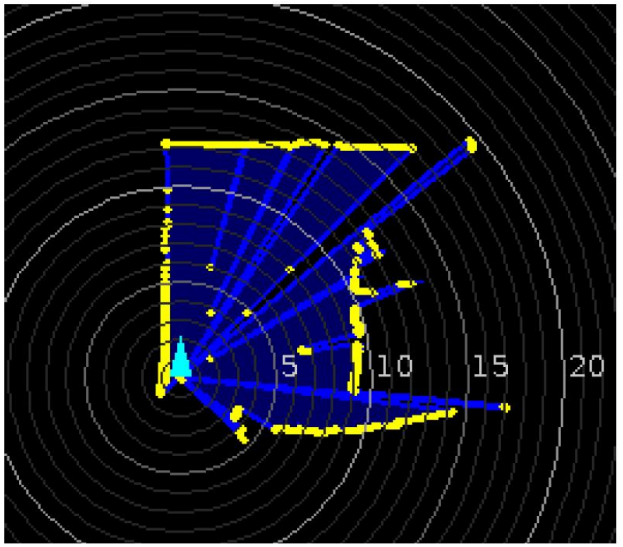
- Discover vertical surfaces, about shoulder height



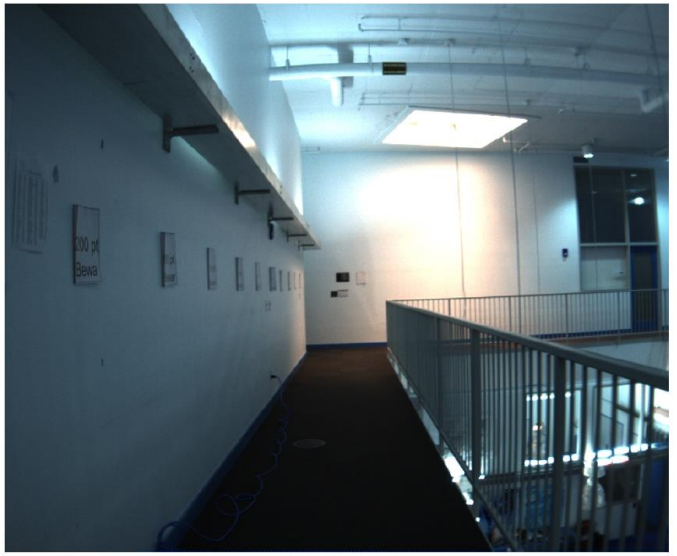


Text Spotting using SLAM

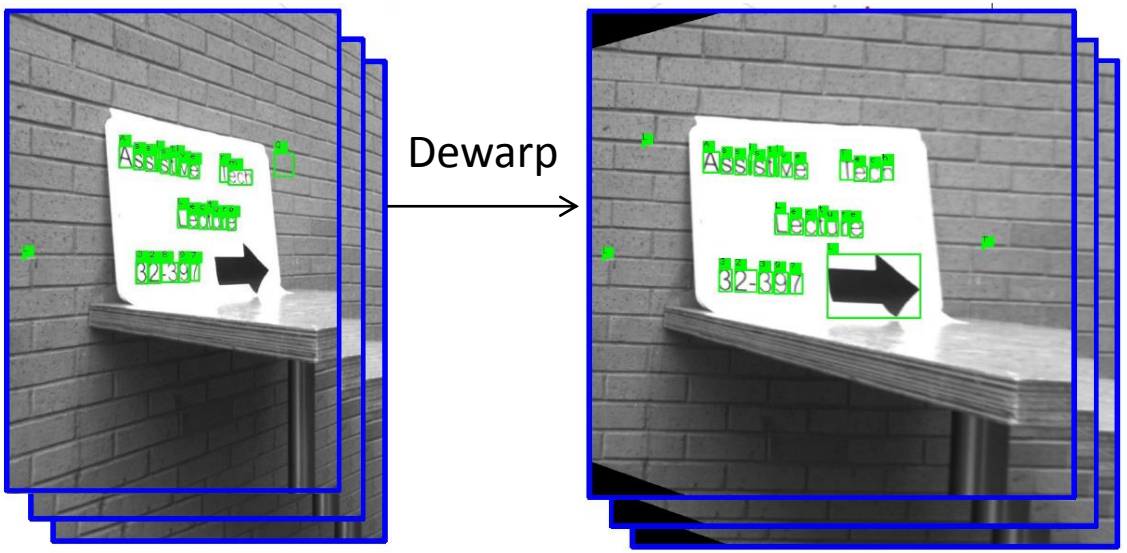
Depth Sensors

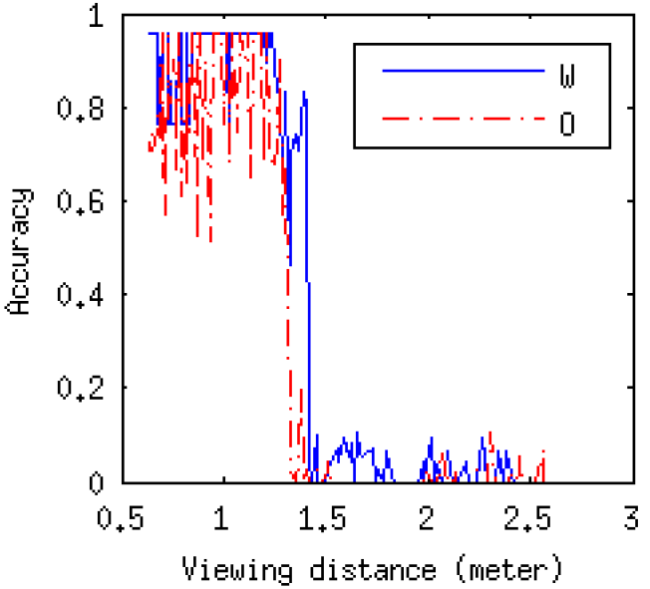


