UNC CHARLOTTE

Intelligent Transportation System

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- What is Intelligent Transportation System?

- **Why do we need Intelligent Transportation System?**
  - **To Avoid Collision**
  - **Obstacle Detection**
  - **Range Detection**

- **How is it Implemented?**
  - **Sensors**
  - **Bluetooth**

Bluetooth

- Data Rate: 1Mbps
- Range: 1m-100m
- Frequency: 2.4GHz
- Frequency Hopping: 1600 hops/sec

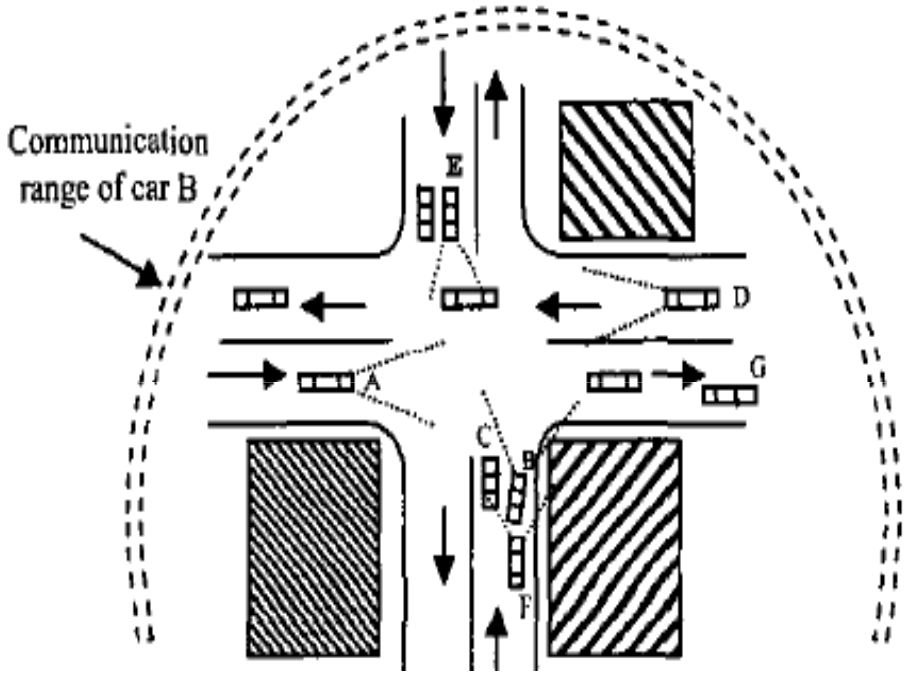
Sensor

Millimeter Wave Radar

- Frequency: 76GHz
- Detect Speed, Direction, and Distance

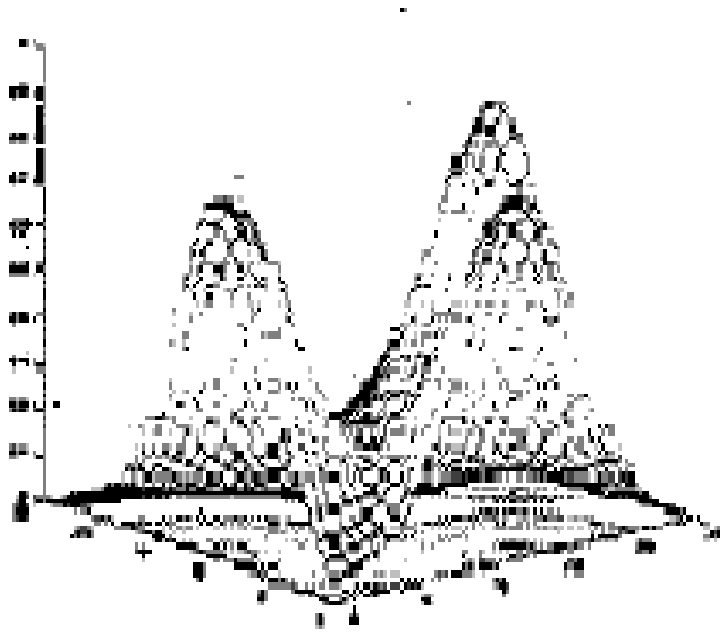
Inter Vehicle Communication

- Form Ad-hoc Network among vehicles
- Follows Master & Slave pattern
  - Sender ⟶ Master
  - Receiver → Slave
- Piconet & Scatternet Formation



