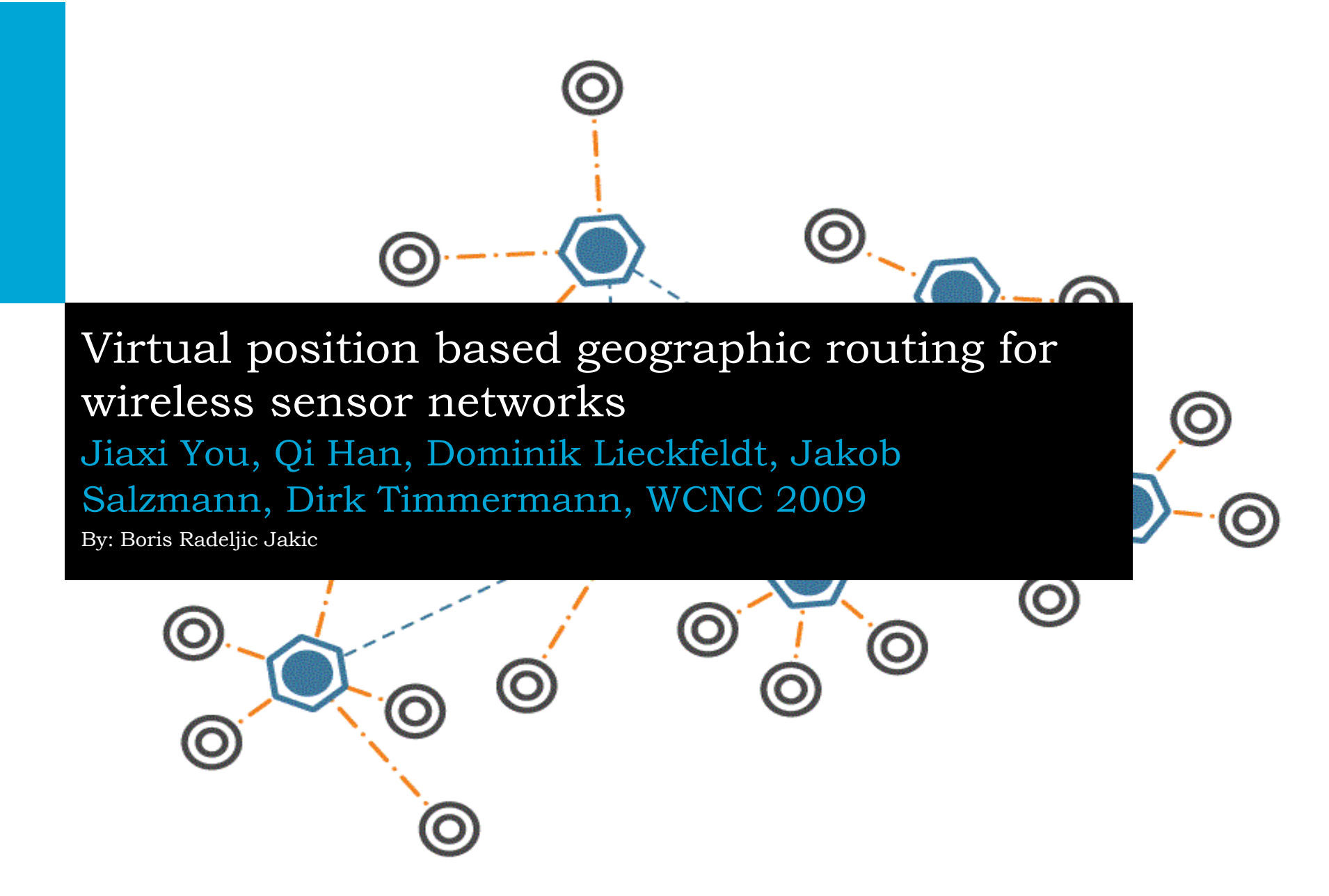


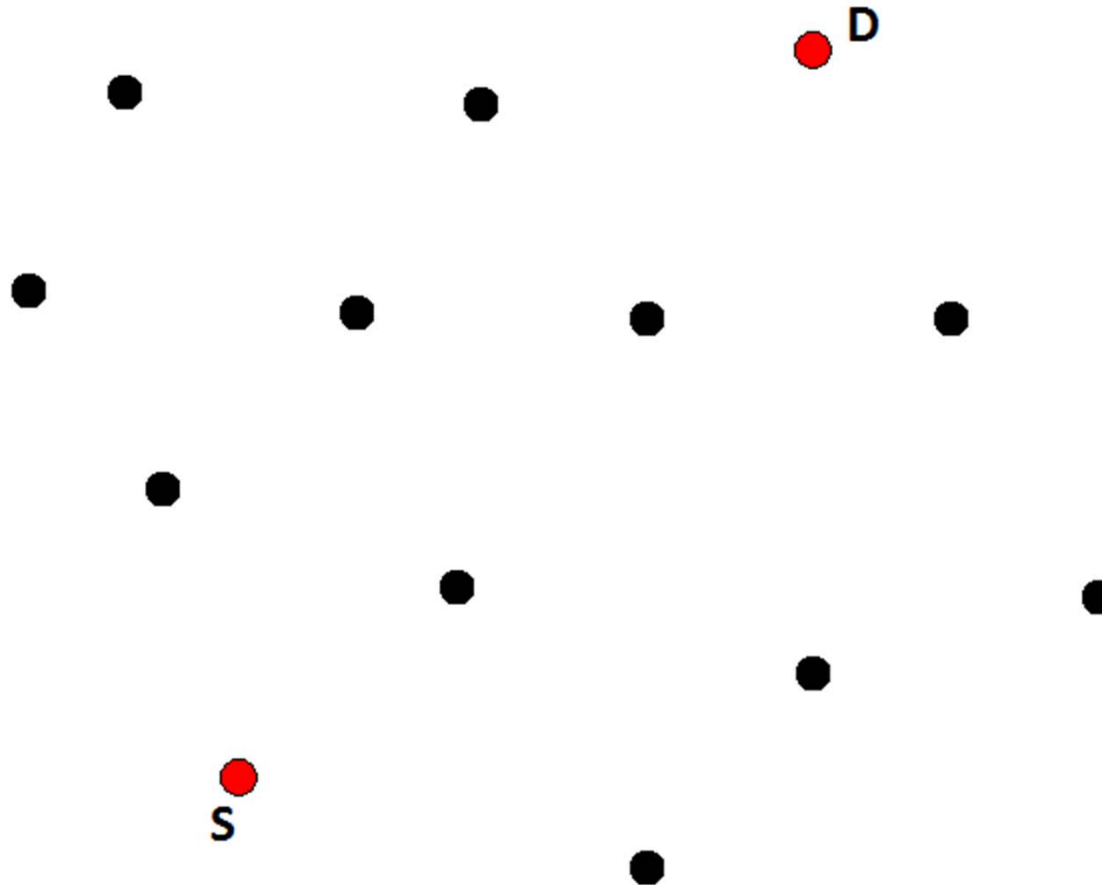


# Virtual position based geographic routing for wireless