Improving Urban Traffic Flow with Drone Supported Vehicular Networks

FINAL TALK BY DMITRIY MONAKHOV

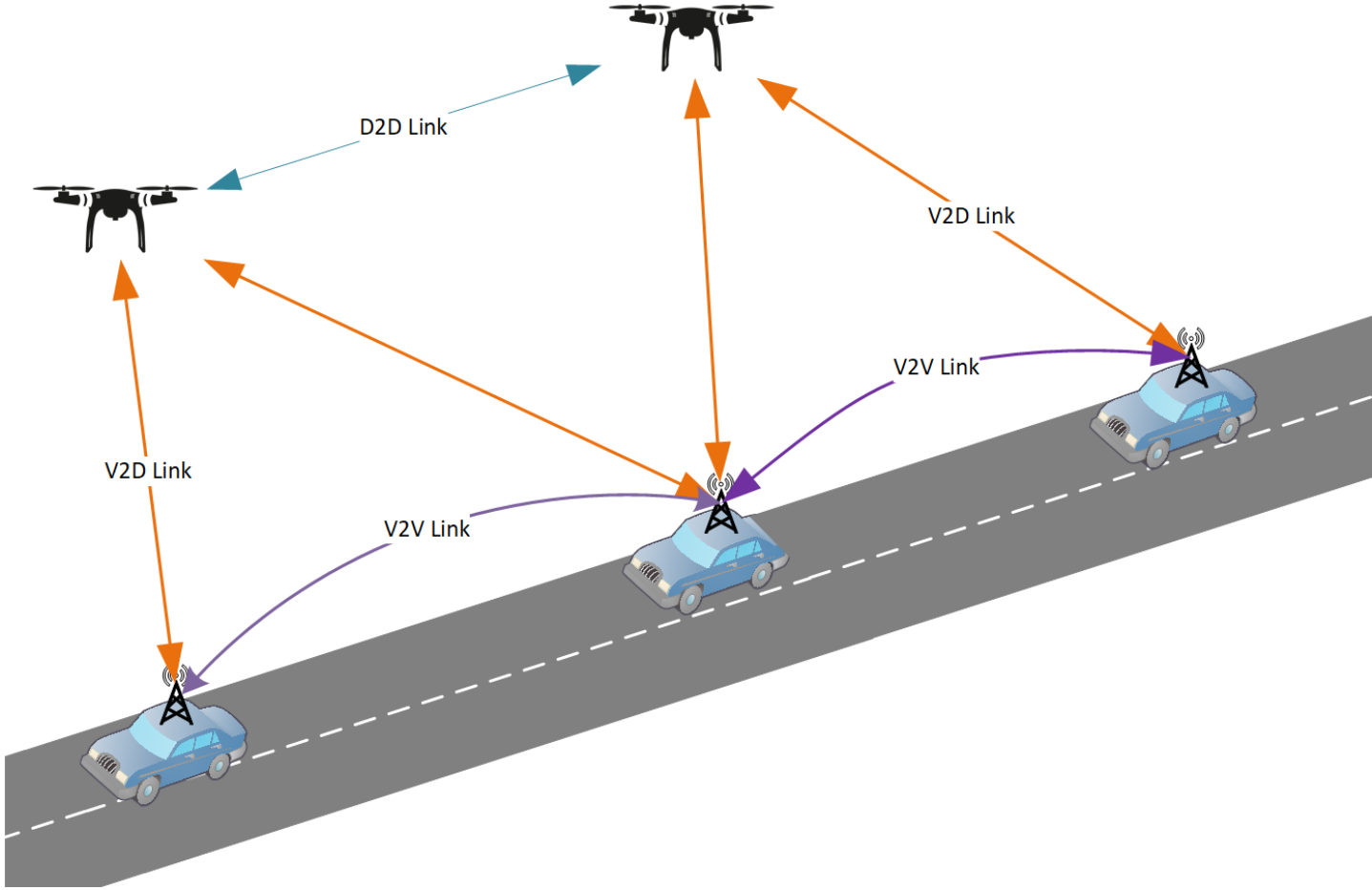
Motivation

- Most recent works focus on different aspects
- Very few works discuss urban environments

Source: https://www.unmannedairspace.info/uncategorized/39-cities-pioneering-urban-drone-operations/