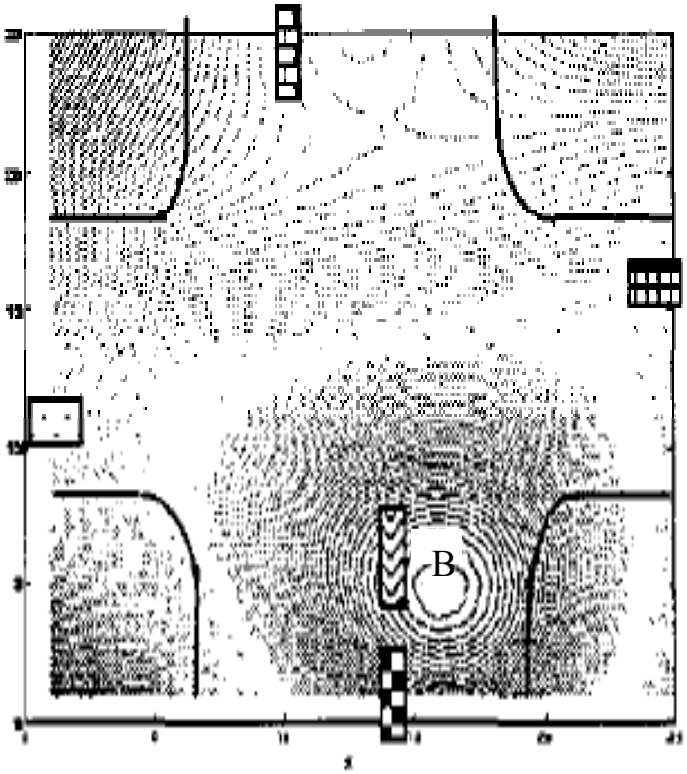
Area Coverage

- Sensor's Field of View: 150^0 – 270^0
- Sensing Range & Communication Range
- Increment in the Coverage Area