sensor networks

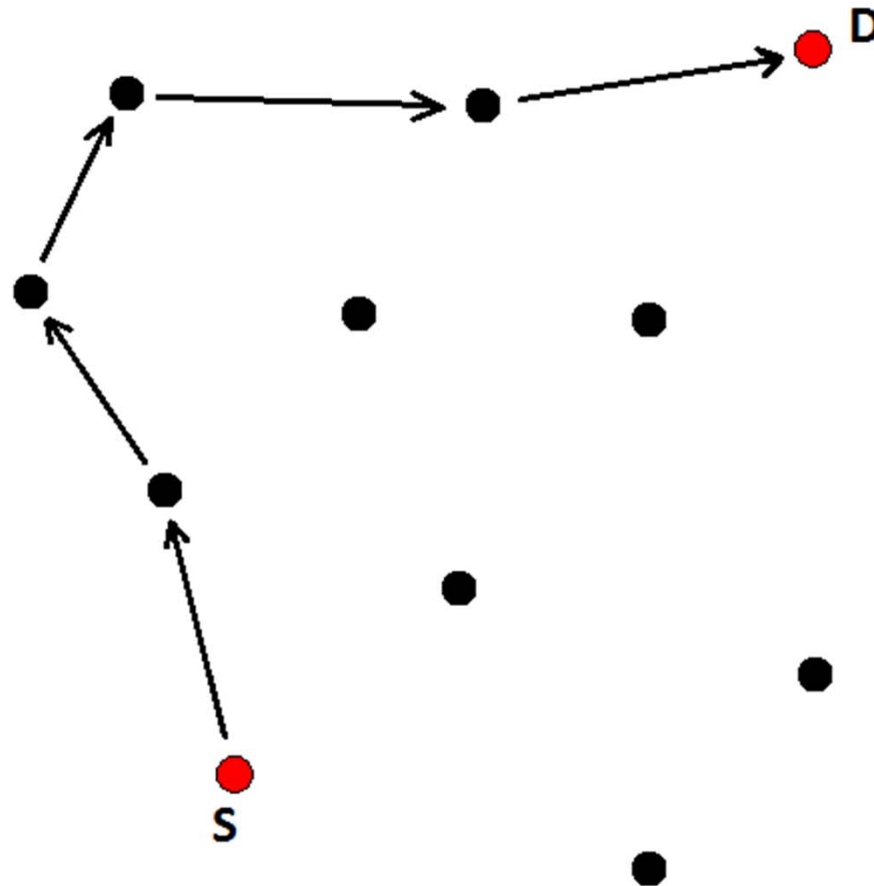
Jiaxi You, Qi Han, Dominik Lieckfeldt, Jakob Salzmann, Dirk Timmermann, WCNC 2009