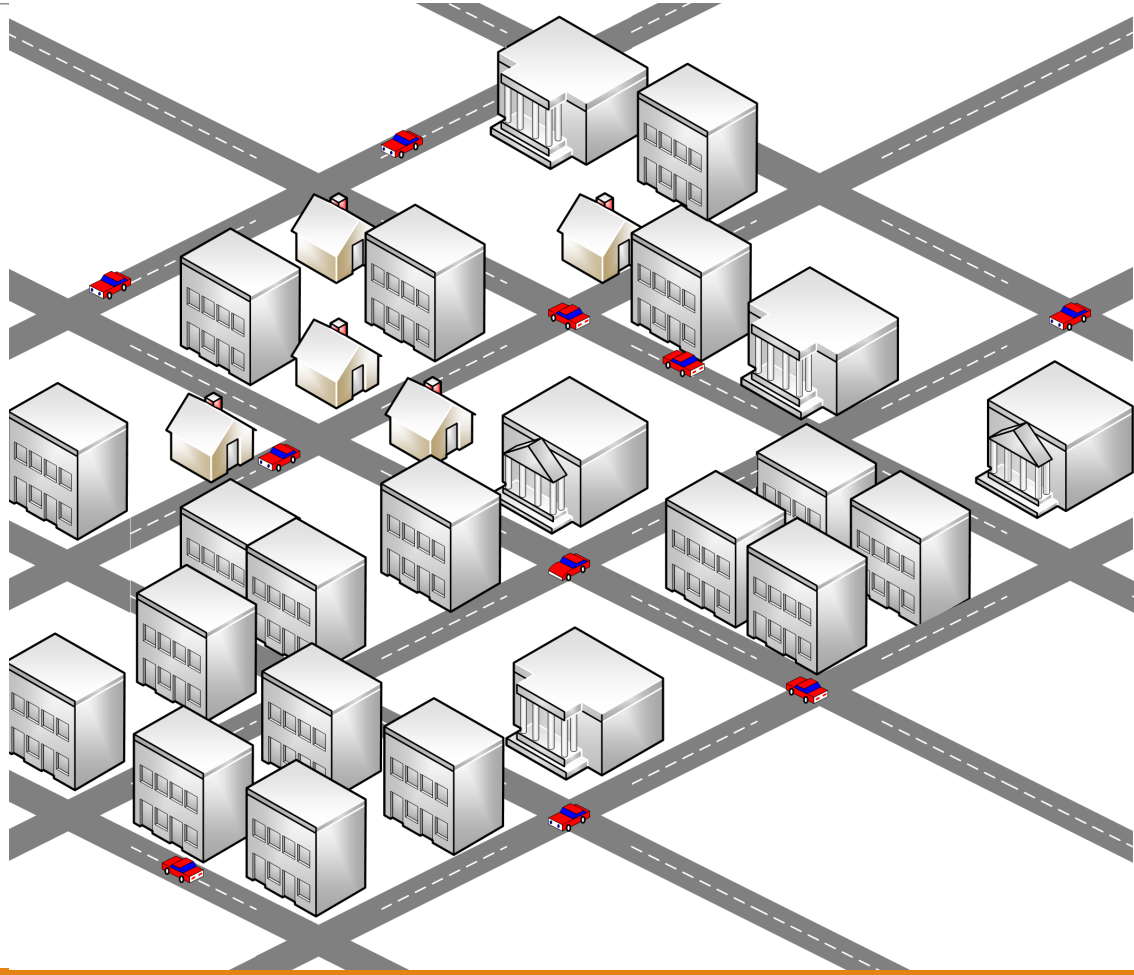
Goals

- Simulate DAVN in a dense city region
- Simulate traffic jams
- Measure traffic flow with and without drones
- Assess drone effects



Implementation: setup

- **Manhattan Grid**
- **Vehicles follow random routes**
- Some vehicles break down and block the road
- Broken vehicles send broadcasts
- Other vehicles change route and rebroadcast



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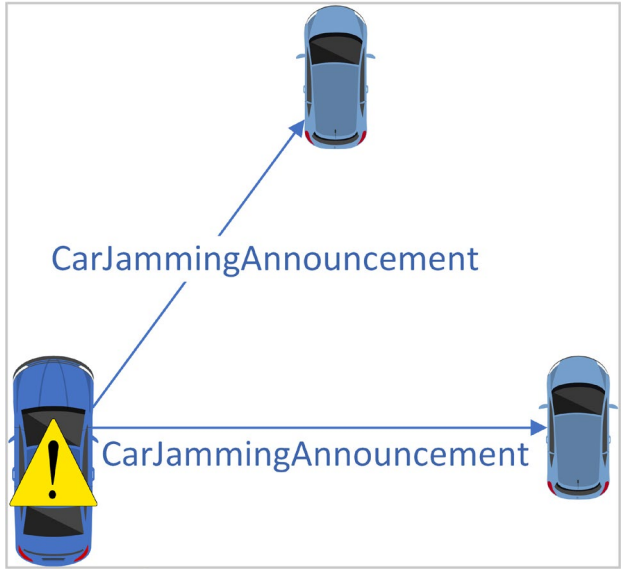

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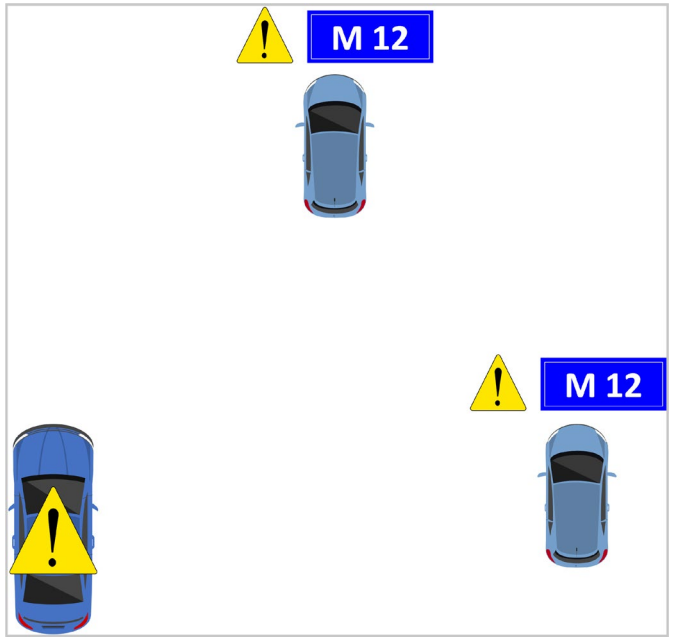

