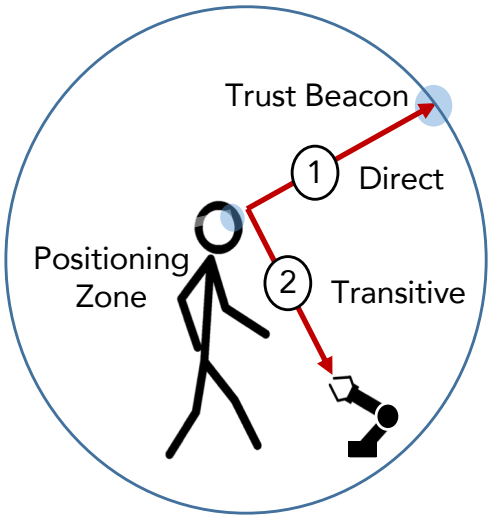
Zone Positioning Service (BU2019-094)

Boston University | Boston, Massachusetts

Overview

Indoor positioning ("indoor GPS") remains challenging due to lack of position accuracy and changing contextual needs. We offer a multi-scale approach that enables positioning within a high-accuracy zone centered around a person yet references larger operating spaces such as buildings, floors, or rooms. The approach uses reference points ("trust beacons") within a space coupled with a user device capable of both self-positioning and positioning of other objects within the user positioning zone.

The device ("zone positioning unit – ZPU) and system allows adaptation to changing application positioning requirements as an individual moves through an indoor space, with highest accuracy rendered at target endpoints ("workspaces"). The technology can be applied to humans or robots.

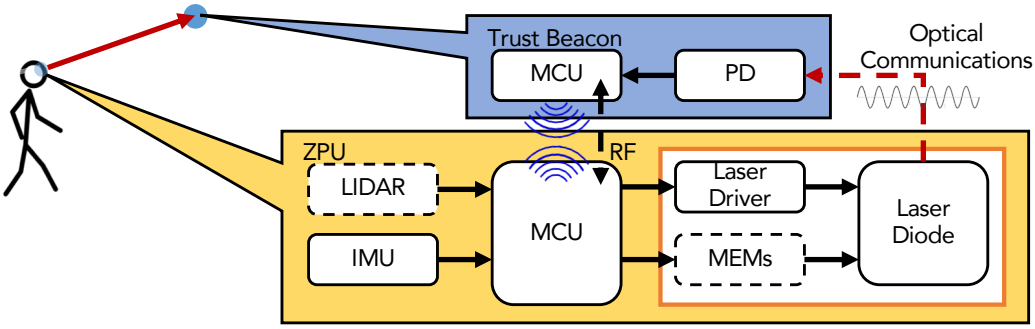


Program Stage

- TRL Level 5 – Prototype Validated in Simulated or Realspace Environment

Applications

- High accuracy positioning within a workspace; control of robots, automated manufacturing, Industry 4.0
- Indoor GPS for security tracking tools, devices, boxes, IoT devices, assets, indoor UAV's, drone to drone positioning
- Consumer data collection, role-based access
- Indoor navigation in malls, airports, hospitals, hotels or other indoor spaces
- Motion tracking in AR/VR headsets and robotics



Intellectual Property

- BU IP# 2019-094, Provisional patent filing.
- BU IP# 2018-002, US Patent https://patents.google.com/patent/US10527712B2/

Differentiation

- Reconciles different accuracy and positioning performance
- Multiscale data representation across map boundaries
- Beacon-enabled position anchors preserve privacy
- Avoids complex, battery intensive image processing on user device
- Accuracy is to cm or less
- Locate passive objects
- Services multiple targets including mobile devices and targeting other objects
- Outperforms all existing solutions

Keywords: Indoor positioning, location based services (LBS), location privacy, multiscale positioning, zone-based positioning, Industry 4.0, autonomous navigation, indoor navigation.

