Digital Twin City for Age-friendly Communities - Crowd-biosensing of Environmental Distress for Older Adults

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Project Goals

- Create a digital twin city (DTC) model that reveals older adults' collective distress and associated environmental conditions
- Leverage the DTC model to develop and evaluate technological and environmental interventions to alleviate older adults' distress while walking and promote their independent mobility (e.g., independent trips, route/mode selection) and health (e.g., physical activity, social interactions, quality of life)

Intellectual Merit

- Integrate measures from experiential data to DTC models
- Gain new knowledge on biological, physiological, and environmental factors contributing to healthy aging
- Advance our ability to sense and react to diverse built environmental issues and emergent urban events
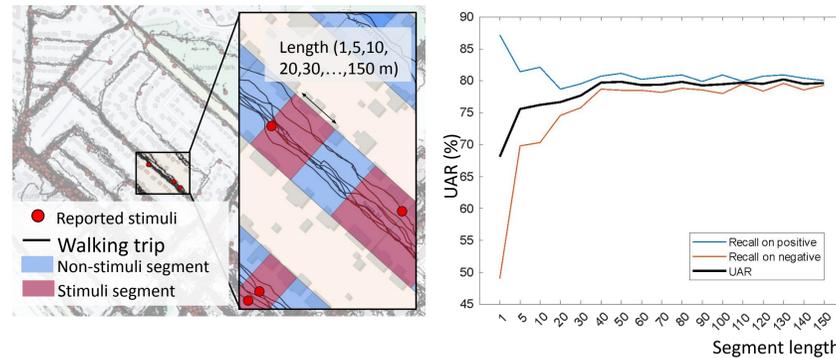
Statistical results and machine learning experiments (62.24%~80.15%) showed that bio-signals can effectively capture distress of pedestrians in daily life.
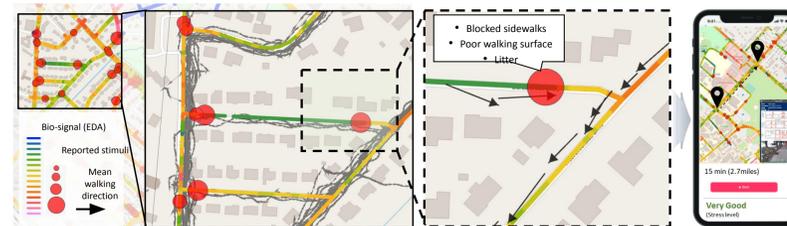
Example of biosignals and reported stimuli visualization and potential application.

Capturing Pedestrians' Distress in Real Life:
A pilot study in College Station, TX
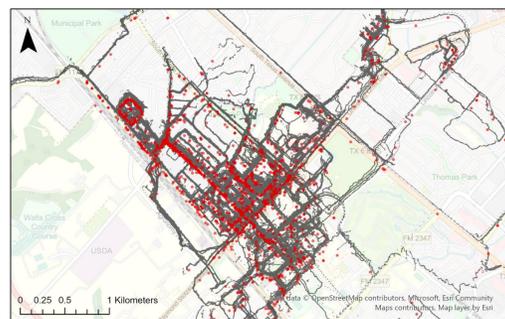
- 67 adult participants
- 6 months of data
- 1561 walking trips
- 1773 locations of reported environmental stimuli

A small-scale data collection was conducted to create a model that can capture collective distress of pedestrians.

Ongoing User Study in Houston, TX

Data from older adults will be collected via three waves to evaluate technological and environmental interventions in underserved, predominantly Hispanic areas in Houston, TX.

- 150 older adults
- 2 weeks/participant

Study Community

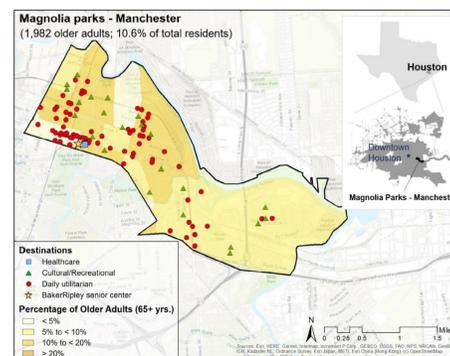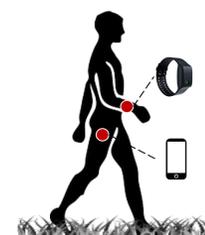## Community Engagement Activities

- Established partnerships with BakerRipley, Magnolia Multi-Service Center, East End District, East End Communities, Texas Environmental Justice Advocacy Services
- Studio class showcased potential environmental interventions (images left)
- Cultivated DTC community ambassadors

Video: https://www.youtube.com/watch?v=KPIwx1tWv_A&t=24s

Broader Impact

1. Immediately benefit local communities by enhancing older adults' understanding of safety risks and mobility challenges in their environment
2. Create a paradigm shift for the diagnosis of the community environment that will contribute to the community's capacity building to create a health-promoting and stress-reducing environment

Next Steps

1. Create a 3D virtual city model that will be semantically updated based on older adults' distress and relevant contextual data
2. Design and evaluate the proposed environmental and technological interventions via large-scale user studies
3. Enhance community education of older adults for environmental issues and S&CC mobility services