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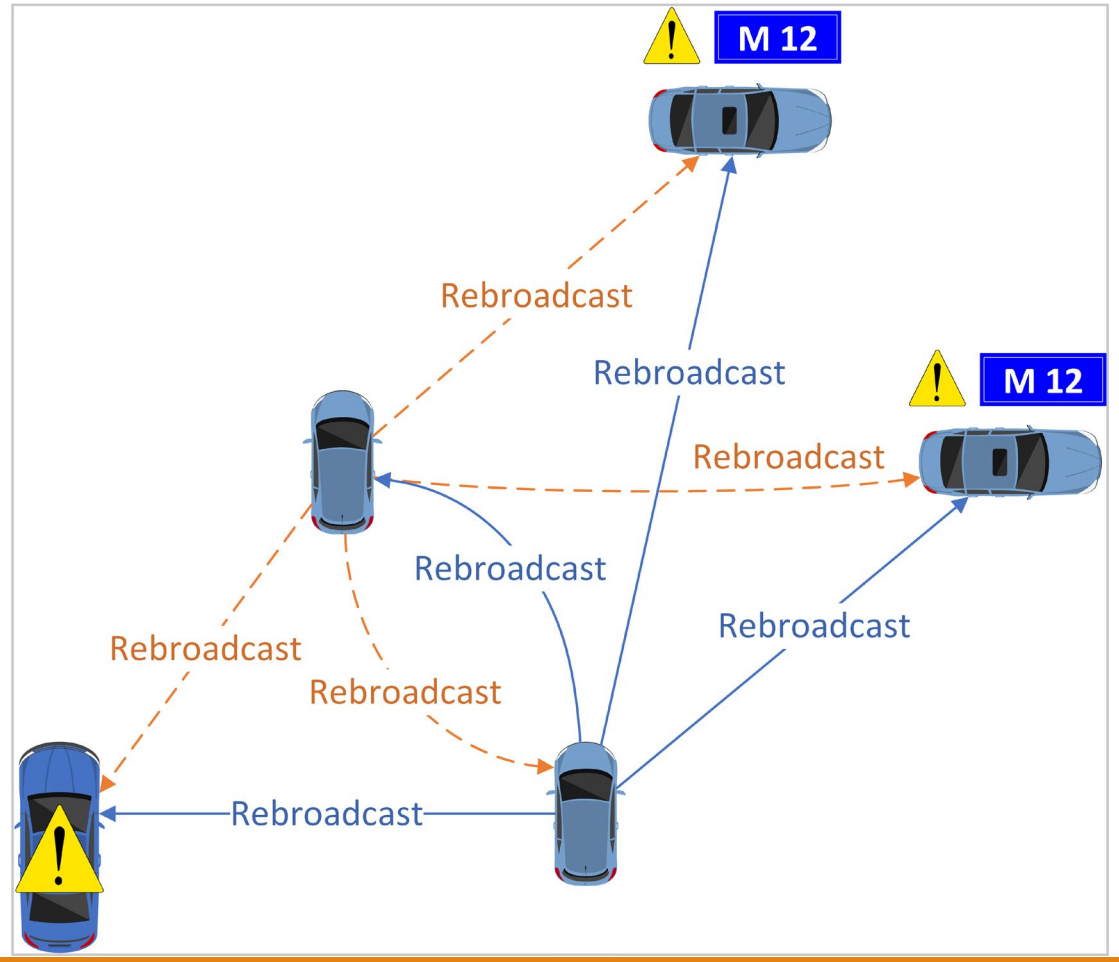
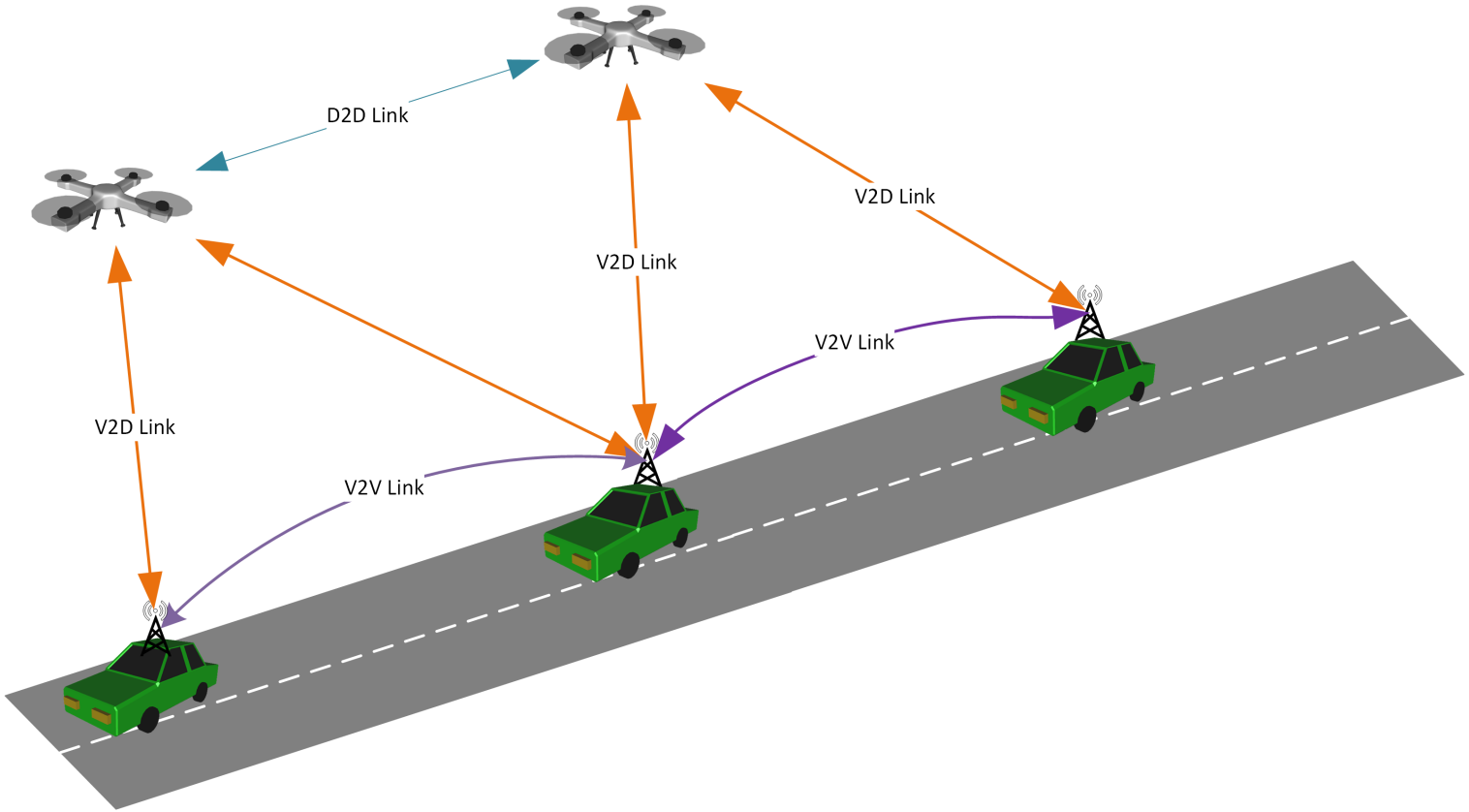


