



RD.2: Dynamic Digital Twins for Secure and Smart Civic Spaces

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SENTRY Challenge

Virtual SENTRY Challenges:

- Layered Security architectural design and simulation
- What-if scenarios and decision support
- Versatile solutions for vast variety of STCPs

Opportunities & Problems:

Digital twins can address the challenges, but only if they can overcome hurdles in lack of:

- **Interoperability:** shared concepts to allow digital twins to be built efficiently
- **Feasibility:** data showing digital twins can monitor and adapt buildings in real-time through data and feedback
- **Causality:** robust human-building interaction models
- **Scalability:** evidence suggesting digital twins can be built effectively for vast variety of STCPs

Accomplishments

Technical foundation:

- 12/2022: Rutgers football stadium digital twin model development using multi-sourced data
- 03/2023: Review of security related architectural data; collected data in campus buildings to build databases of security features for AI assisted digital twinning methods
- 12/2022: prototype methods for crowd data extraction from multi-modal data

Experiments and model refinement

- 10/2022: meetings with NJOHSP for lessons learned
- 01/2023: metal detector experiment at the MetLife stadium to model user and security system interactions
- 03/2023: outreach via a science fair at local schools

Surface transportation security case study:

- 11/2022: SENTRY transportation sector security brainstorming session
- 01/2022: MOU with NJ Transit
- 03/2022: Kickoff meeting with NJ Transit to launch Hoboken terminal based virtual SENTRY studies

Addressing the Challenge

The team will build and experiment with digital twins of exemplar STCPs, including school buildings, sport venues, and surface transportation facilities.

Technical Foundation

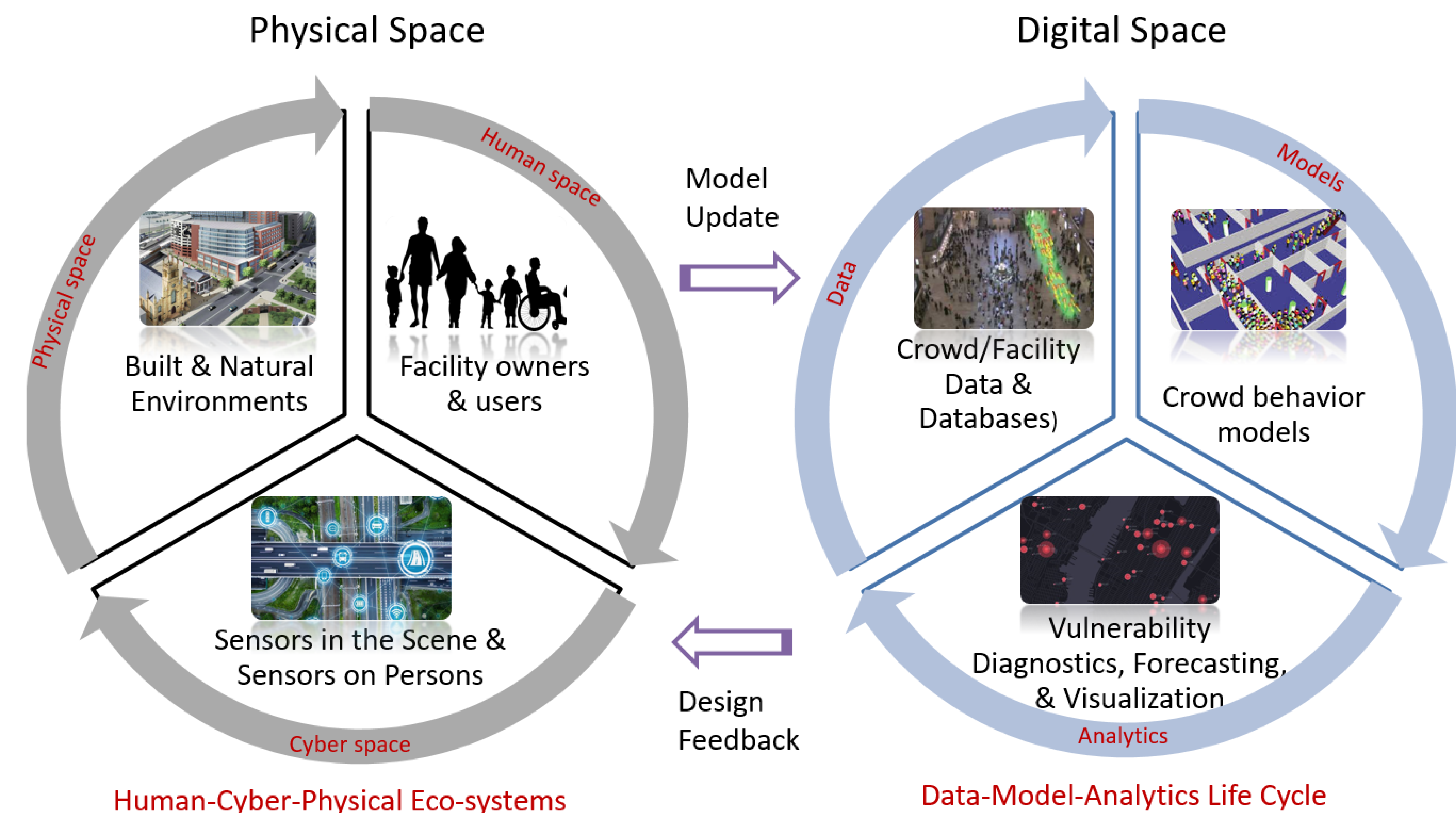
- Task 1: Evaluate ways to create digital twins for STCPs.
- Task 2: Create dynamic digital twins
- Task 3: Study agent collaboration in a digital twin to monitor a crisis in real-time
- Task 4: Study data assimilation for emergency response planning

Experiments and Model Refinement

- Task 5: Model user interaction with buildings
- Task 6: Deliberate with stakeholders

Scalability

- Task 7: Study scale-up feasibility



Next Steps

Support of the Virtual SENTRY Framework:

- Integrate digital twin data, model, and algorithms to create decision simulators for STCPs with a focus on public transportation facilities and large sports venues.
- Iterations of experiments, analysis, and model refinement to improve the use of dynamic digital twin to support real-time situation awareness and critical decision making
- Lead the Hoboken terminal study to prototype and evaluate the Virtual SENTRY framework
- Making the dynamic digital twin platform available to other SENTRY researchers

Partnerships and Stakeholders:

- Surface transportation sector security ideation session
- Organize site visits to surface transportation venues in NYC metropolitan area
- Leveraging existing studies with NJ Transit, NJOHSP, and NJOEM to evaluate the concept and framework of secure public space and triage knowledge and capability gaps
- Outreach events at K-12 schools
- **SENTRY Research teams:**
- RA, RB, RC + RD.1 + RD.3



The day when the robot dog met with the bomb squat robot and the kids

Are you ready to dive into the digital twin in a VR world?

Outreach: The 41st Chester Science Fair – 03/18/2023
Next: 04/21/2023: Groundwork Elizabeth