Obtain **Pose** from LIDAR

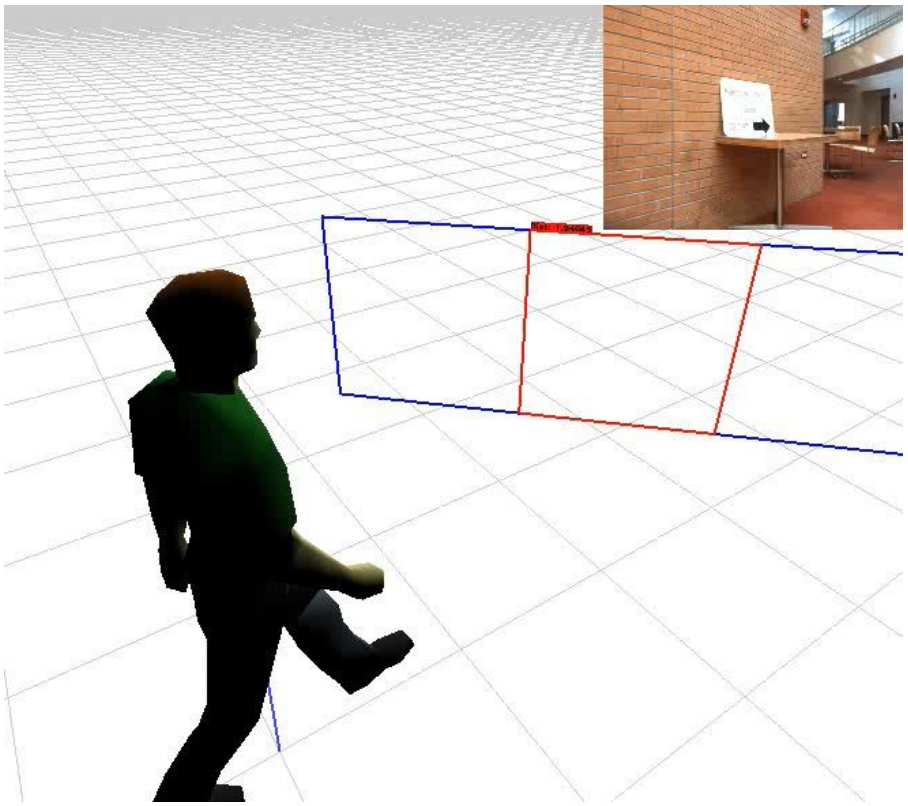


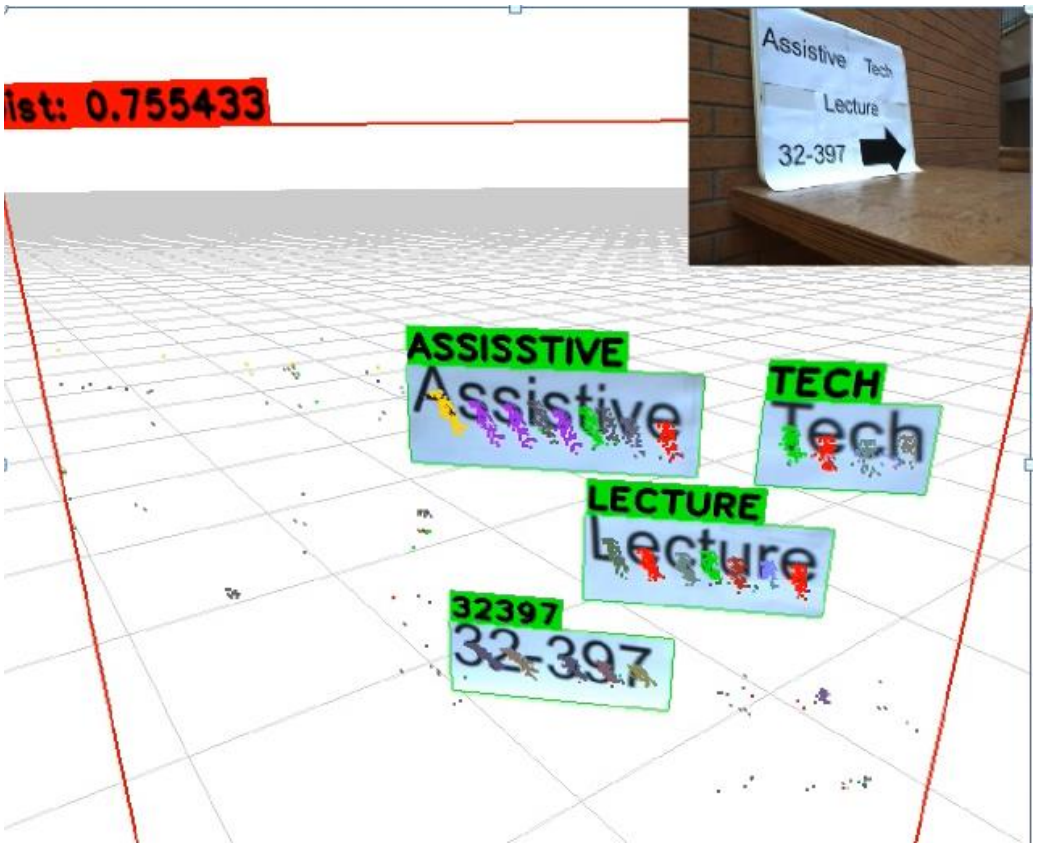
Scene Image





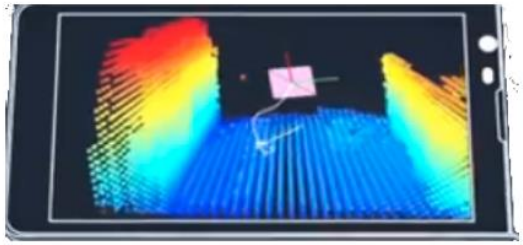
Improve Accuracy by Multiple Observation Integration

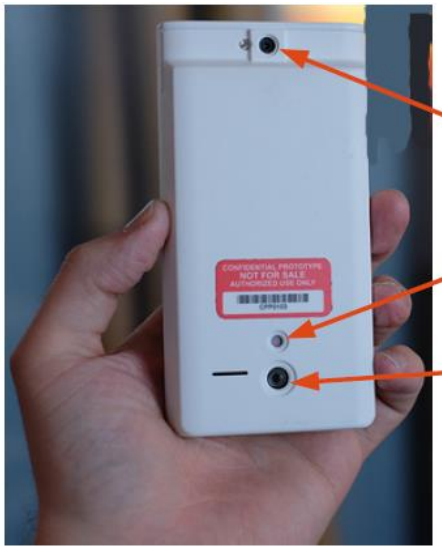




Potential Impact and Future Work

- Health care for 285 million BVI people
- Impossible → Possible → **Usable** → Affordable
  - Safety, trust-worthy, and well-accepted by the public





Control and **schedule** PTZ camera to trace text for motion blur compensation.