By: Boris Radeljic Jakic

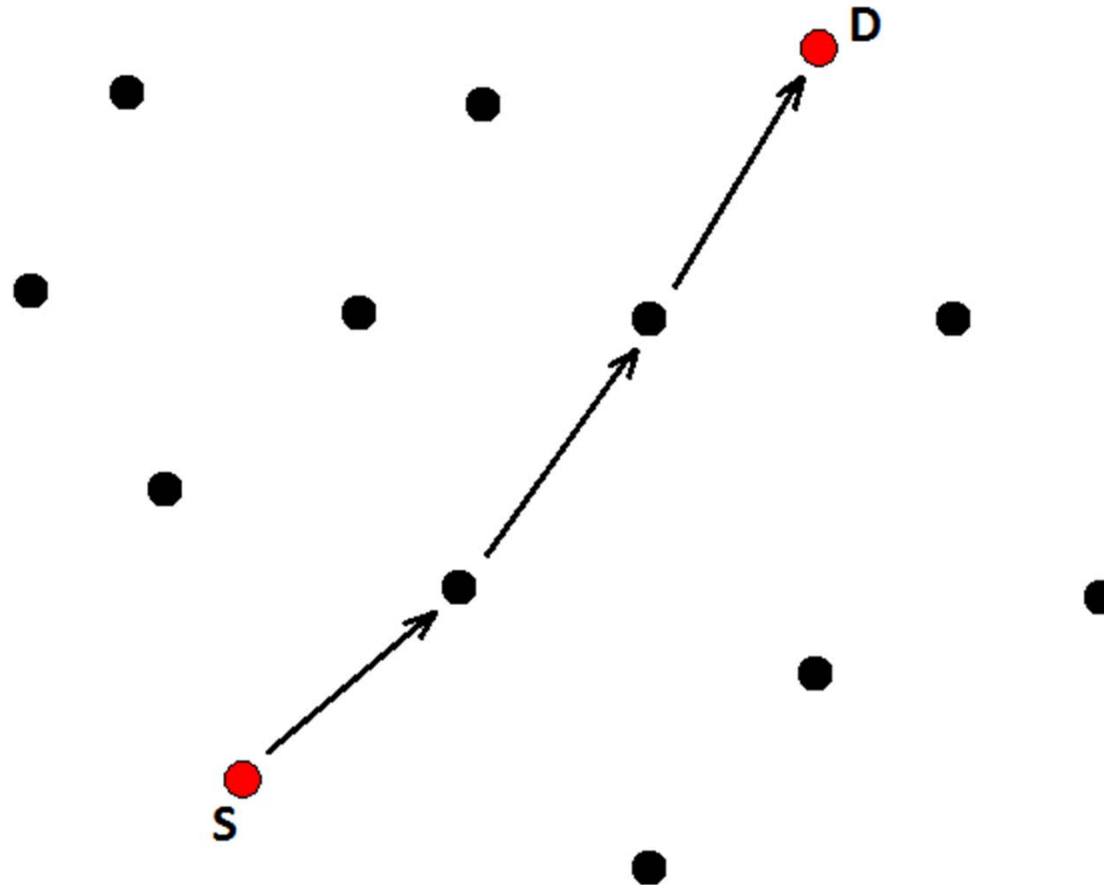
# Routing in WSN



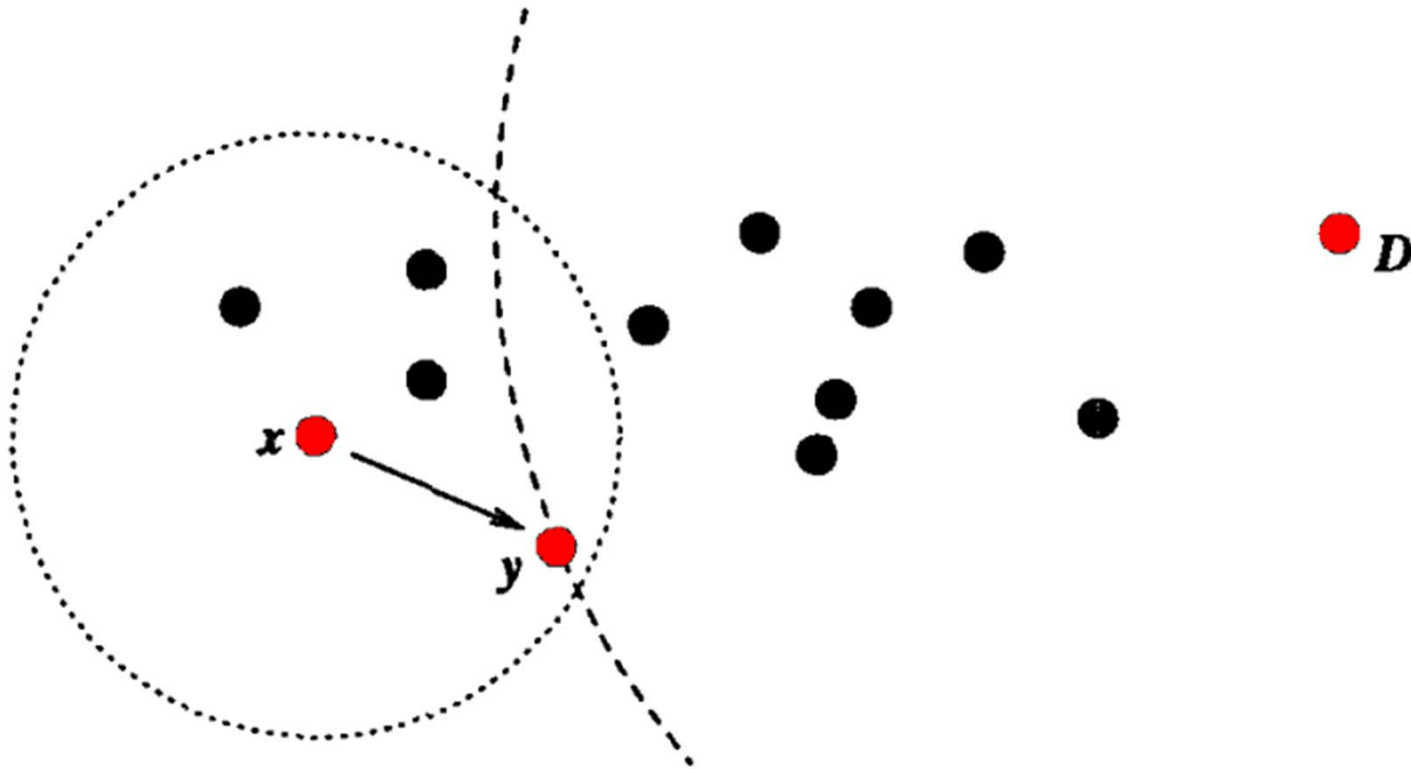
# Routing in WSN



# Routing in WSN



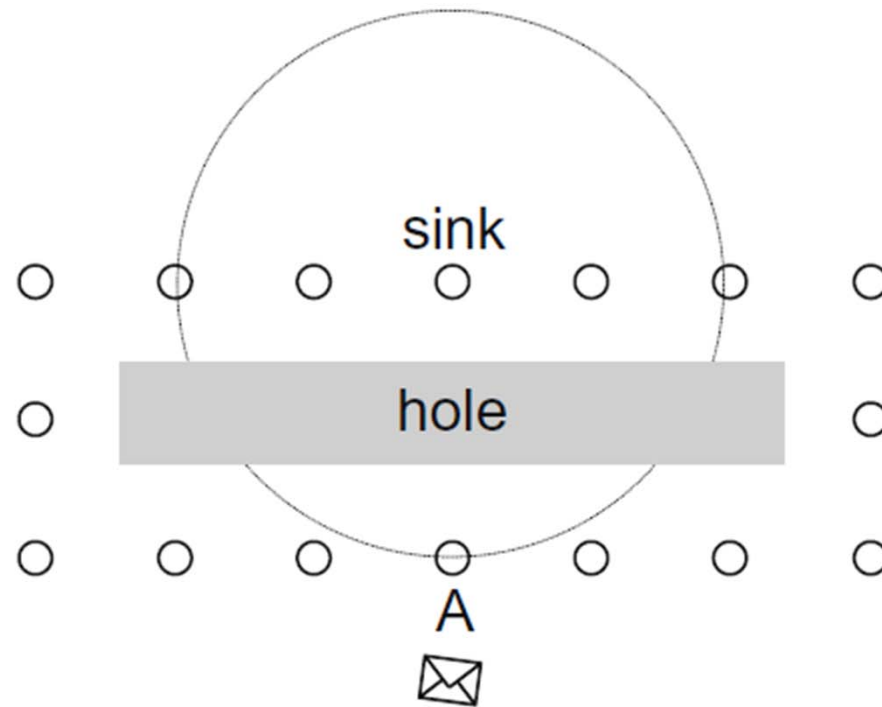
# Greedy forwarding



Source: GPSR: Greedy Perimeter Stateless Routing for Wireless Networks

# Problem with greedy forwarding

If the topology isn't uniform, there can be a local minimum



