A Selective Flooding Method for Propagating Emergency Messages in Vehicle Safety Communications

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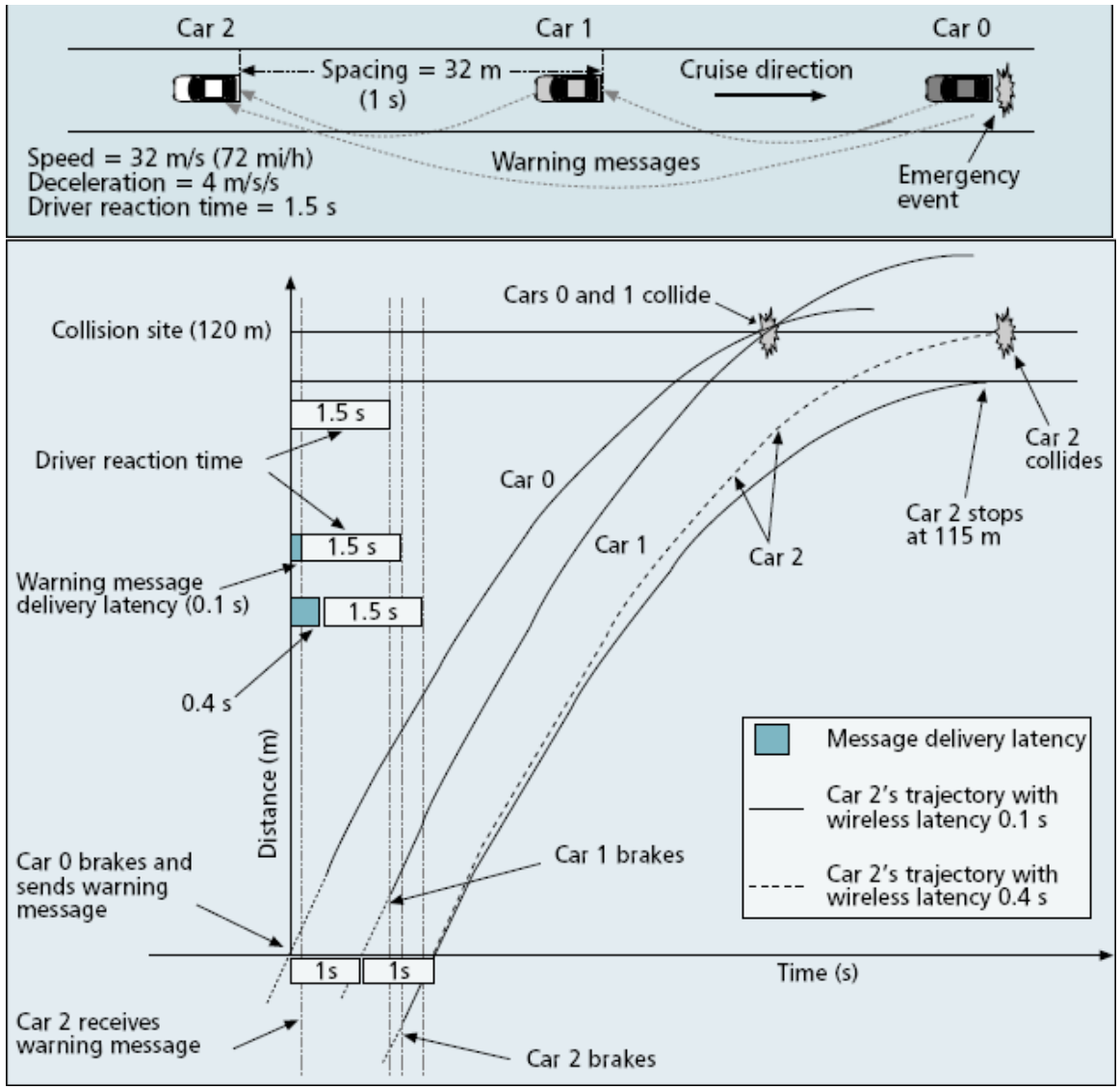
Outline

- Introduction
- Related works
- Least Common Neighbor Flooding
- Simulation
- Conclusion

Introduction

- Drivers typically rely on the rear brake light of front vehicle in emergency situations.
- The reaction time of drivers ranges between 0.7 and 1.5 seconds.
- If a car suffers an accident and then broadcast the Emergency Warning Message (EWM) immediately, the drivers of rear vehicle platoon may react earlier.



