NEW POWER SAVING ALGORITHM POWER AWARE WITH THE SURVIVABLE ROUTING ALGORITHM FOR MOBILE AD HOC NETWORKS

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Objective of the problem

- Routing the packets
- Increases route survivability
- Increases throughput
- Decreases number of path reconstructions

Introduction

- Infrastructure-less
- Wireless
- Free license
- Self-organizing and self-managing
- Mobile nodes
- Network topology changes
- Node is both a host and router
- Multi-hop
- Heterogeneity

Introduction (cont….)

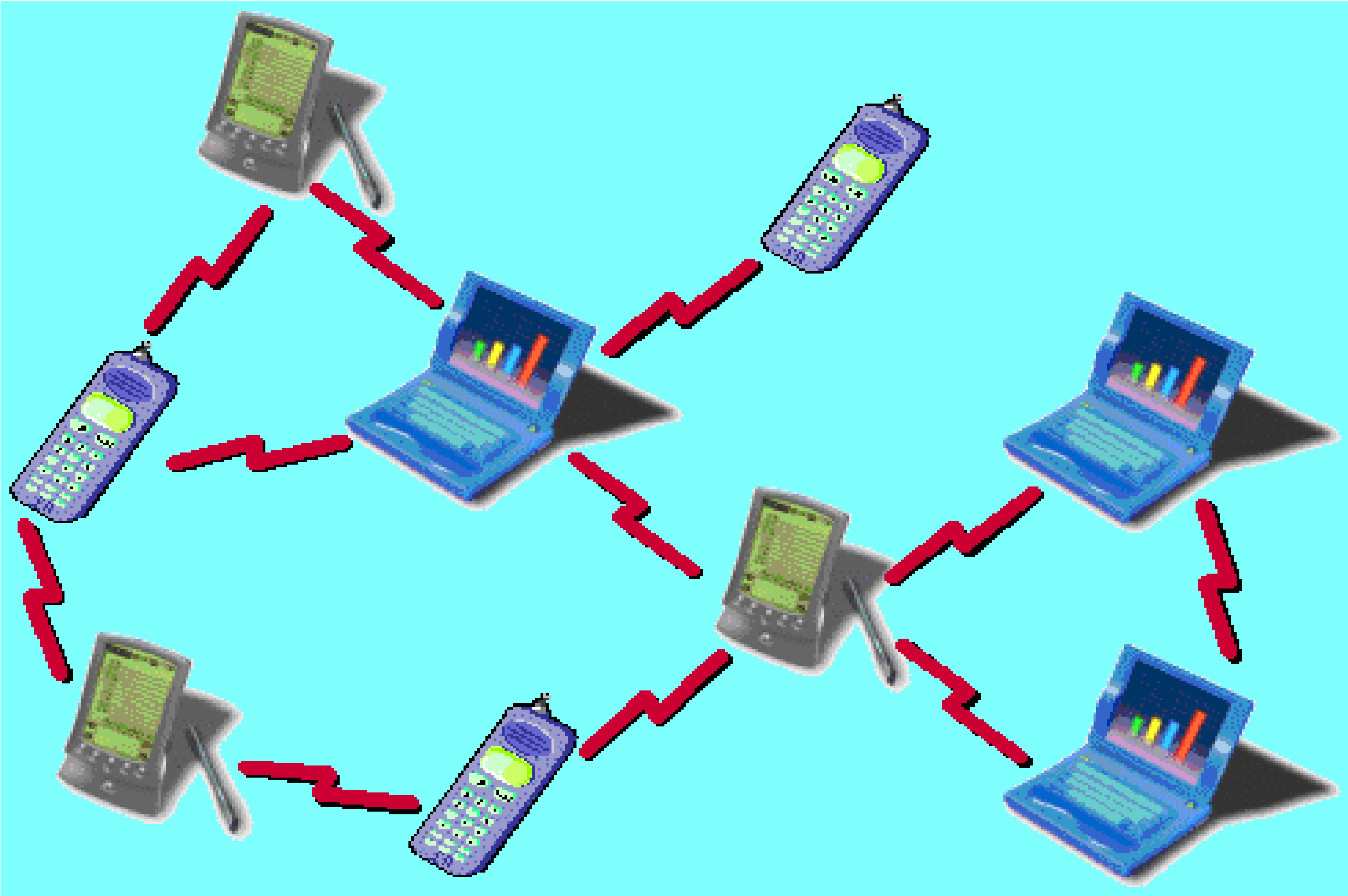

Figure.1. Structure of MANET.

