Bridging Communities: Advancing JuPedSim for Pedestrian Dynamics and Urban Mobility Research

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Background

- Joint **traffic-crowd modeling** is of crucial importance, as both systems interact, particularly in heavily frequented areas
- SUMO-JuPedSim coupling was originally designed to analyze interacting flows to and from **major events**
- **BridgeSim** modernizes the simulator coupling by redesigning the API, improving documentation and performance, and supporting community adoption
- Funded by **Helmholtz**, Call “ScienceServe: Boosting Research Software at Helmholtz”

Traffic vs. Crowd Modeling

SUMO		JuPedSim
Agents move on network elements that allow pedestrians		Agents move in a 2D area, consider obstacles and target waypoints
Lane-based striping model with collision avoidance		Various models for simulating collective phenomena
Simulation time step in seconds		Simulation time step in microseconds

SUMO-JuPedSim API

Previous Approach

SUMO *C++* → C-API *(deprecated, being removed)* → JuPedSim *Python library, C++ core*

New Approach

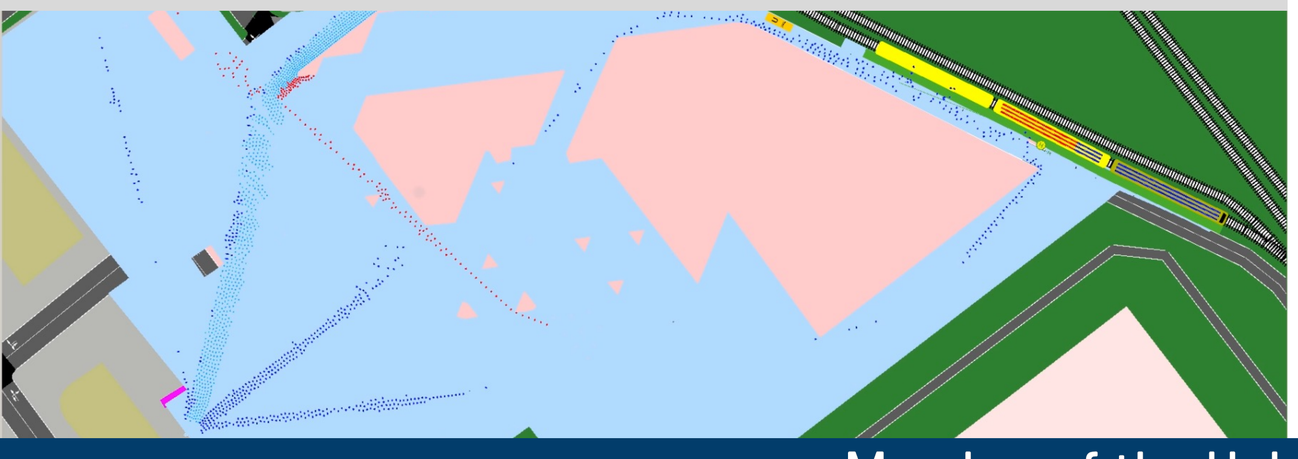
SUMO *gRPC client (C++)* → **gRPC / protobuf** → JuPedSim *gRPC server (Python)*

Example RPC calls:
Create geometry / simulation / agents
Add waypoints / journeys
Get updated agent properties

Why this approach?
Language decoupling, version-independent interfaces, easier integration, and clearer API contracts via protobuf

Functionalities

- Automatic generation or definition of 2D area
- Select a JuPedSim model and adjust its parameters
- Define sources and journeys for pedestrian streams
- Configure vanishing zones to model ticket control



Feedback Welcome

- Do you have a SUMO scenario where crowd dynamics are relevant?
- What runtime overhead would be acceptable for a coupled simulation?
- Which API features would be most useful for your workflow?
- Would you be interested in testing SUMO-JuPedSim or contributing scenarios?

Let us know!
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JuPedSim Repository

SUMO-JuPedSim Tutorials