Picture is captured from "Vehicle-to-vehicle wireless communication protocols for enhancing highway traffic safety"

Introduction

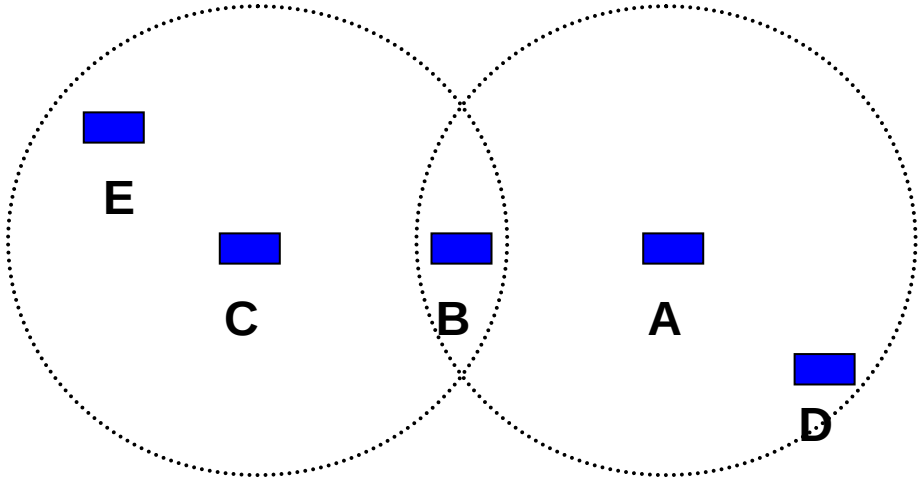
- The problem is, in a dense vehicular network, EWMs may suffer serious collisions in conventional flooding.

Related works

- Exchange location information from GPS.
- Distance Defer Transmission (DDT)
  - location of sender is stamped in EWM, and nodes with longer distance will have shorter defer time.
- Source broadcast EWM periodically, and receivers send their own EWM or ignore the message if the direction is contrary.

Least Common Neighbor Flooding

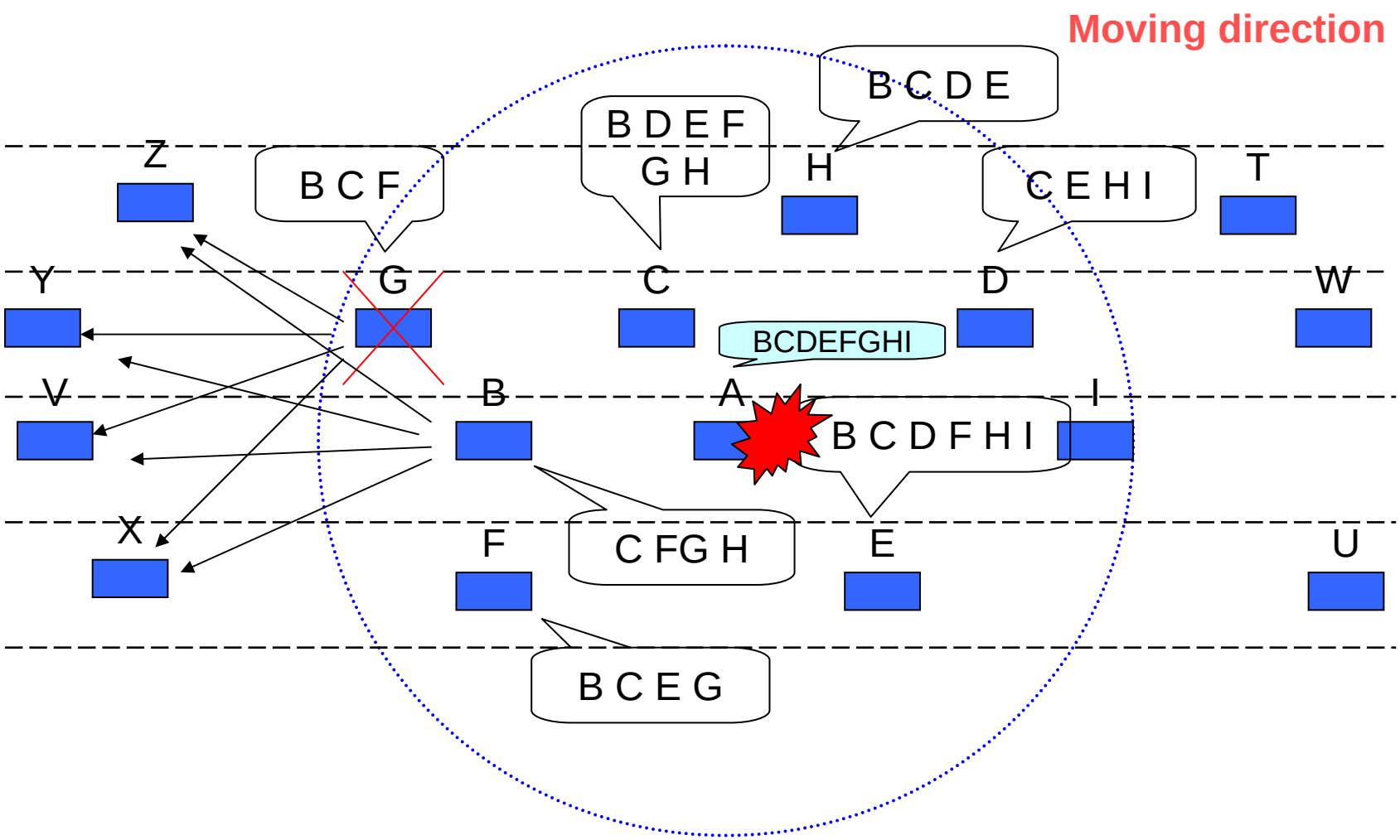
- Common neighbor:
  - A and C have a common neighbor, B