Introduction (cont….)

- Emergency & War time
- M-commerce
- Vehicular service
- Education
- Local area network
- Sensor network

MANET issues

- Power-constrained
- Limited security
- Bandwidth-constrained
- survivability of the nodes
- Throughput
- Unnecessary transmission is something to be avoided
- Computation load need to be minimized

Some of the existing works

- **Power Aware Multi Access Protocol with Signaling(PAMAS)**
  - Energy efficient MAC protocol
  - Achieves goal
    - Making nodes with power-off.
  - Provides best results in dense networks
  - In small network, the power saving is low.

Some of the existing works (cont….)

❖ Minimum Total Transmission Power Routing(MTPR)

- Minimize total transmission power consumption for all nodes
- Total transmission-power for all the routes I

$$P(L_d) = \sum_{i=0}^{D-1} T(n_i, n_{i+1}) \qquad (1)$$

- Selects a path with more number of hops
- Increases the end-to-end delay

Some of the existing works (cont….)

- **Min-Max Battery Cost Routing (MMBCR)**

  - Smaller remaining-battery capacities of nodes are avoided

  -Nodes with more residual-battery capacities are chosen in a route.

$$R(L_e) = \underset{n_i \in Le}{Max}\ C_i(t) \qquad (2)$$

$$R(L_o) = \underset{L_e \in L_*}{Min}\ R(L_e) \qquad (3)$$

Proposed model

- Routing the packets
- Uses
  - Minimum total transmission-power
  - Relay-capacity of the node.
- Source-destination chooses an efficient route
  - By route-selection window mechanism.

Proposed model (cont….)

$$Total\ Power = P_{XT} - P_{XR} \qquad (4)$$

$$RN_i = NT_i * LT_i \qquad (5)$$

$$LT_i = \frac{RE_i}{E_i(t)} \qquad (6)$$

Simulation

Table I. Simulation parameters

Traffic type	CBR
CBR packet size	512 bytes
Routing protocol	DSR
Hello_packet_interval	1 s
Node mobility	0-20 m/s
Frequency	2.4 Ghz
Channel capacity	2 Mbps
Transmission range	250 m
Transmit power	1.32 W
Receiver power	0.96 W
Idle power	0.82 W
Mobility	Random waypoint
Voltage	5 V
Initial node energy	9000 J
Route-selection window time at source	3 ms
Route-selection window time at destination	2 ms

Results

In this simulation, we have considered following metrics:

- Network lifetime Route Survivability
- Throughput
- Power Consumption
- Number of Path Reconstructions

Results (cont….)

Route Survivability:

- We consider 100 nodes
- Node mobility varied from 0-20 m/s
- 5 mobile nodes transmit data at 5 packets/s.
- Experimental setup executed for 25 runs

Results (cont….)