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Zone Positioning System (BU2019-094)

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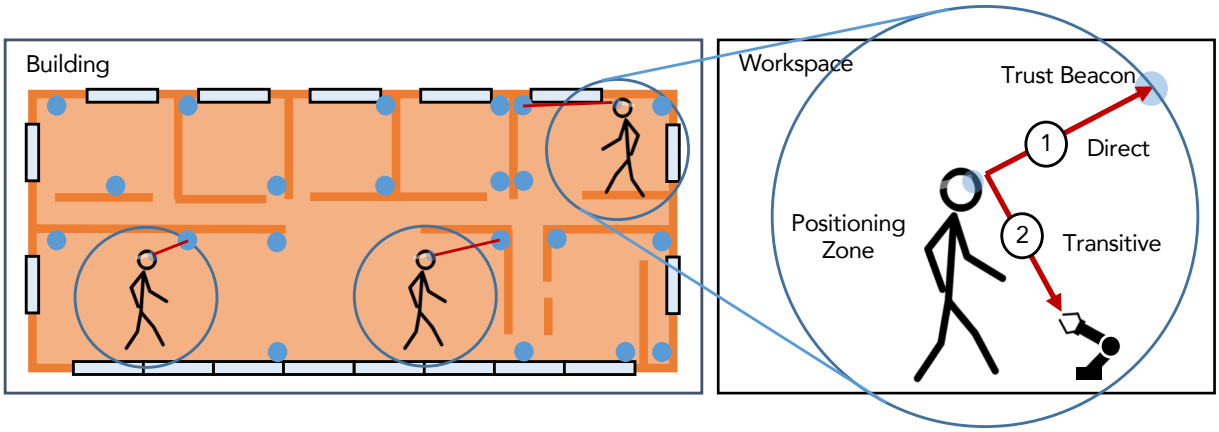
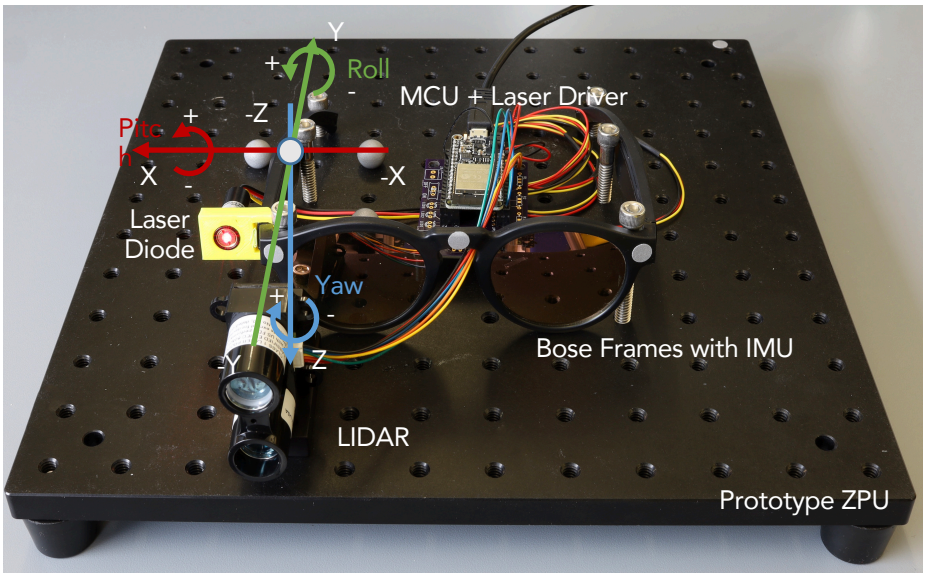
Portable positioning zone follows person through indoor space and resolves mobile location at multiple spatial scales and resolutions



Example Components

- Head mounted Zone Positioning Unit
  - MEMs Mirror with scan module
  - Eyeglass platform with IMU
  - 40° Field of View
  - 1kHz scan rate
  - Eye safe 5mW laser
  - LIDAR
- Fixed anchor trust beacons
  - Photodiode



Related Publications

- 2020 IEEE Access, *"Direct and Transitive 3D Localization Using a Zone-Based Positioning Service," E.W. Lam, T.D.C. Little*, IEEE Access, https://doi.org/10.1109/ACCESS.2020.2991141
- 2020, IEEE ICC Workshop on Optical Wireless Communications, "*Zone-Based Positioning Using Thrust Beacons, Angle Diversity, and Optical Wireless Communications," E.W. Lam, T.D.C Little,* to appear, June 2020.
- 2019 International Symposium on Wireless Communications Systems (ISWCS19) SS10 - Visible Light Communications for the Industry 4.0, "*Visible Light Positioning for Location-Based Services in Industry 4.0", E.W. Lam, T.D.C. Little, https://doi.org/10.1109/ISWCS.2019.8877305*

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