Least Common Neighbor Flooding

- The Least Common Neighbor node (LCN)
  - Node with minimum number of common neighbors of sender.
- Estimate relative distance from sender.
- No location information exchange periodically.
- LCN has minimum transmission defer time.
- Nodes will discard the duplicate packets.

Least Common Neighbor Flooding



Simulation

Table 1. Simulation Parameters

Simulation parameters	
Parameter	***Value***
Node density	50~500
Vehilce speed	80~120km/h
Simulation area	2500m X 2500m
Number of events	10
MAC protocol	IEEE 802.11
Radio range	250m
Emergency message's TTL	5
Vehicle acceleration	3 times each
Simulation time	30 seconds

Simulation

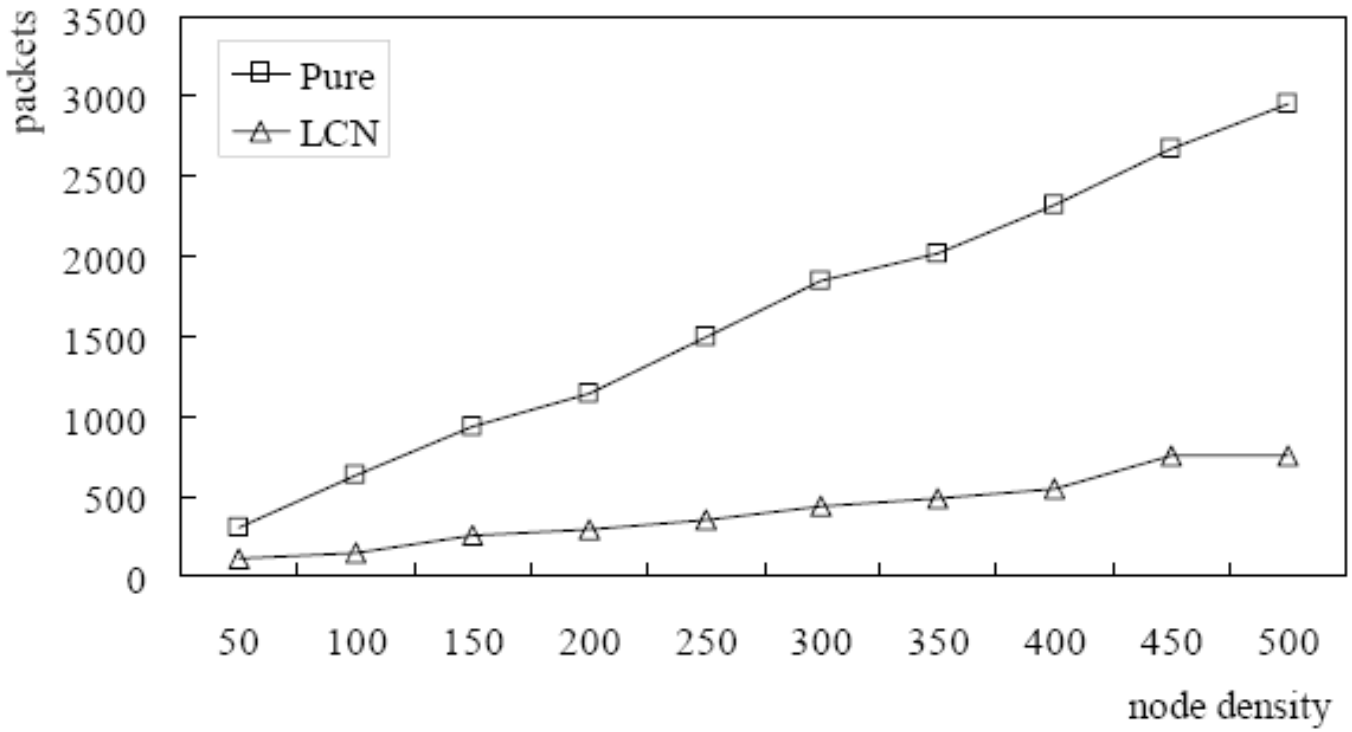


Figure 5. The number of forward packets

Simulation

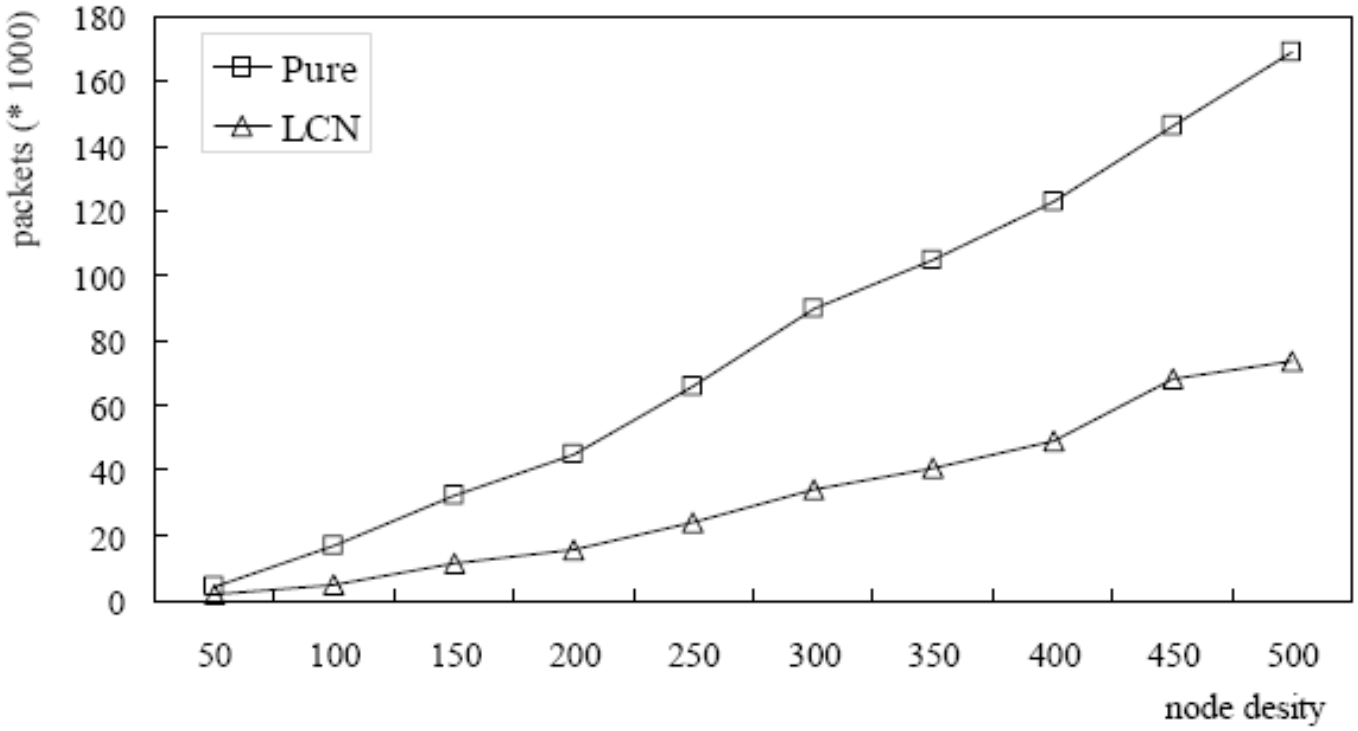


Figure 6. The number of received packets

Simulation

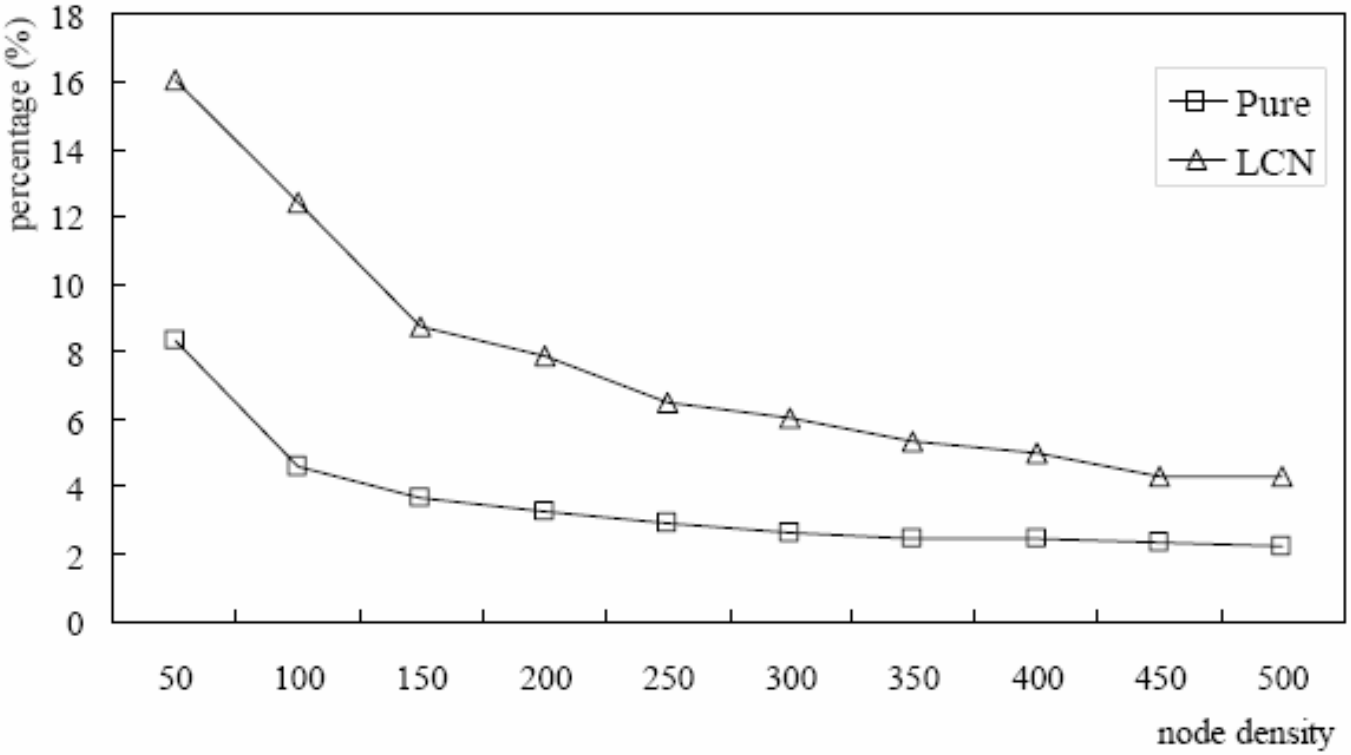


Figure 7. The percentage of effective packets

Simulation

- When the number of nodes is 500:

	Pure Flooding	LCN Flooding
Total forward packets	3,000	750
Total received packets	170,000	70,000
Non-duplicate packets	2%	4%

Conclusion

- Advantages:
  - Neighbor information is retrieved from overhearing or hello message.
  - No location information exchange overhead.
  - Node with longest distance will rebroadcast first.
- Disadvantages:
  - Direction problem.