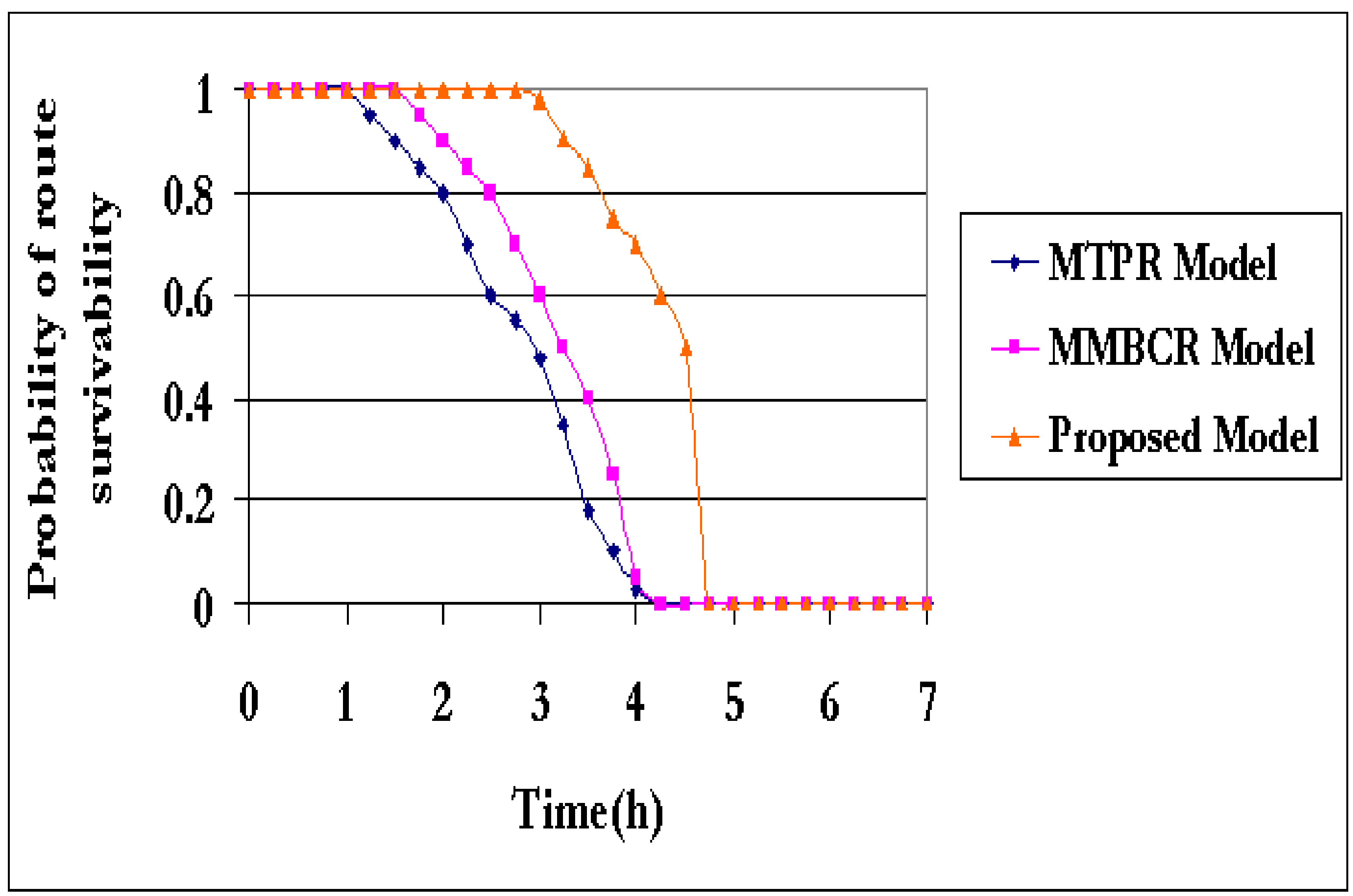

Figure 2. Probability of route survivability.

Results (cont….)

Throughput :

- We consider 100 mobile nodes
- Node mobility differed from 0-20 m/s.
- 5 nodes transmit data at 5 packets/s.
- Executed for 25 runs with different speeds

Results (cont….)