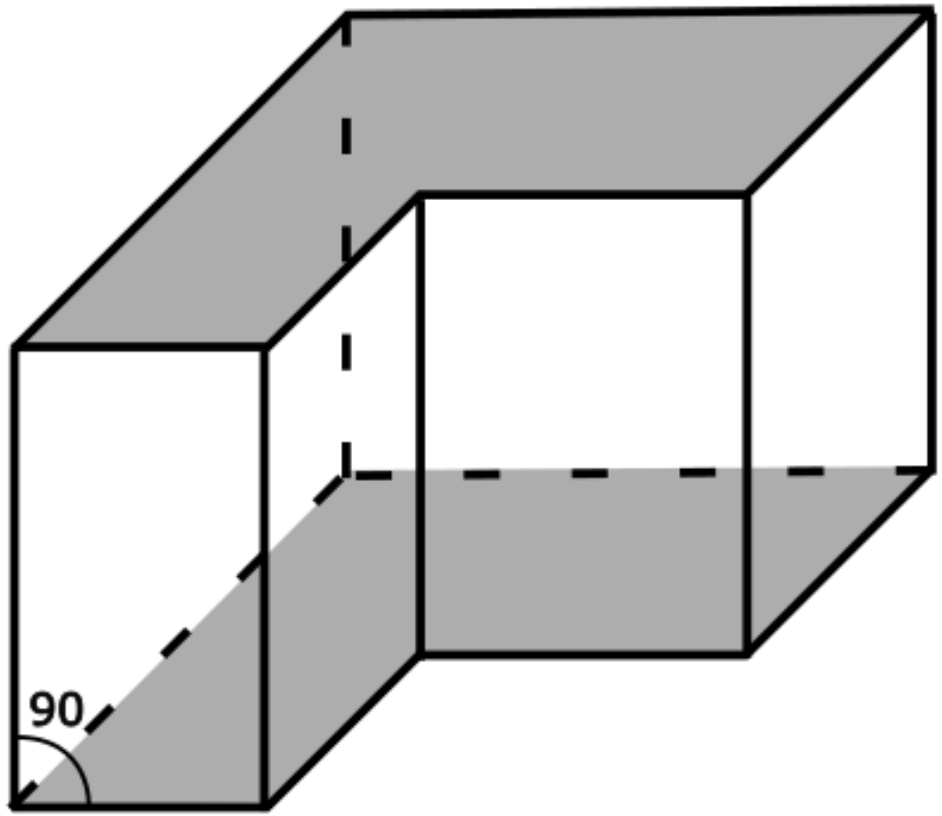
Implementation: drones

- Drones reuse vehicles' protocol
- Drones fly opportunistically above buildings (average altitude: 175 m)
- Drones rebroadcast messages from vehicles and other drones