Source: Virtual Position based geographic routing for wireless sensor networks



# Content

- Virtual position based forwarding
  - Basic ViP
  - HVP
  - RM-ViP
- Performance evaluation and comparison to other geographical routing protocols
- Conclusion

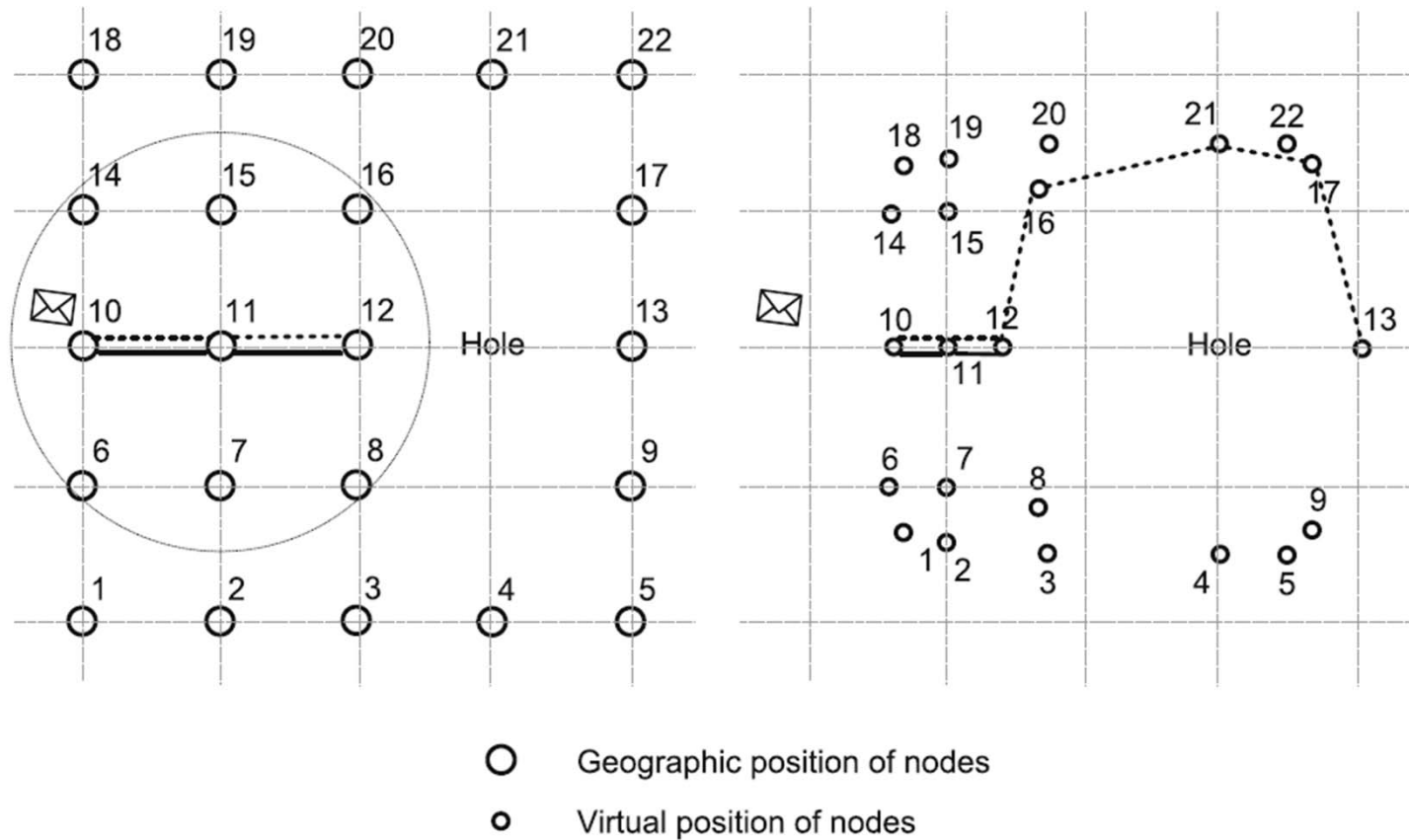
# Virtual position based routing

- Virtual position: Middle point of all a nodes direct neighbors
- Virtual position =

