

CS/EE/ME 75(a)

Nov. 13, 2019

Today:

- DARPA Urban Circuit Video!
- Analysis of Contest Challenges
- Brief review of Tunnel Circuit videos?
- Preliminary Design Review—
 - Example PDR
 - questions?
 - PDR Scheduling

Traversability Challenges for the Urban Circuit

Urban Video (see next slides for the analysis)



Small (in height) Obstacles



Cluttered Environment



Might be difficult for telemax!

Traverse over water (splashing & mud possible)



Narrow Passages



Thin Poles

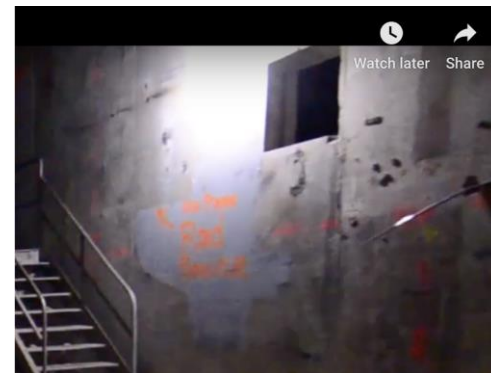


Compliant Obstacles

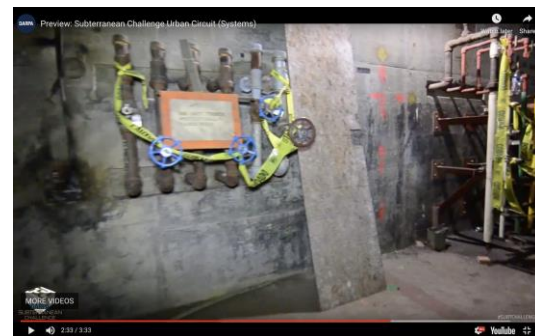
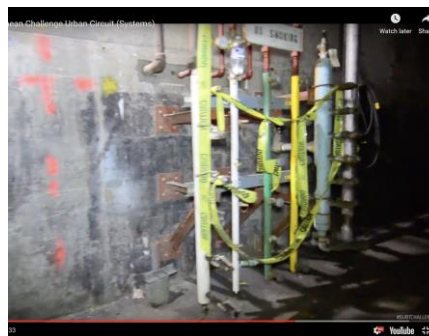


Urban Video analysis

We are not gonna enter into these pipes (since it says so on the wall - it might lead to negative points by DARPA). --



Complicated backgrounds for artifact detection



Vertical Spaces and possible artifact locations

Potential challenges

- A lot of vertical space where artifacts could be placed
- A lot of hiding places for artifacts
 - Search may be very important
- Artifacts close to the ground? Ceiling?

Changes to assumptions

- Large range detection may be less critical
- Search more critical



Stair Climbing

1. Tight Landings
2. Narrow Width @ Stairs
3. No stair “risers”



Urban Video analysis

Small positive non-Husky traversable obstacles (telemax can handle)



around obstacles and maze-like structure will make localization hard

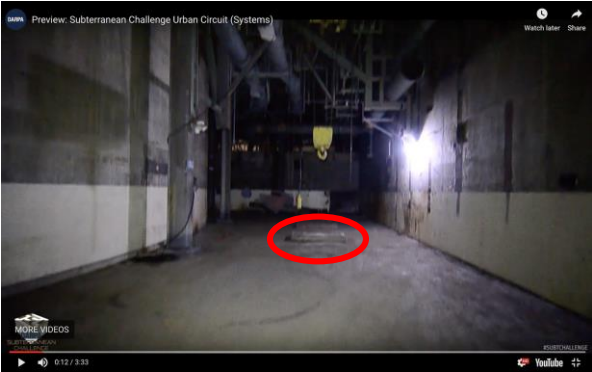


Urban Video analysis: Many holes?!

Are these holes important?



Two different levels connected by a hole?



Urban Video analysis (Stairs)

<https://docs.google.com/presentation/d/1xucgm56su2wXyYyGmnltp45iw8DOTW8X7Dz99P-FYs/edit#sISSSSSSSSSS=id.p>

Three sets of stairs are visible:

- 1) Straight (up or down)
- 2) Turning, with connections to three levels
- 3) Turning (3 landing) between two levels only?
 - a) it the lowest level to its left are those valves in the wall

For perception

- 1) Some stairs with risers, some without.



Urban Video analysis (localization)

Generally all feature-rich

- 1) Small rooms
- 2) A lot of features on the ceiling (we won't see with our lidar at the moment)
- 3) Largest room has a lot of features
- 4) Many features on the ground

Potential challenges

- Turning in place in small rooms
- Localization up stairs
- Long corridors (but still seem to have features)
- Z unobservability if we only use horizontal VLP16

Things to maybe use

- The space is very structured - use the knowledge that there are mostly 90 degree turns?



Corridor



Ceiling features

Lots of lidar features



Homework

Team Tasks: (all unit levels)

- Create a PDR package!
- **Schedule:**
 - **Nov. 20:** 1-25 Minute PDR sessions in class, followed by short lecture

Team Tasks: (6+ unit level)

- **RC Car:**
 - Contact Nikhilesh Alatur and David Fan to see if they can “roll back” the NUC.
 - Complete power box design and start fabricating
- **Drive-O-Copter:**
 - Make suspension choice.
 - Start on avionics coordination
- **Extreme Localization:**
 - While waiting for UWB kit, consider stair climbing and triangulation?