2021 NSF CYBER-PHYSICAL SYSTEMS PRINCIPAL INVESTIGATORS' MEETING

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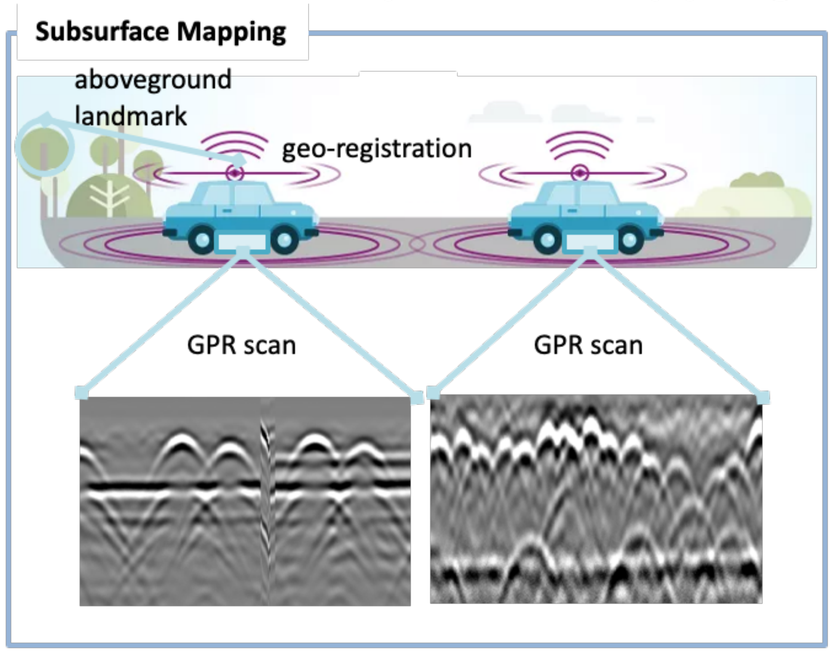
CRII: CPS: Modeling Subsurface Features and Connected Autonomous Vehicles as Cyber-Physical Systems for Reciprocal Mapping and Localization

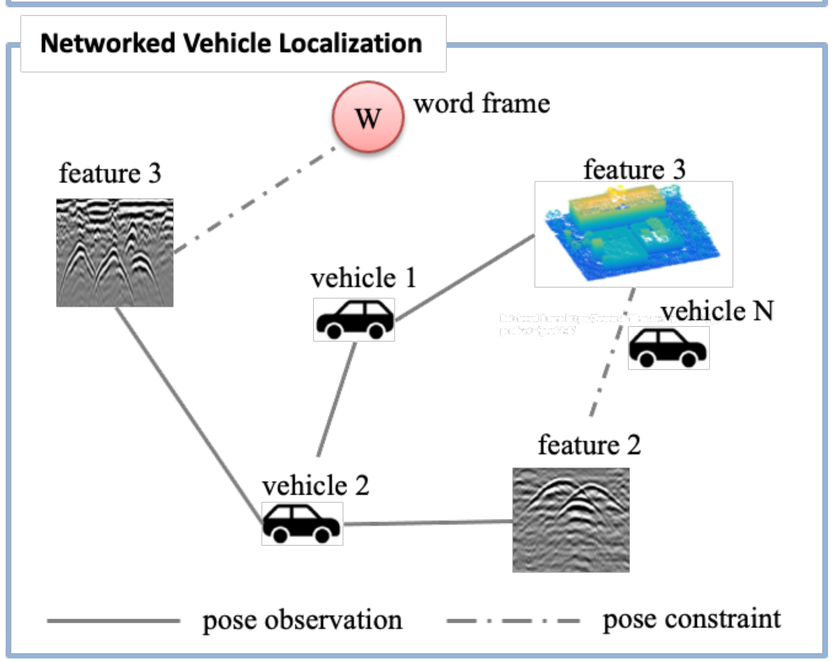
Challenge:

- Unknown city subsurface.
- Comprehensive subsurface mapping due to limited mobility of sensor platforms and absence of data processing algorithms.
- Accurate vehicle localization in urban areas.

Solution:

- Transform autonomous vehicles with ground penetrating radar into dynamic sensor platforms to scan city subsurface and produce accurate maps.
- Exploit geo-registered and invulnerable subsurface landmarks to assist accurate vehicle localization.





Scientific Impact:

- Machine learning based methods for radar signal processing to detect, locate, and characterize subsurface features.
- Data fusion method to integrate GPS, IMU, LiDAR, and GPR data for autonomy in vehicle localization and subsurface mapping.

Broader Impact:

- Produce subsurface maps with enhanced accuracy and rich information to improve the buried infrastructure and public safety.
- Contribute to the improved education and public science literacy by exposing them to novel technologies and applications.