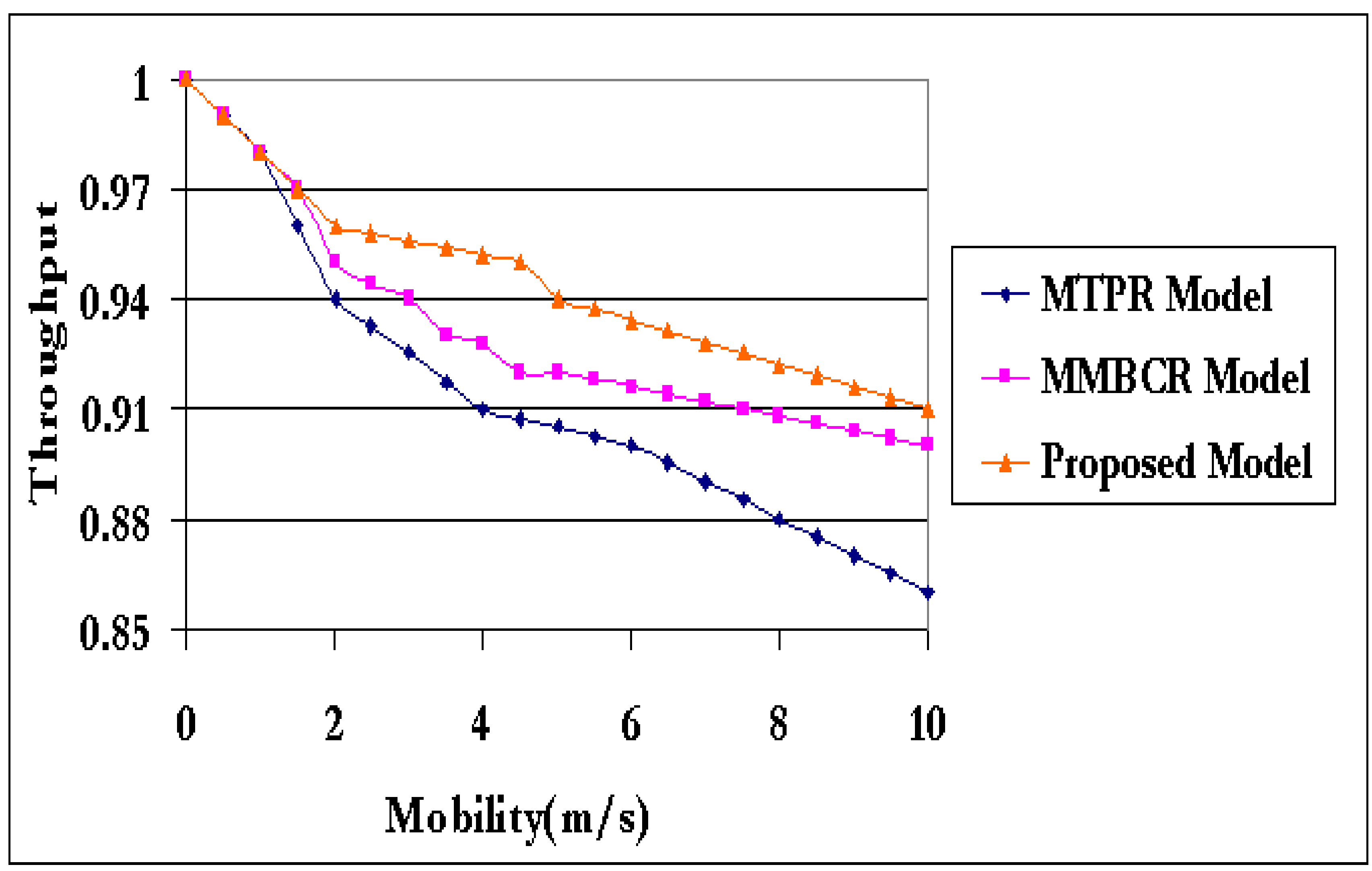

Figure 3. Mobility versus throughput.

Results (cont….)

Power Consumption :

- We deployed 25 mobile nodes
- No.of packets sent from 0-80 packets/s
- Each node traveled constantly at 2 m/s.
- Experimental setup executed for 20 times

Results (cont….)