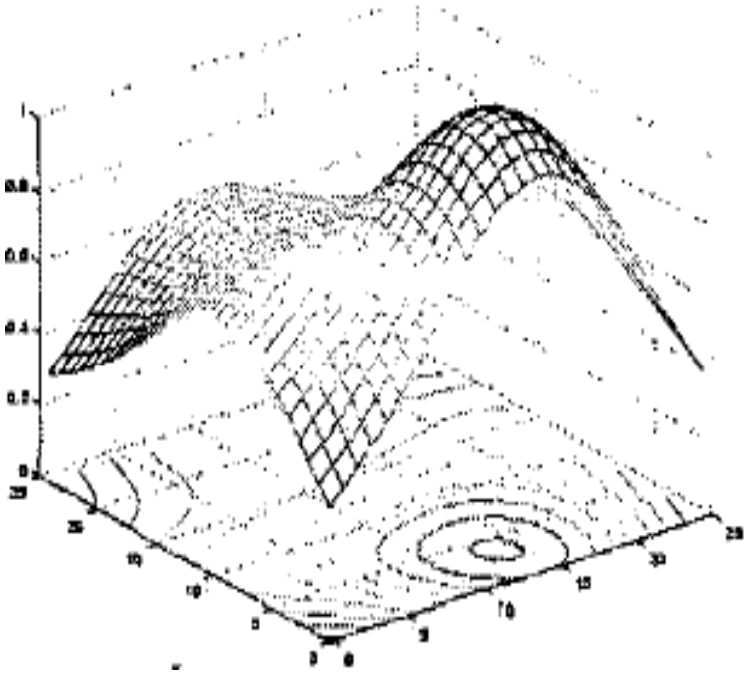


Sensing Model of three Non-Isotropic Sensor

Analysis of Topology

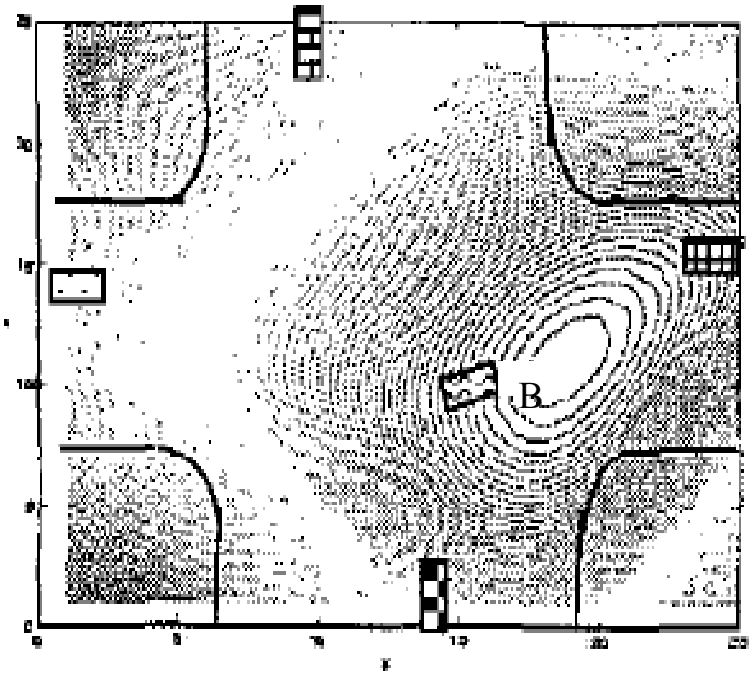


Sensing Area

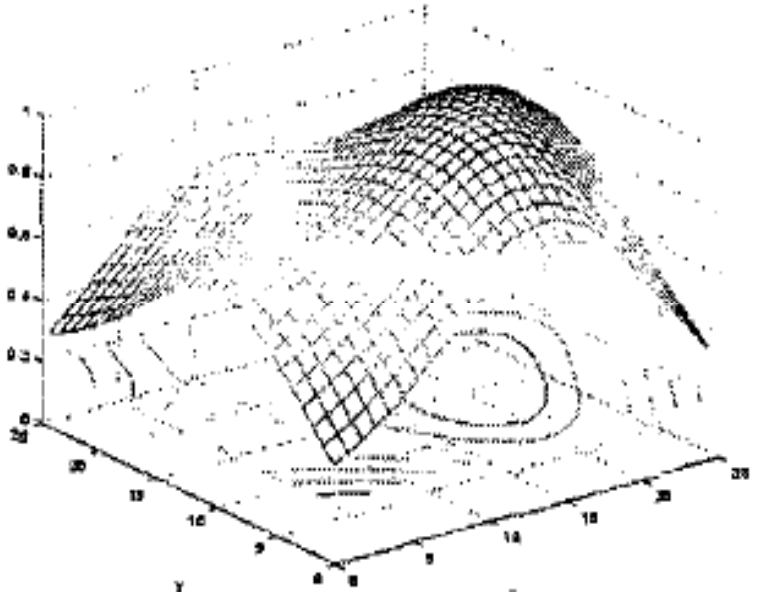


Plot of Probability of Detection for B

Analysis of Topology cont…



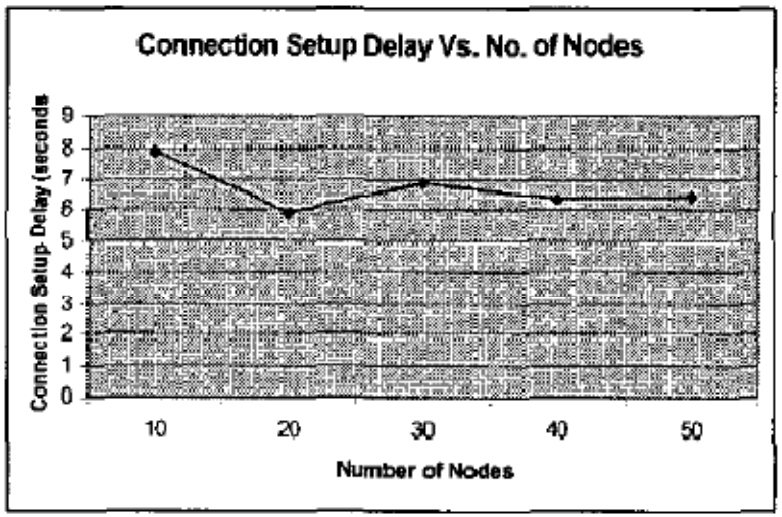
Changed Sensing Area

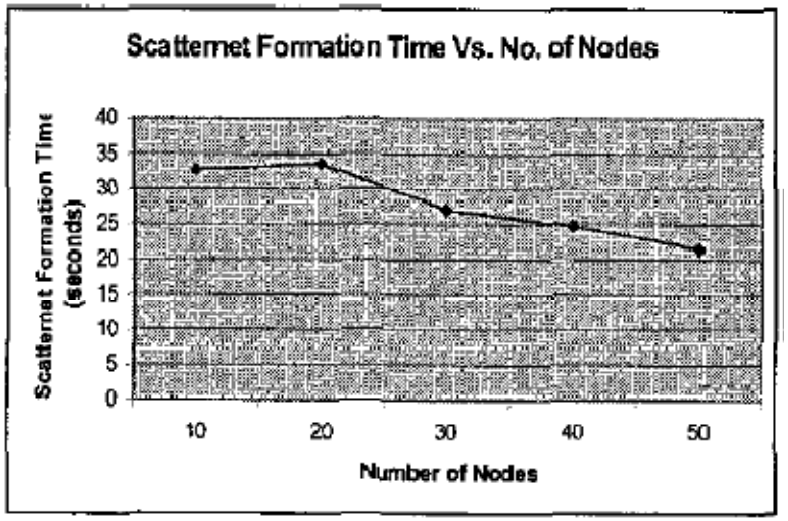


Changed Plot of Probability of Detection for B

Simulation Results

- Simulation Area : 25m x25m
- Communication Range: 10m





Advantages

- Unsafe situation is captured on time.
- Work in any Environmental conditions (Fog, Storm, etc).
- Accidents can be avoided.
- No change in the highway system is needed.

Conclusion

- **Factors like Communication overhead, Communication Efficiency not taken into account.**
- **Speed of the vehicle and surrounding interfering objects are not considered.**
- **Can be implemented in real time situations after considering and testing under the above factors.**