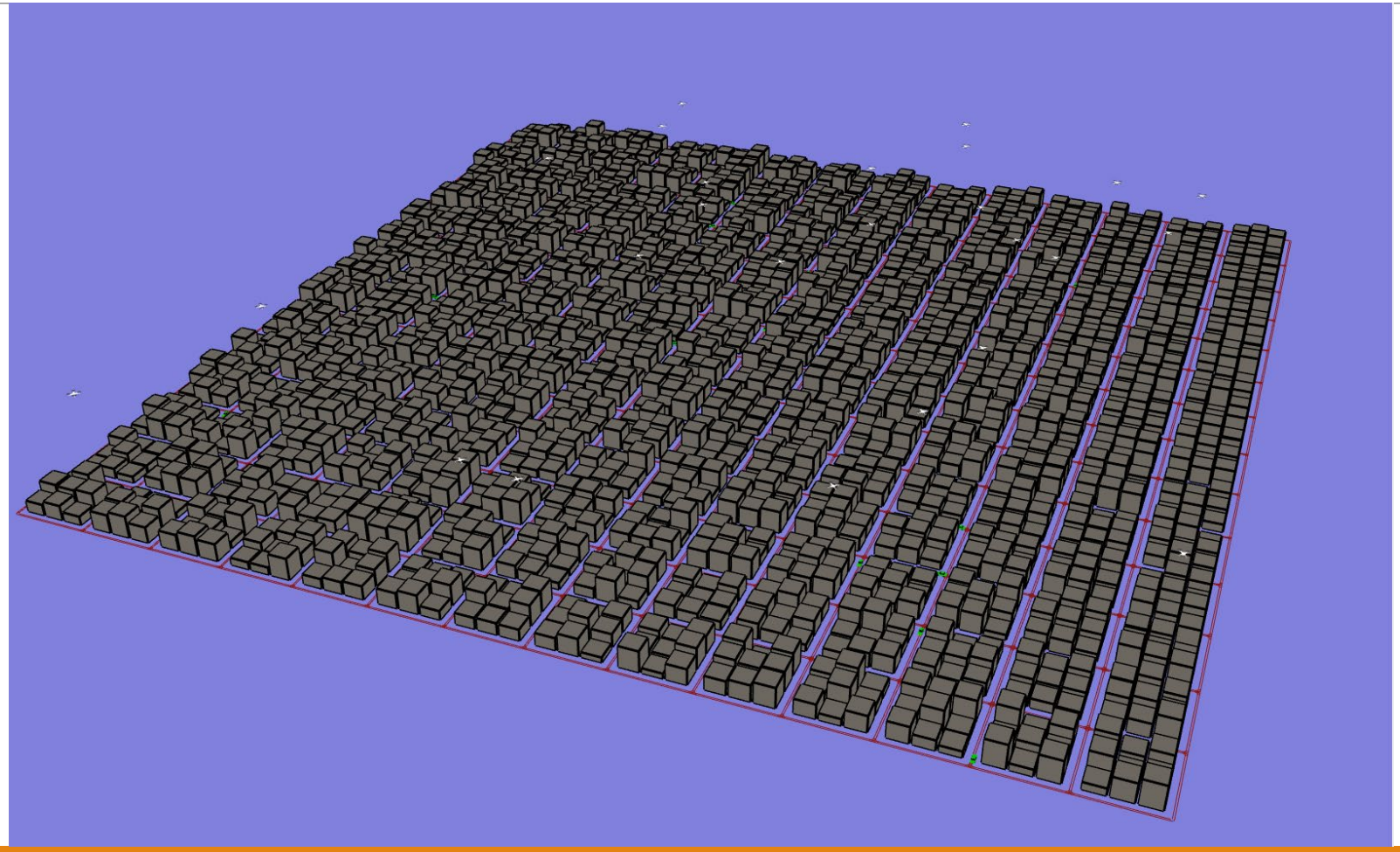


Implementation: 3D Shadowing

- Buildings are approximated as right prisms
- Calculates line-prism intersection points
- Reuses existing Veins infrastructure



