Node Stability-Based Location Updating in Mobile *Ad-Hoc Networks*

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OUTLINE

- Introduction
- Two types of Location Updating
- Assumption
- Algorithm
- *Simulation*

Introduction

- the nodes are mobile, which renders the network topology in MANETs susceptible to change with time.
- In the *conventional location updating algorithm,* each node periodically broadcasts a Hello packet and it updates its Neighbor Table on receiving the acknowledgment from the node.

Introduction

This algorithm improves:

1. less number of acknowledgments is transmitted in maintaining the Neighbor Table;
2. less number of collisions takes place;
3. less updating is required to maintain the Neighbor Table;

Two types of Location Updating

- Updating this information when the network layer requires
  - The overhead involved in the periodic updating of the Neighbor Table is not involved in this case.
  - Updating of the Neighbor Table , on demand, causes a delay.

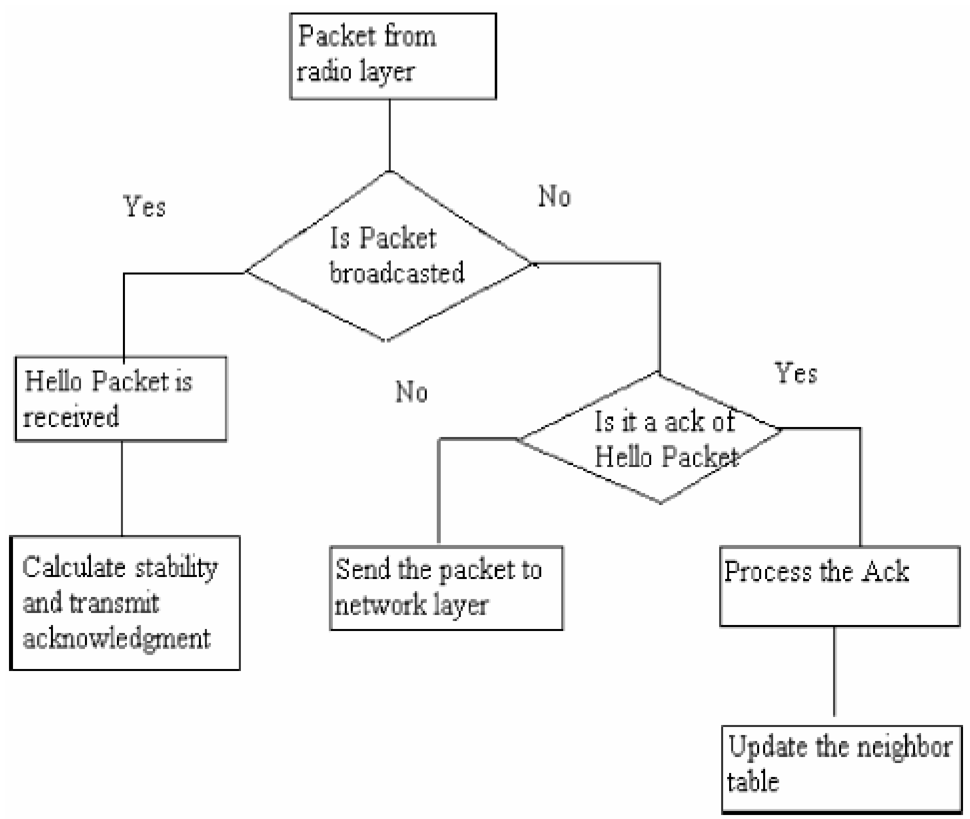
Two types of Location Updating

- Updating the Neighbor Table periodically
  - When the routing table requires the Neighbor Table, it can be provided without much delay.
  - The periodic updating of the Neighbor Table causes a lot of traffic on the network.

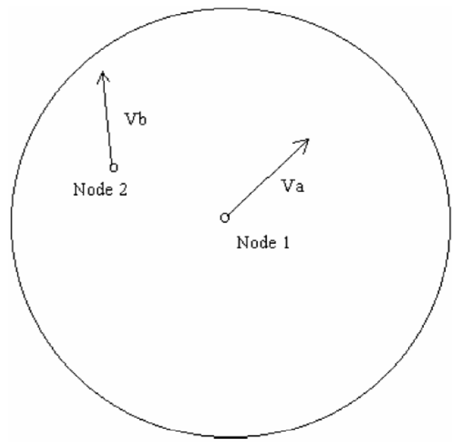
Assumption

- each node knows its location using Global Positioning System (GPS);
- each node knows its current velocity vector (a node can use GPS and a clock for this);
- each node has an omni-directional antenna;
- each node has enough computational power;
- each node knows the time for which it can stay switched-on

