# BeeIP: Bee-Inspired Protocol for Routing in Mobile Ad-Hoc Networks

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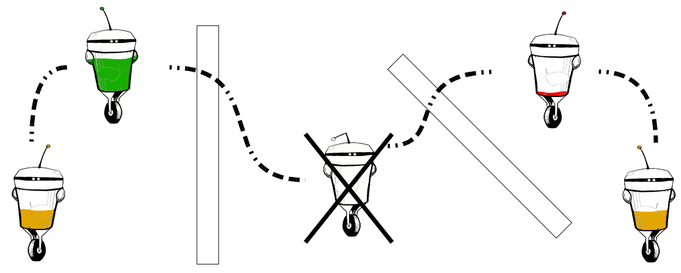
## Introduction

Routing in MANETs faces two major challenges: *nodes*' ***mobility*** and their ***resource constraints***.



We expect routing protocols for MANETs to:

autonomously gain knowledge of the topology
be able to adapt to any topological changes occurred
provide optimal routing solutions for any destination
forward data packets to their destination or next hop
be as fast and efficient as possible

## Methodology

BeeIP uses bee agents (i.e. scouts, ack_scouts and foragers) to **explore** the network, **collect** information, **carry** payloads, and constantly **monitor** a link.

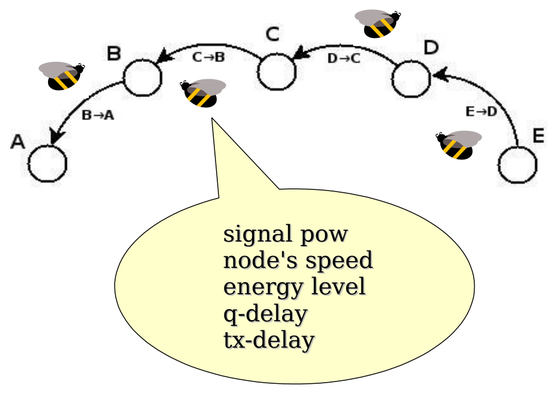
The collected information is used to calculate the **local** (pair) and **global** (path) reliability levels of a link.

Reliability levels are used to detect any link improvement or deterioration.

### Predictions

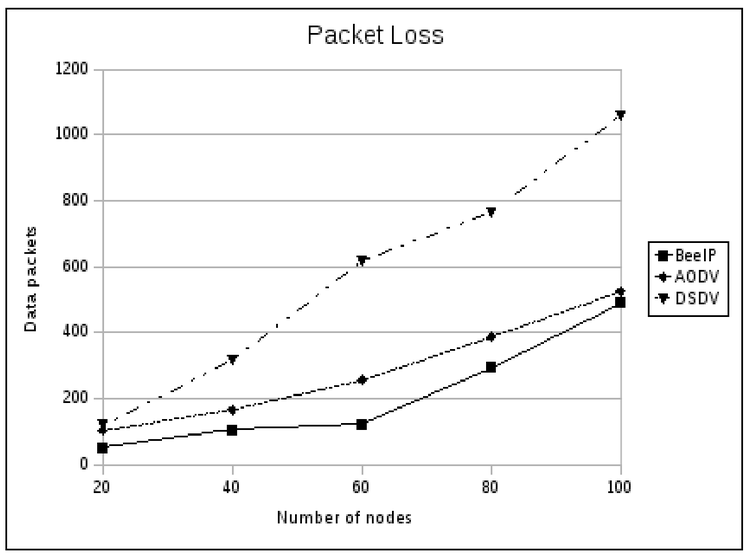
A series of global reliability differences allows predictions to be made at the source node.

New scouting processes may be initialized.