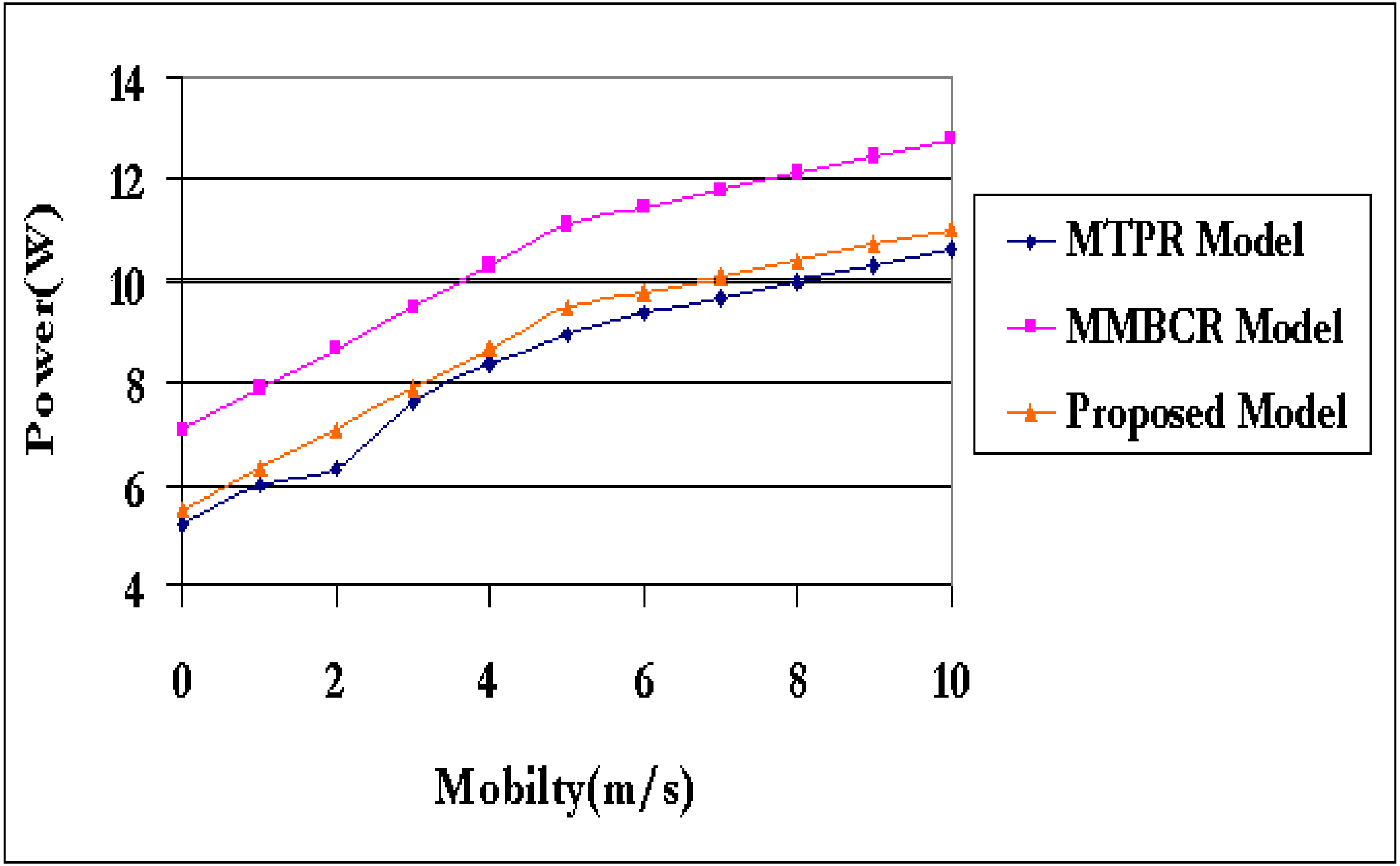

Figure 4. Mobility against power.