Implementation: visualization



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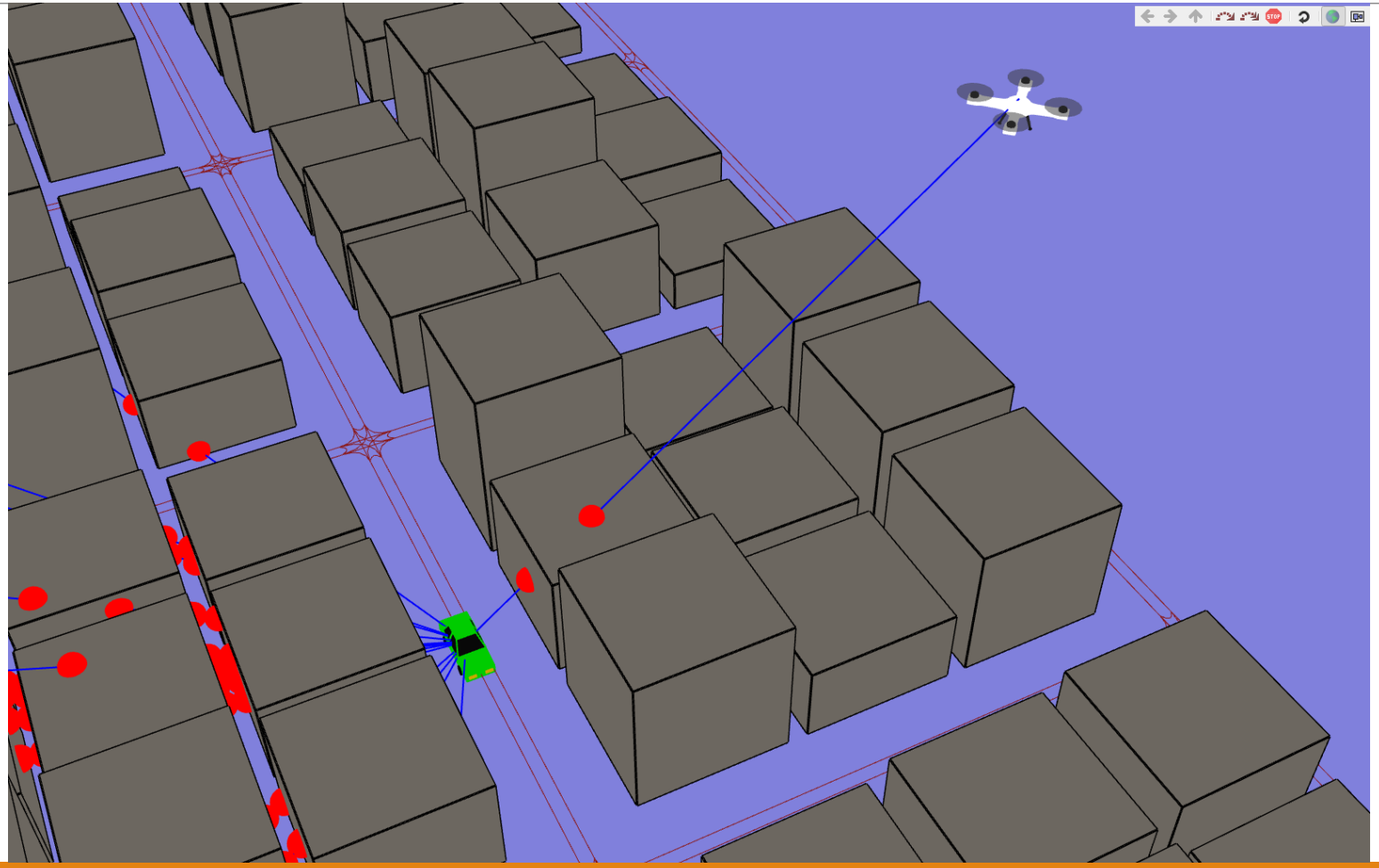
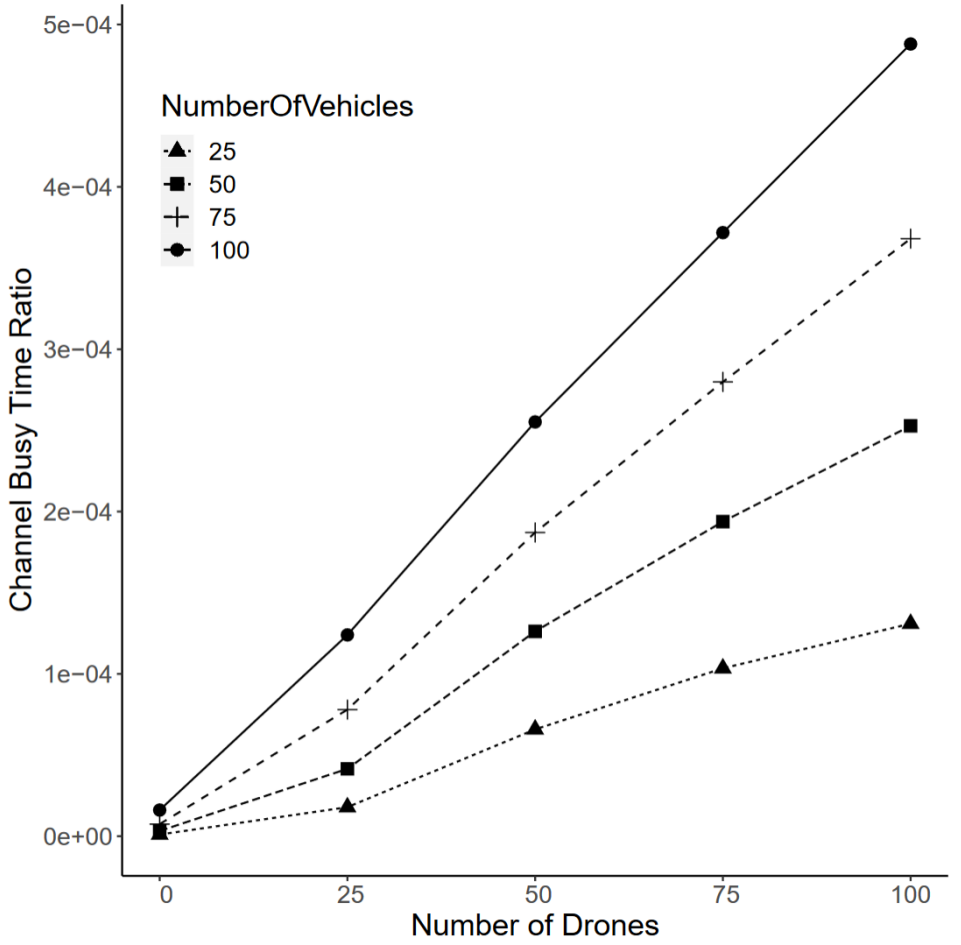
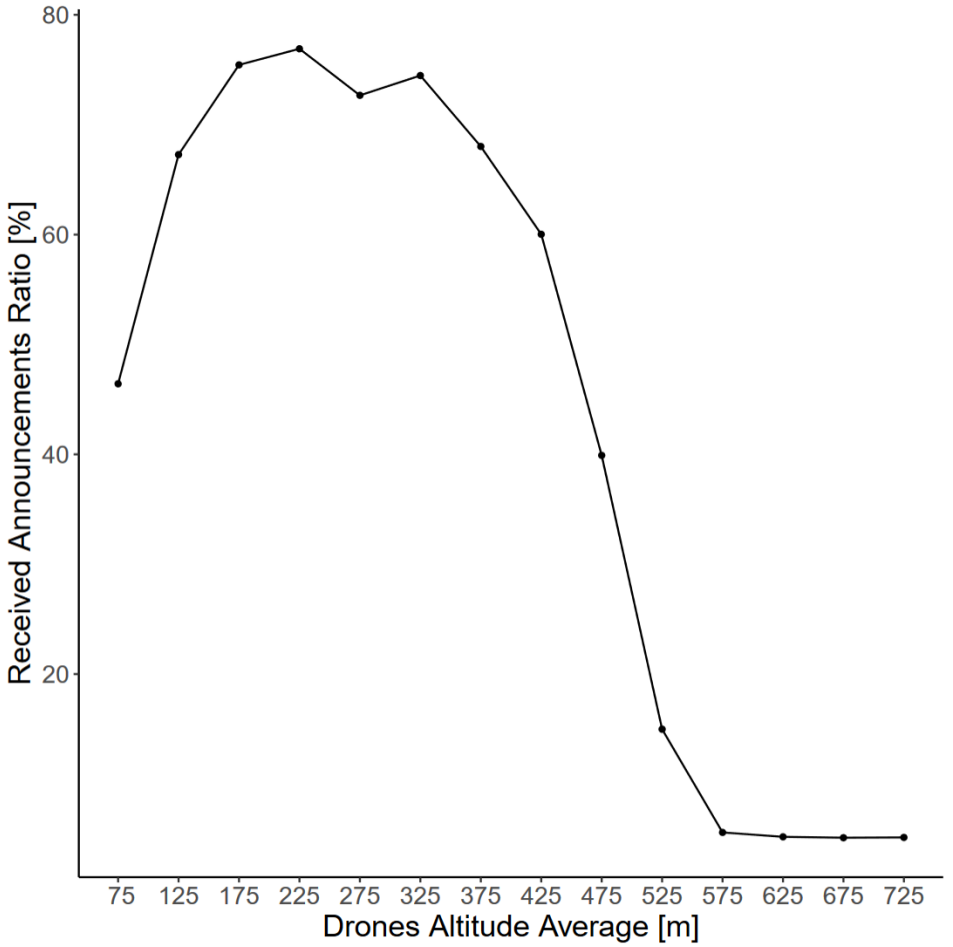


