Feasibility of Floating Content in VANETs

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ABSTRACT

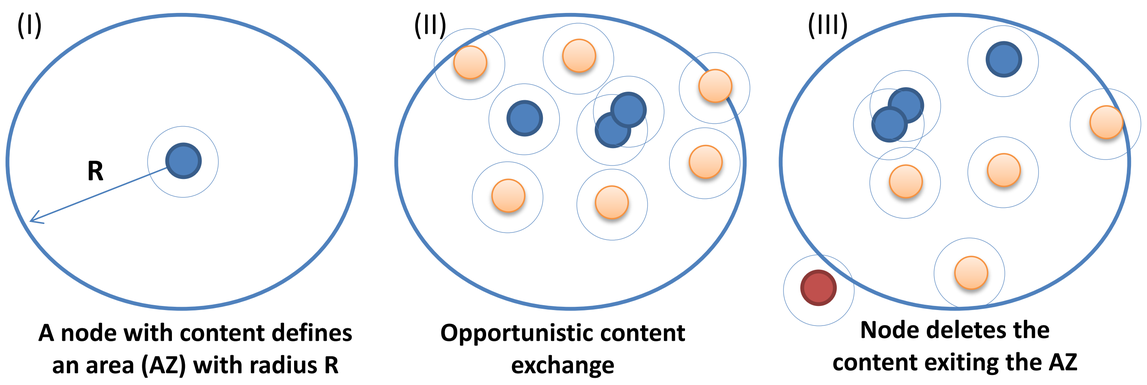
Problem: The challenge of *infrastructure-less* communication model in *vehicular ad-hoc networks*.

Contribution: Employing *Floating Content* (FC) parametrization by mapping traffic mobility features into the proposed model *(Random Waypoint extension)*.

Results: Analysis and simulations proved the feasibility of the FC paradigm in realistic urban settings over a wide range of traffic conditions.

FLOATING CONTENT BASICS

Probabilistic content storing in geographically constrained conditions[1]



A node with content defines an area (AZ) with radius R

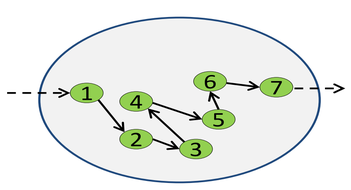
Opportunistic content exchange

Node deletes the content exiting the AZ

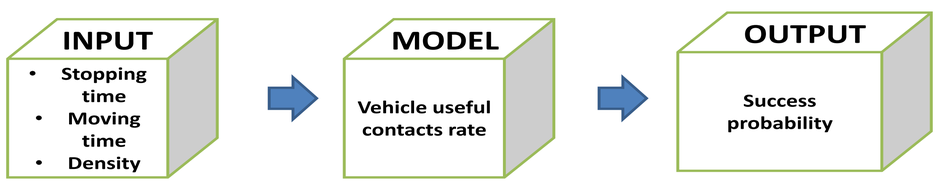
- **Success Probability**, the probability for a node entering the AZ to get the content item during its sojourn in the AZ.
- **Availability**, the fraction of users inside the AZ holding a copy of that content item.

MODELING OF FC IN VEHICULAR SETTING

Mobility features mapping into RWP with pause model



A node journey within AZ where ● is a waypoint

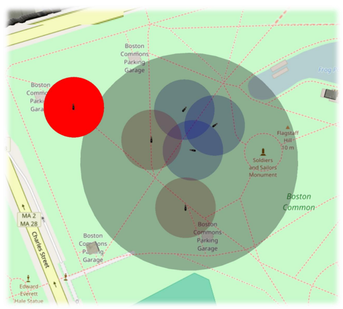


$$P_{succ} = \frac{P_{epoch}}{1-p(1-P_{epoch})},$$

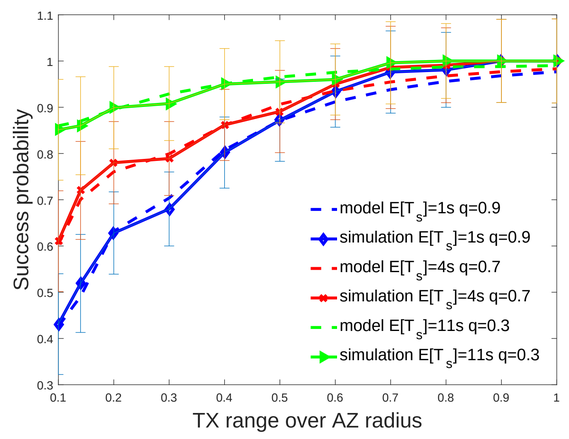
where P_{epoch} is the success probability in an epoch, and p is the probability to exit the AZ

