

Cyber-physical Systems Breakout

What is a cyber-physical system?

- a systems that involves data/information, signal, devices, people

Challenge of deploying sensors in existing infrastructure

- how to deal with cost issues; how to do “sensor retrofits” in buildings .

CPS for health monitoring of physical infrastructure

- Need to keep the human in the loop versus fully automated health/fault monitoring
- In vehicular systems, human is currently at the center, so decisions need to be made with human in the loop (challenge: in an aging society, perhaps more automation is important with “less” human-in-the-loop feedback).

Security of CPS systems

- Need a different approach : it is possible to inject bogus data into sensors and attack the system.
 - Need resilience to attacks at the boundary of the physical system.
- Traditional CS research does not address this topic and need a fundamentally different approach.

Cost-effectiveness of deploying a CPS

- Today the cost of deploying the system outweighs benefits / cost-savings.
- How can you do cost-effective instrumentation of a physical infrastructure (bridge/home) and infer the rest? Need to do “more with less” sensors. How “little” is good enough to get the resolution we need.

CPS and interface to the user

- Automated versus participatory systems
- Provide the right data abstraction to users - non tech-savvy users also need to benefit from deployed CPS systems (E.g, smart home systems).

CPS as Silos

- Today each CPS system is a silo and they don't talk to one another
- An individual/user interacts with multiple such systems each day (e.g., multiple buildings, home, car, etc).
- How can the CPS integrate to provide a “user-centric” view as opposed to a system-centric view? E.g., what is my carbon footprint for the day versus what is the carbon footprint of this building.

Privacy issues resulting from data produced by CPS

Are regulations the answer? Can you design for privacy?

Communication protocols used by CPS

- what communication infrastructure is most sustainable? Are wireless systems more sustainable than wired ones?
- For energy monitoring, can we use powerline networks - since the infrastructure is already available? What about the overheads/footprint for hardware devices needed for powerline networks.

Lifecycle of a CPS

- To be sustainable, need to move away from a culture of frequent replacement
- Can we design a CPS to have the same lifespan as a building? How do we design for upgradeability -- since new features will evolve, need to design for software upgradeability.