NRI: FND: The Urban Design and Policy Implications of Ubiquitous Robots and Navigation Safety

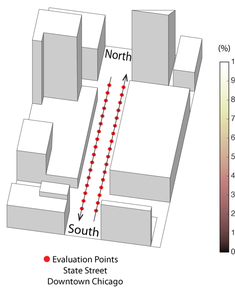
Matthew Spenko[1], Boris Pervan[1], and Ron Henderson[2]
[1]Mechanical, Materials, and Aerospace Dept, [2]School of Architecture
ILLINOIS INSTITUTE OF TECHNOLOGY

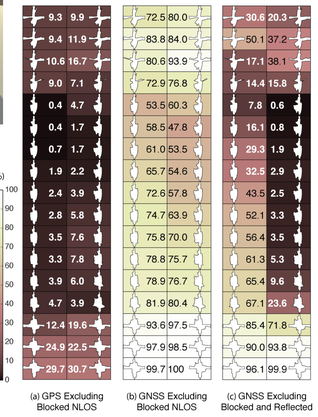
We are developing tools for landscape architects and urban designers to evaluate the social and environmental impacts of autonomous vehicle localization safety in the design of urban streets and public space

- This research is the first to understand what changes to the urban environment can simultaneously ensure safety, usability, and sustainability.
- It is the first to investigate the critical link between the urban landscape and navigation safety of mobile co-robots, from self-driving cars, to delivery drones, or any mobile co-robot that operates on city streets and sidewalks.



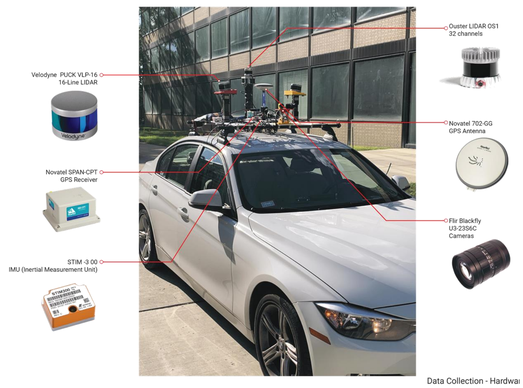
- Experimental data collection allows us to create a simulated environment that architects can easily modify.
- Localization integrity, a measure of trust in the robot's ability to localize is used to evaluate changes to the urban landscape



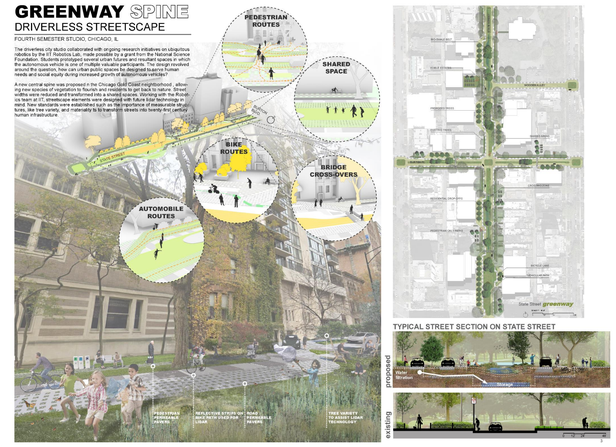


(a) GPS Excluding Blocked NLOS
(b) GNSS Excluding Blocked NLOS
(c) GNSS Excluding Blocked and Reflected

- Evaluating Global Navigation Satellite System (GNSS) performance in urban environments highlights areas of concern
- Architectural scenario building exercises are based on the engineering findings



Data Collection - Hardwar

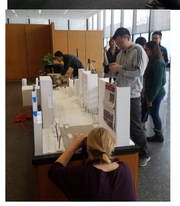


Broader Impact: Society

- How do we balance co-robot safety with other broader societal needs?
- How can urban design convey a sense of trust to the public as they operate near co-robots?
- How can we ensure that all stakeholders benefit from the presence of ubiquitous robots?
- What architectural features can be added or removed from the streetscape to improve overall safety?

Education and Outreach






Integrating architectural education with engineering

Potential Impact

Modifying the environment to maximize co-robot safety could have negative societal impacts if the process does not consider the needs of other stake-holders such as pedestrians, cyclists, drivers, homeowners, and businesses. In response, this highly-interdisciplinary research project is studying the relationship between landscape architecture, city planning, and mobile co-robot navigation safety and to understand the impact that ubiquitous robots will have on shaping urban design.

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