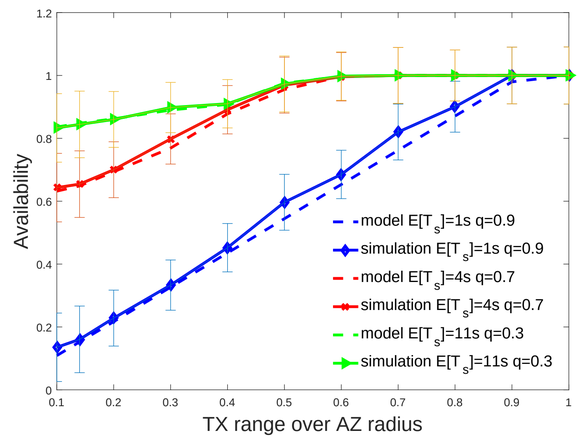
NUMERICAL EVALUATION

Boston park scenario



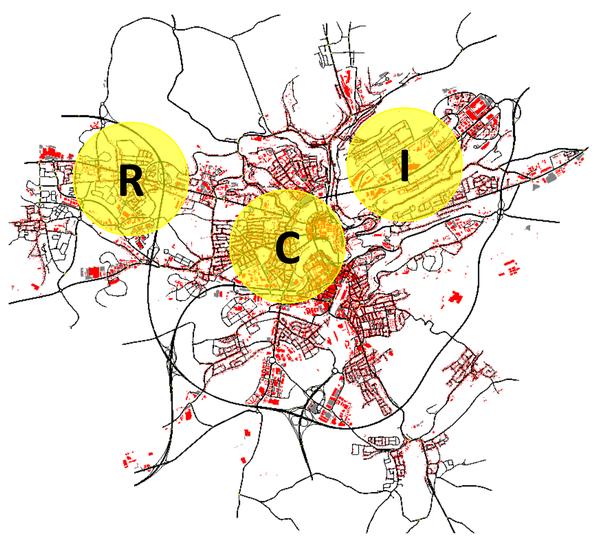
- Arrival rate = 0.1/s
- AZ radius = 50m
- Simulation time = 2h
- Node speed = 1m/s
- Stopping time = 1s,4s,11s
- Moving time =9s

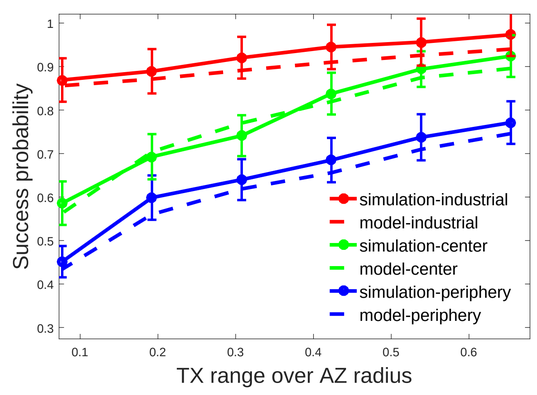




Although *(i)* clustering of nodes with content and *(ii)* border effects are not included in the model, the simulations show a good model's accuracy.

Luxembourg SUMO traffic scenario[2]



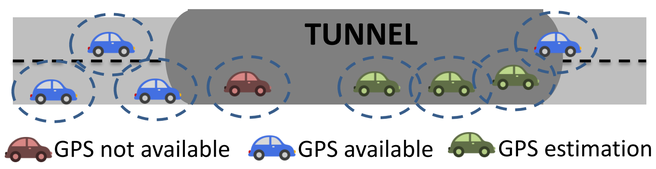


Industrial; **C**ity center; **R**esidential; Simulation time 3h, AZ radius=250m

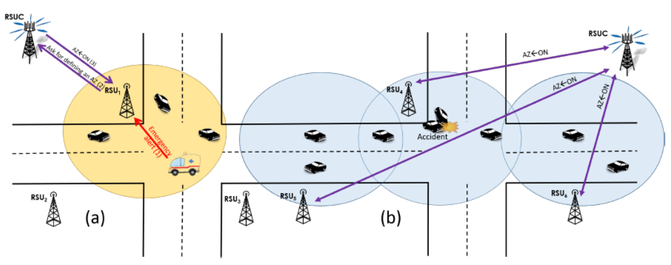
Even in scenarios with realistic mobility patterns, simulation results are in good agreement with analytical values of success probability.

PRACTICAL APPLICATIONS

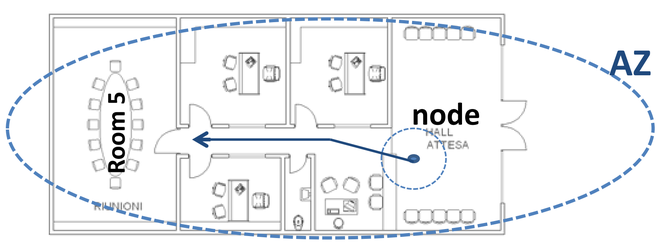
GPS estimation through other vehicles



AZ dynamic reshape



Indoor localization



REFERENCES

[1] E. Hyytia et al., "When does content float? characterizing availability of anchored information in opportunistic content sharing", in INFOCOM 2011.

[2] L. Codeca et al., "Luxembourg sumo traffic scenario: 24 hours of mobility for vehicular networking research", IEEE Vehicular Networking Conference 2015.