$$(x'_A, y'_A) = \left( \frac{1}{n} \sum_{i=1}^n x_{A,i}, \frac{1}{n} \sum_{i=1}^n y_{A,i} \right)$$

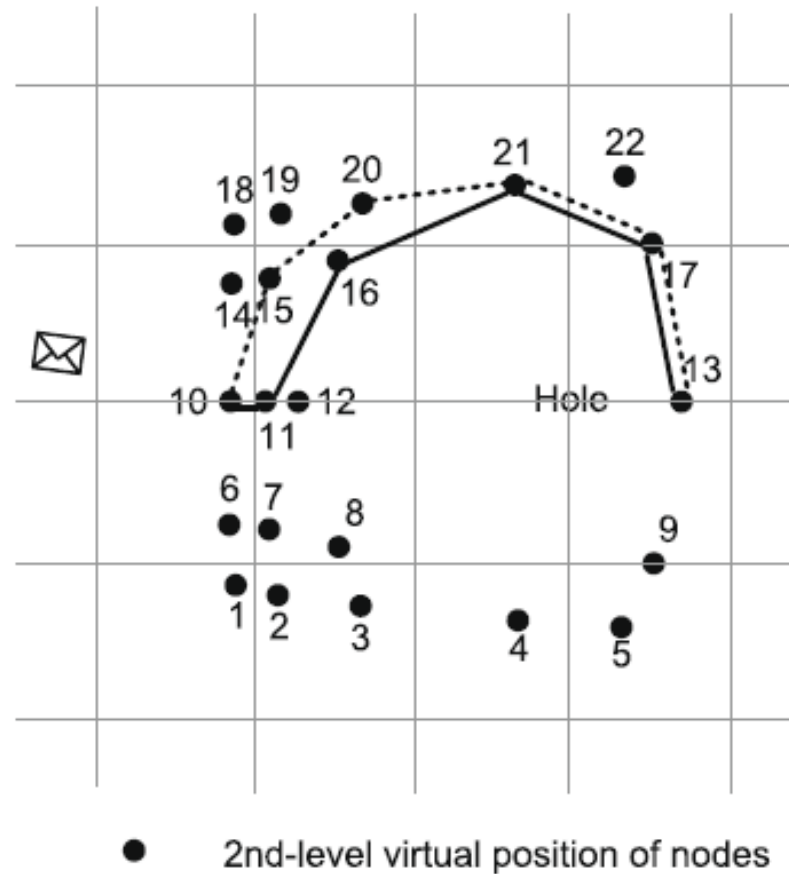
- This position provides information about how the neighbors are distributed around a node.

# Greedy forwarding with ViP (1)



Source: Virtual Position based geographic routing for wireless sensor networks

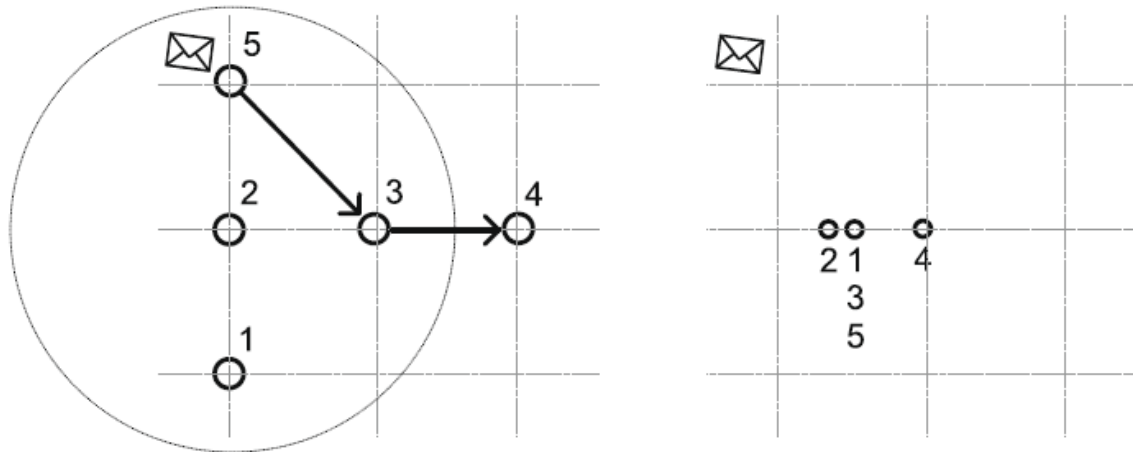
# Greedy forwarding with ViP (2)



Source: Virtual Position based geographic routing for wireless sensor networks

# Greedy forwarding with ViP (3)

With ViP holes can be introduced:



- Geographic position of nodes
- 1st-level virtual position of nodes

Source: Virtual Position based geographic routing for wireless sensor networks

# Greedy forwarding with hierarchical ViP (HVP)

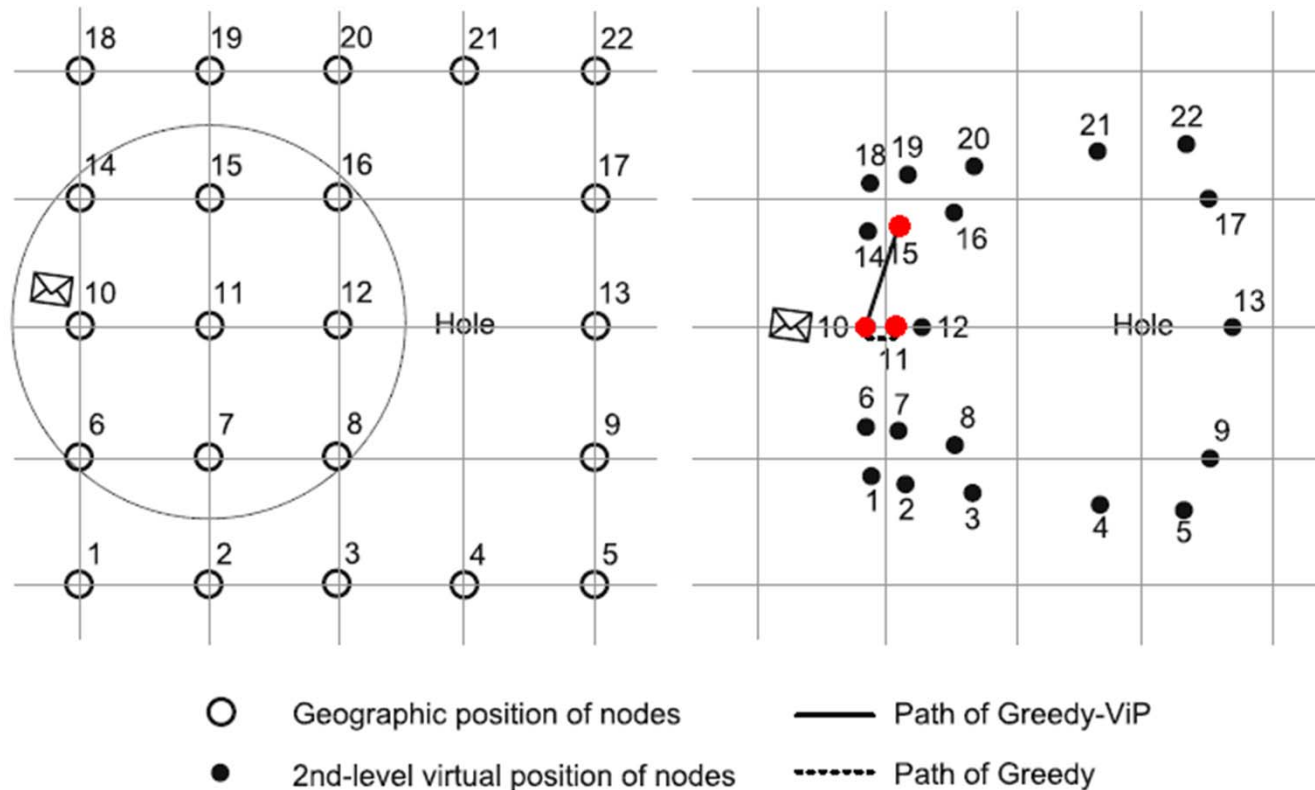
- When a K-level ViP introduces a local minimum HVP will lower the level of virtual positions
- Requirements:
  - Geographical position
  - K-Level virtual position
  - Flag\_level



# Restricted multipath greedy forwarding with ViP (1)

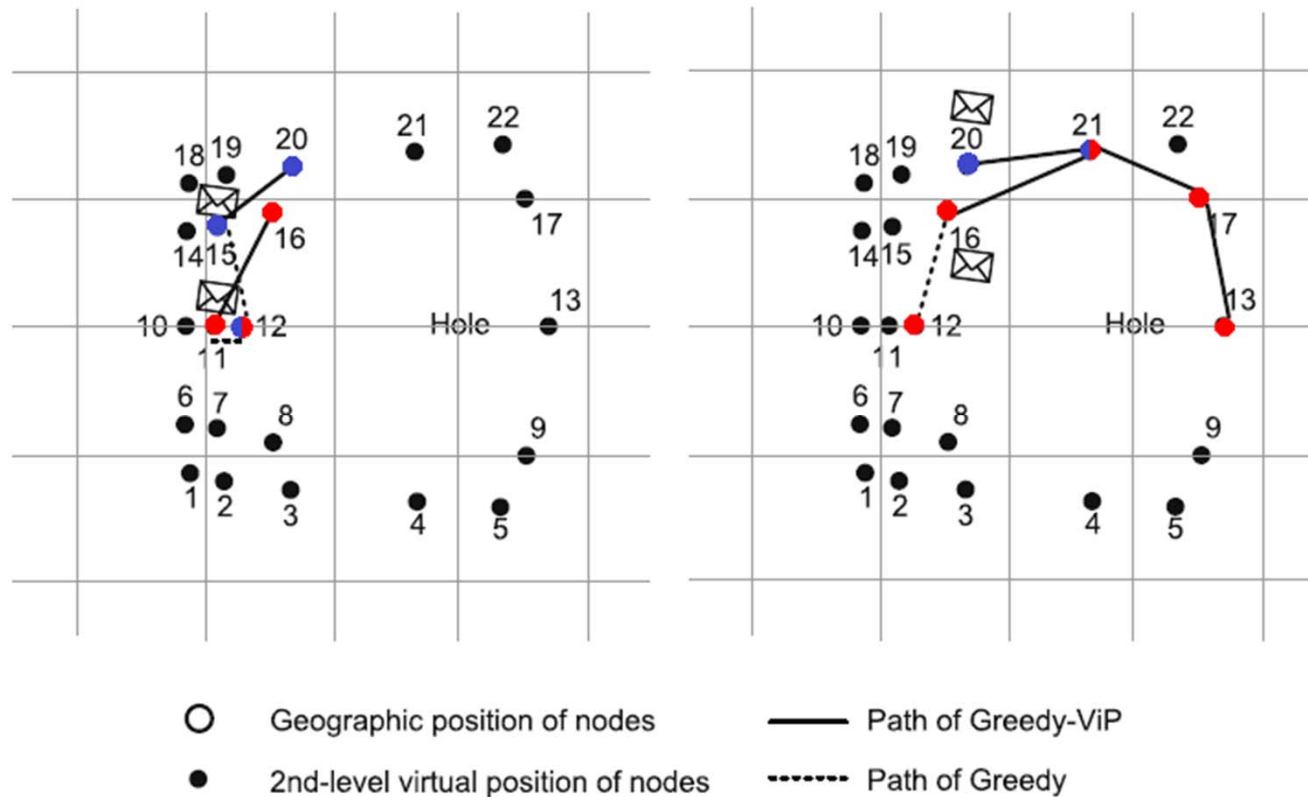
- Multipath geographic routing extended from ViP
- Send to only 1 or 2 nodes
- Based on: Kth-level ViP and Geographical position