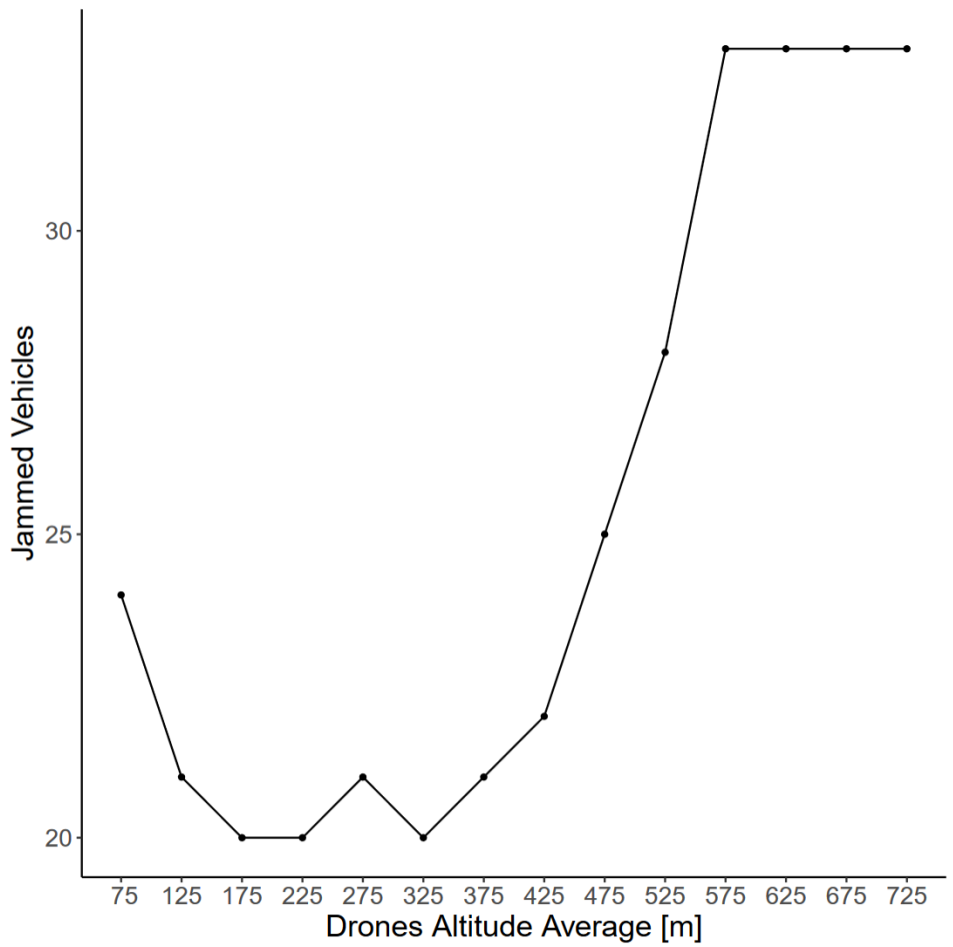
Broadcast storm suppression

- Weighted p-persistence algorithm
- Different parameters for drones and vehicles
- **Channel busy-time ratio low in all cases**



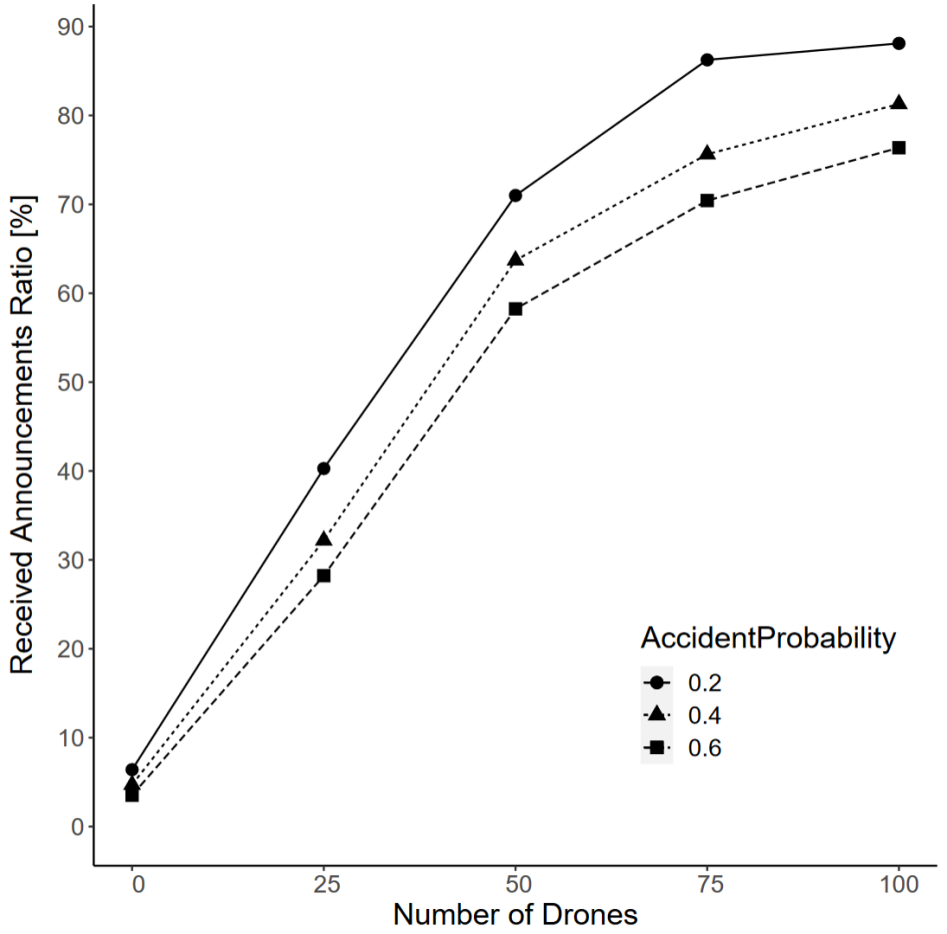
Drone flight altitude





Evaluation

- Can be used as connectivity metric
- Connectivity increases when number of drones is rising
- Accident probability has negative impact



Evaluation: traffic flow improvement

Accident probability is fixed: 30%