Routing in Mobile Robots

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Problem Statement
Current system – Publisher Subscriber architecture.
Cons – (a) Single Point of Failure, (b) Mobile robots move out of range from central broker.
Aim – Define an efficient distributed routing algorithm to provide communication between these mobile robots.

Research Phase
Reactive routing algorithms find a route only when needed. Makes it easy to update routes at the time of use. Avoids the overhead of finding all unrequired routes. Some algorithms considered, studied and analyzed:

AODV
- Robot that wants to communicate sends Route Request (RREQ) messages to its neighbors.
- Neighbors forward the RREQ till it reaches the destination.
- Destination initiates a Route Reply (RREP) message to form a reverse route to the source. This route is used for message sending.

Validation of a route depends upon the Freshness of the last received OGM and the sliding window.

B.A.T.M.A.N.
- Better Approach To Mobile Ad-Hoc Networks.
- Robot sends an OGM (Originator Message) to prove it’s existence periodically to neighbors.
- Neighbors forward the OGM further to its own neighbors.
- Every robot that receives OGM makes routes depending on the OGM’s received.

Experimental Results
Packet Loss Percentage vs. Communication Range
Packet Drop Percentage vs. No. of Robots

Conclusion
- The above results clearly show how the packet loss rate decreases with increase in the communication range as more robots are directly reachable.
- Packet loss increases with increase in the speed of the robots as robots move further away faster.
- We also see that the packet loss decreases with increase in the number of robots as there are more available paths for the packet.
- These are all genuine expected results and show that B.A.T.M.A.N. can be effectively used for routing in mobile robots.

IEEE 802.11s
- Uses 4-way handshake for direct communications.
- Uses AODV for dynamic topologies.
Both AODV and IEEE 802.11s include delays due to Reverse Path Formation. Robots would already move by the time a path is formed. Therefore, they cannot be used.