# Restricted multipath greedy forwarding with ViP (2)



Source: Virtual Position based geographic routing for wireless sensor networks

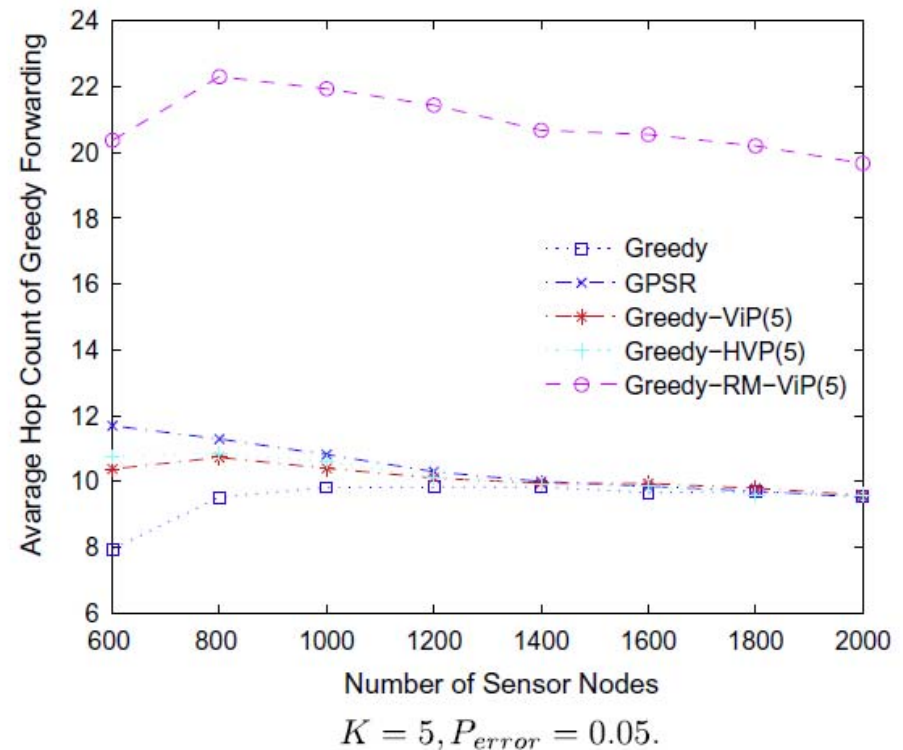
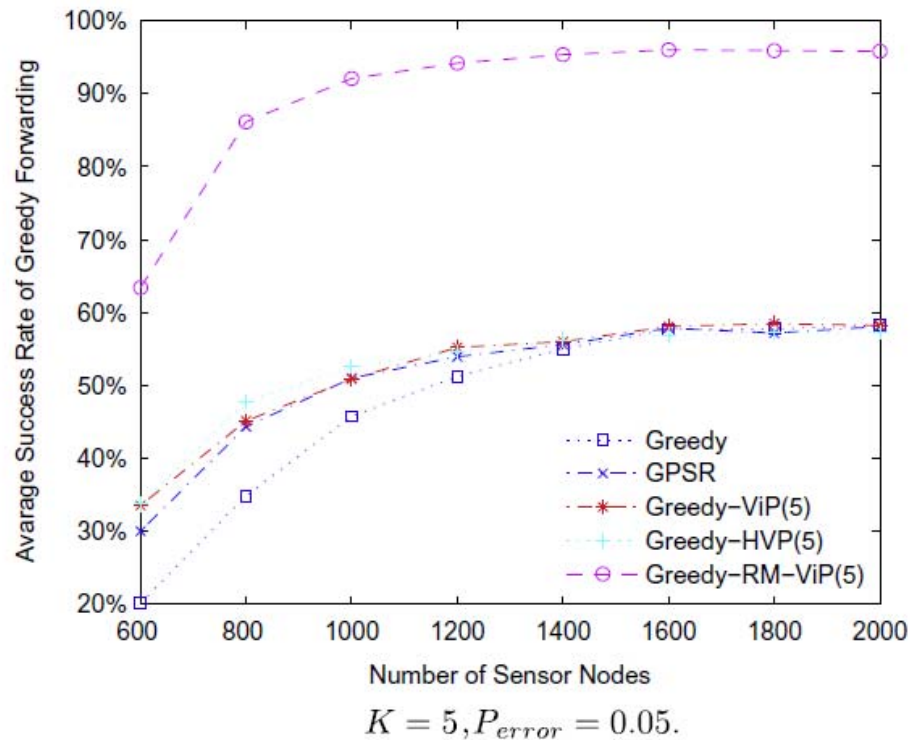
# Restricted multipath greedy forwarding with ViP (3)