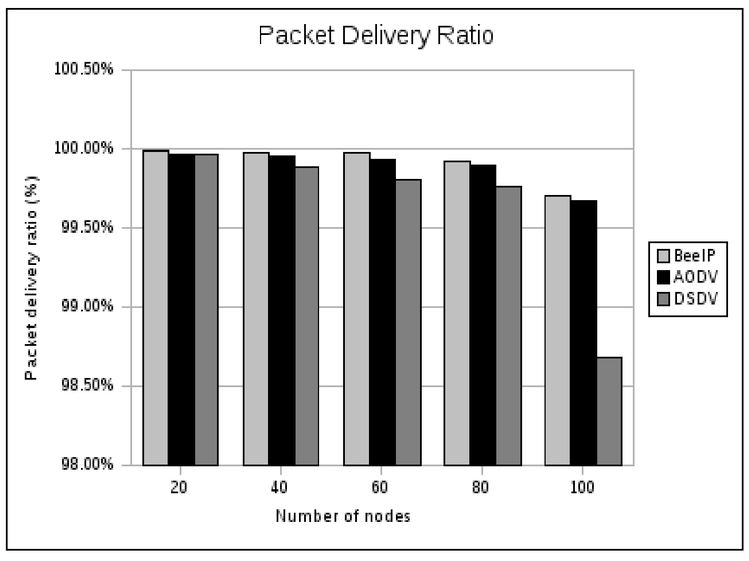

## Experimental results

BeeIP is compared with the two well-known routing protocols: AODV and DSDV, using the ns-2 network simulator.



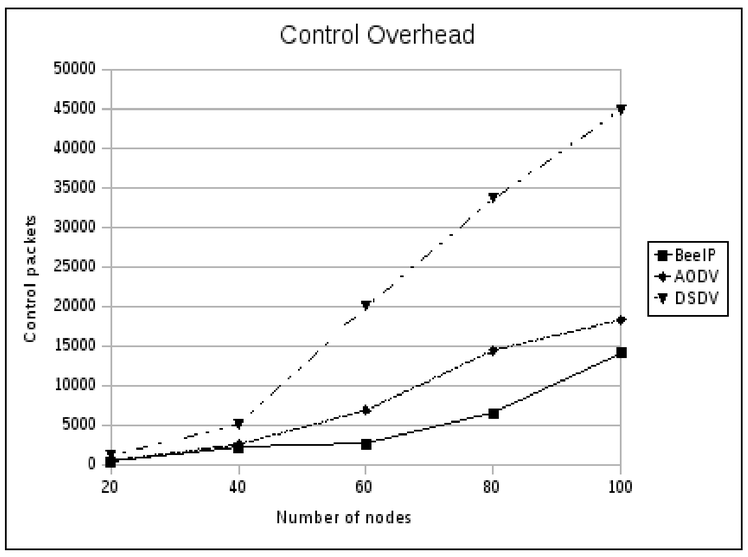

Five scenarios of different network sizes were used to compare the three protocols. Each simulation ran for 600 seconds.

This figure shows the number of data packets which were dropped by the routing protocols during each simulation. BeeIP has less packet loss compared to AODV and DSDV.




The ratio between the successfully delivered packets and the total transmitted packets during the simulations is presented.

BeeIP (light bar) achieves better performance compared to AODV and DSDV, under the same network circumstances.




Control overhead is defined as the number of control packets that are sent to maintain routing, for a constant simulation period.

BeeIP uses less control packets than AODV and DSDV.

**Number of nodes**

| | 20 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|
| **BeeIP:** | *14* (*369399*) | *27* (*333449*) | *146* (*381166*) | *184* (*355629*) | *271* (*163024*) |
| **AODV:** | *15* (*310912*) | *39* (*330284*) | *196* (*374010*) | *220* (*354899*) | *343* (*157042*) |

BeeIP administers less *path discovery processes* to have more *data packets successfully delivered* than AODV.

## Conclusion

BeeIP is a new bee-inspired routing protocol for MANETs. Compared to AODV and DSDV, BeeIP is able to achieve **better performance** in terms of **packet loss** and **control overhead**. Additionally, under the same network conditions, BeeIP is able to deliver **more data packets** than AODV, initializing **less path discovery** processes.

## References

I would like to thank Dr Myra Wilson and Mr Dave Price for their constant interest, cooperation and support throughout this work.

**References and further reading**

(1) Giagkos, A., Wilson M.S.: A Cross-Layer Design for Bee-Inspired Routing Protocols in MANETs. In: Proceedings of TAROS 2009, Kyriacou, T., et al (eds.). TAROS 2009, pp. 25-32. Ulster University (2009)

(2) Frisch von K.: The Dance Language and Orientation of Bees. Oxford University Press (1967)