Results (cont….)

Number of Path Reconstructions :

- Deployed 50 mobile nodes
- No.of packets sent between 5-20 packets/s
- Each node moved constantly with 0-25 m/s.

Results (cont….)

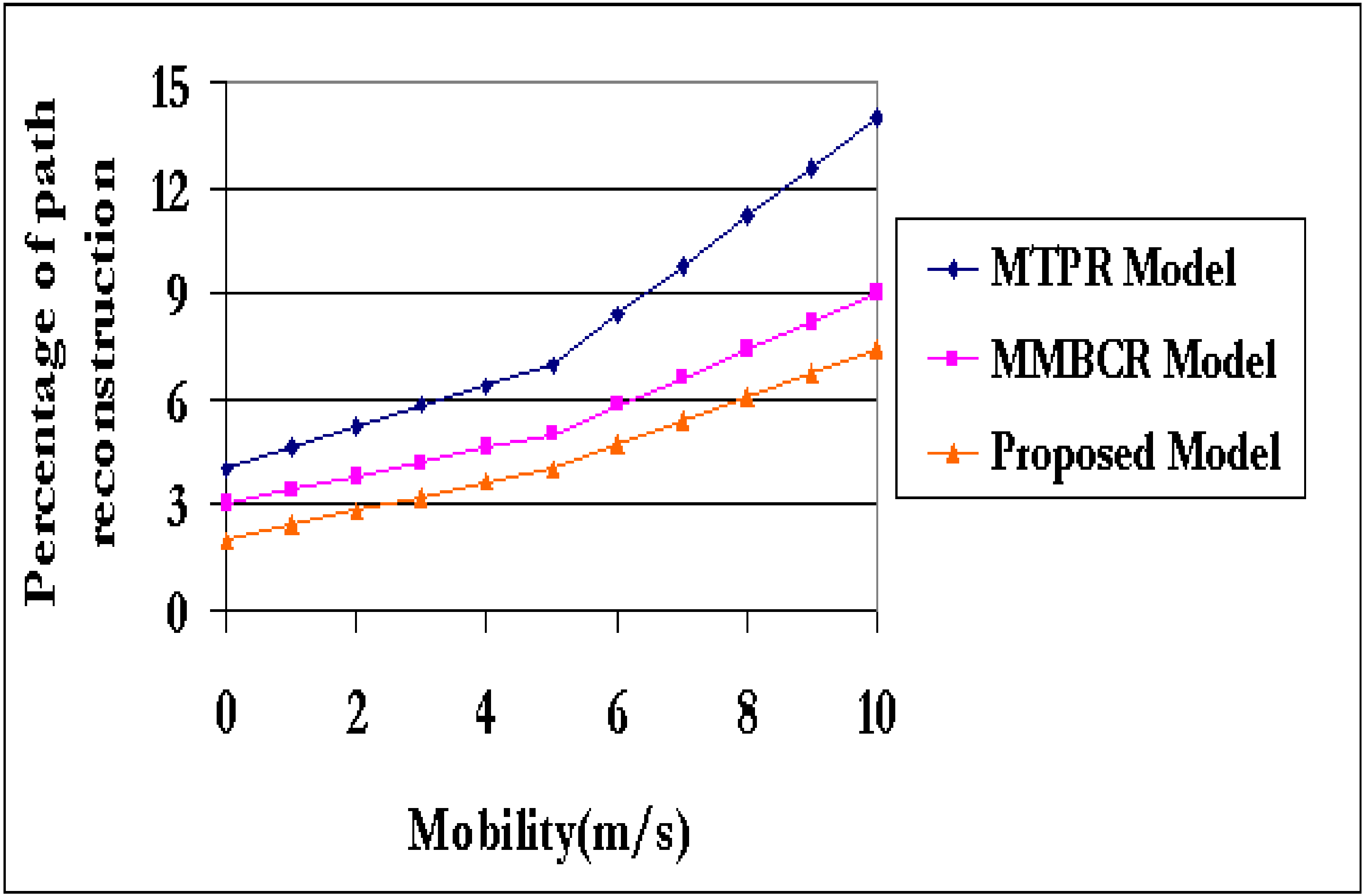

Figure 5. Mobility versus percentage of path reconstructions.