Source: Virtual Position based geographic routing for wireless sensor networks

# Performance evaluation

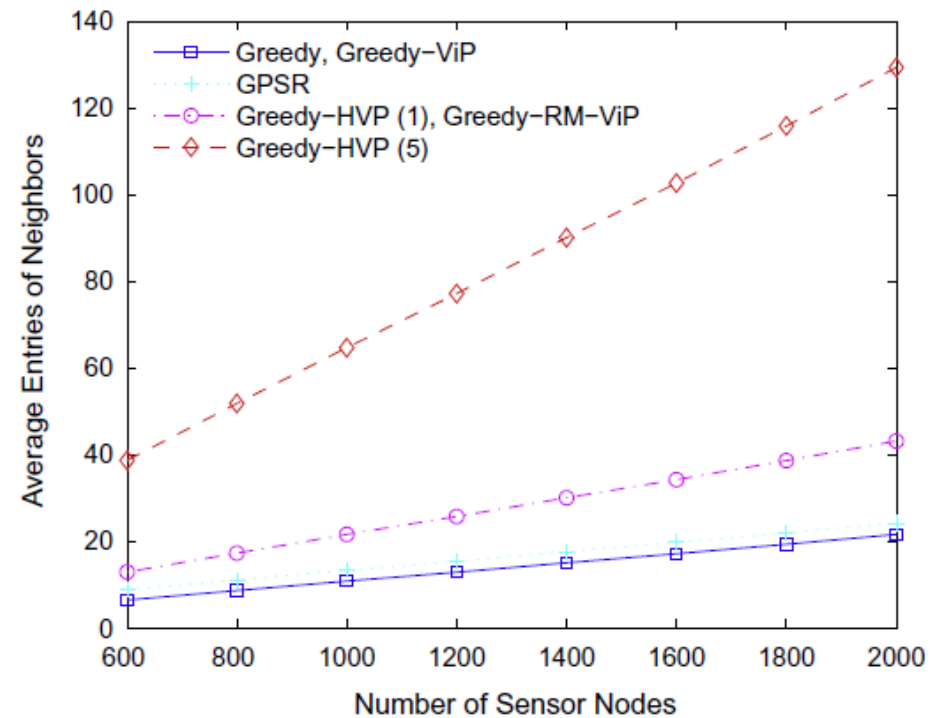
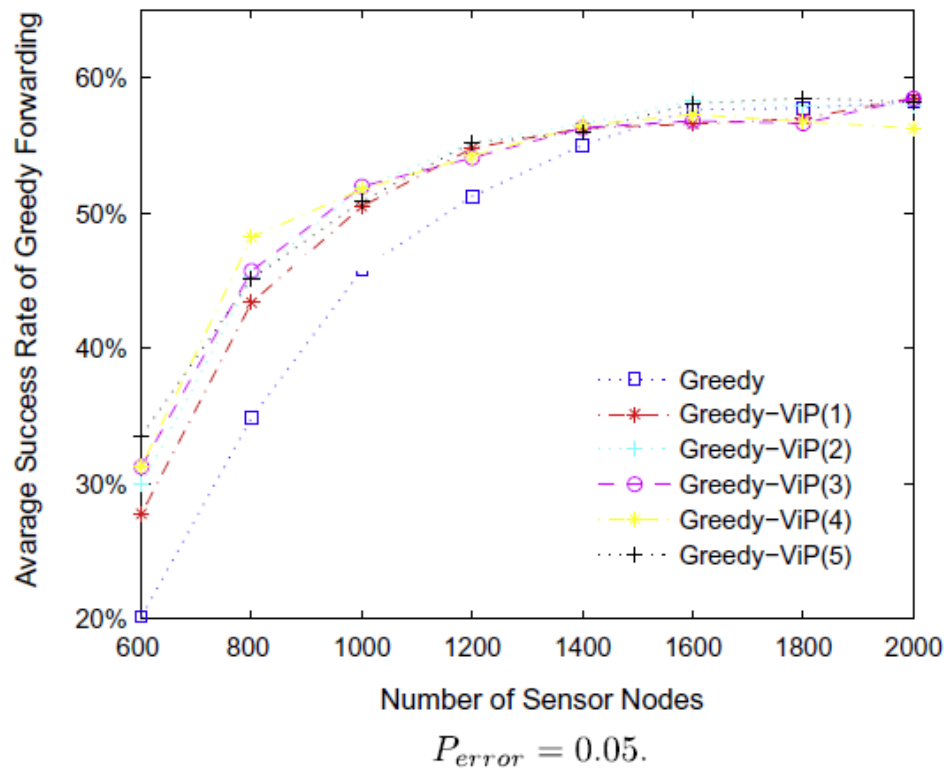
Far better success rate of RM-ViP due to multicast messages!



Source: Virtual Position based geographic routing for wireless sensor networks

# Performance evaluation

More is not always better!



Source: Virtual Position based geographic routing for wireless sensor networks

# Conclusion

- 3 algorithms based on Virtual Position
  - Greedy forwarding with ViP
  - HVP
  - RM-ViP
- Improves succesrate (especially for sparse networks)
- Limited control overhead



# Questions?