Conclusions

- Fixed parameters range
  - Topology
  - Mobility
- The drawback of this model
  - Takes more number of hops
- We have not considered packets loss

Future work

- To support more area
- To find better routes under delay constraints,
- Find better path under heterogeneous network

References

1. Renato M. de Moraes, Hamid R. Sadjadpour, J. J. Garcia-Luna-Aceves(2006), "Mobility-Capacity-Delay Trade-Off In Wireless Ad Hoc Networks", *Ad Hoc Networks*, Vol. 4, No. 5, pp. 607-620.
2. C. M. Chao, J. P. Sheu, and I. C. Chou(2006), "An Adaptive Quorum-Based Energy Conserving Protocol for IEEE 802.11 Ad hoc Networks", *IEEE Transactions on Mobile Computing*, Vol. 5, No. 5, pp. 166-170.
3. Chi Ma and Yuanyuan Yang(2005), "A Prioritized Battery-Aware Routing Protocol for Wireless Ad Hoc Networks", *In Proceedings of The ACM International symposium on Modeling, Analysis and Simulation of Wireless and Mobile Systems*, pp. 45-52.
4. Juan A. Sánchez Pedro M. Ruiz(2006), "Improving Delivery Ratio and Power Efficiency in Unicast Geographic Routing with a Realistic Physical Layer for Wireless Sensor Networks", *In Proceedings of The DSD*, pp. 591-597.
5. C. S. Raghavendra and Suresh Singh(1998), "PAMAS-Power Aware Multi-access Protocol with Signaling for Ad Hoc Networks", *ACM Communications Review*, Vol. 28, pp. 5-26.
6. S. Singh, M. Woo, and C.S. Raghavendra(1998), "Power-Aware with Routing in Mobile Ad Hoc Networks", *In Proceedings of The ACM MOBICOM*, pp. 181-190.
7. C-K. Toh(2001), Maximum Battery Life Routing to Support Ubiquitous Mobile Computing in Wireless Ad Hoc Networks, *IEEE Communications*, Vol. 39, No. 6, pp. 2-11.

References (cont…)

8. Shakeel Ahmad, Irfan Awan, Athar Waqqas, Bashir Ahmad(2008), "Performance Analysis of DSR and Extended DSR Protocols", *In Proceedings of The International Conference on Modeling and Simulation,* pp. 191-196.
9. Balaswamy and K.Soundararajan(2008), "An Efficient Route Discovery Mechanism for Mobile Ad Hoc Networks", *International Journal of Computer Science and Network Security*, Vol. 8, No. 10, pp. 25-51.
10. Nicolas Roux, Jean-Sebastien Pegon, Madhavi W. Subbarao(2007), "Cost Adaptive Mechanism to Provide Network Diversity for MANET Reactive Routing Protocols", *http://w3.antd.nist.gov/pubs/roux_m2000.pdf*
11. S. Gobriel, D. Mosse and R. Melhem(2006), "Mitigating the Flooding Waves Problem in Energy-Efficient Routing for MANETs", *In Proceedings of The IEEE Conference on Distributed Computing Systems*, pp. 47-47.
12. Jaikaeo, C, Sridhara, V, Shen, C. C(2006), "Energy Conserving Multicast for MANET with Swarm Intelligence", *In Proceeding of The International Symposium on a World of Wireless, Mobile and Multimedia networks*, pp. 7-11.
13. Abdalla M. Hanashi, Aamir Siddique, Irfan Awan, and Michael E(2008), "Woodward: Dynamic Probabilistic Flooding Performance Evaluation of On-Demand Routing Protocols in MANETs", *In Proceedings of The CISIS*, pp. 200-204.