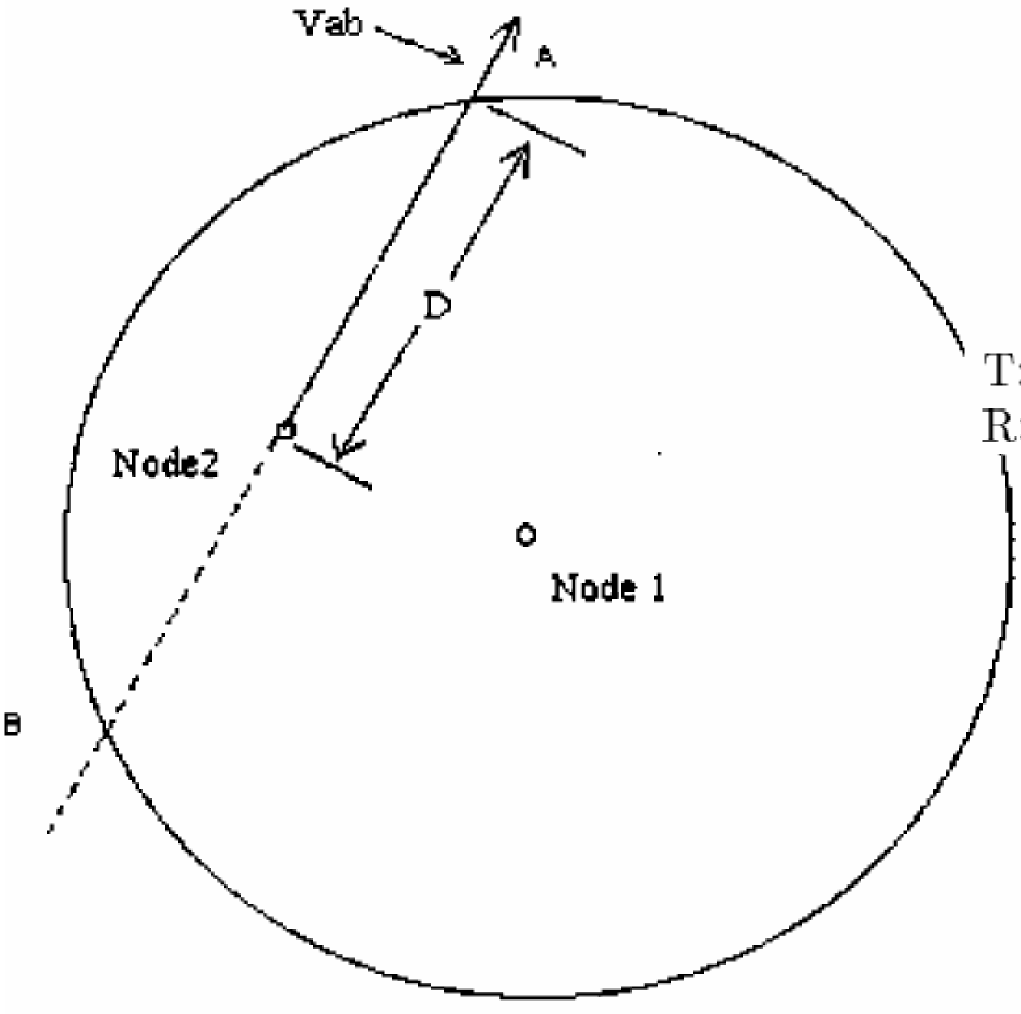
- the processing of packets in the proposed algorithm



Algorithm



- ***Stability:***
- *How close the node A is to the boundary of the transmission range of node B. The closer the nodes A and* B are, the more stable will be the node A.
- *Battery backup of A. If the time remaining for which* the node can stay powered up is very less, the stability of A will decrease. This is because A can die out any time.



$$K_f = D/(T * V_{ab}).$$

$$K = \tan^{-1}(K_f).$$

T: The retransmission time of Hello packet.

R: Transmission range of Node1

- ***Retransmission Time*** is dependent on the minimum value of the stability factor of its neighbors

Steps to Initialize

1. Set $T = T_1$.

2. Set $LK = K_2$, where LK is the limiter K.

Steps to Send Hello Packets

Do the following and send the Hello packet after every T seconds.

1. If there are no neighbors then

$LK =$ next K in K_{recv} list,

Else

Set $LK = K_2$.

2. Mark all neighbors having $K_{recv} \leq LK$.

3. Fill in the current Hello packet with the following information of the node:

(a) GPS coordinates.

(b) Velocity Vector.

(c) Range.

4. Wait for the acknowledgments till "time out" interval.

5. Do the following according to the appropriate situation:

(a) For a node which is marked and does not send acknowledgement, remove it from the Neighbor Table.

(b) For a node which is not marked, but exists in the Neighbor Table, send an acknowledgement and update its K_{recv}.

(c) For a node that does not exist in the Neighbor Table, send an acknowledgement (implying that it is a new node). Enter its K_{recv} from the acknowledgement and set $K_{send} = 0$ in the Neighbor Table entry corresponding to this node.

6. According to the minimum value of K_{recv}, modify the retransmission time T.

Steps taken when a node receives a Hello packet

1. Calculate K on the basis of the battery backup of the receiving node and the following information sent in the Hello packet:

   (a) GPS.

   (b) Velocity Vector.

   (c) Range.

2. Compare LK with K.

3. If $LK \geq K$ or $LK \geq K_{send}$ then

   {

   Update K_{send} entry corresponding to the transmitter node.

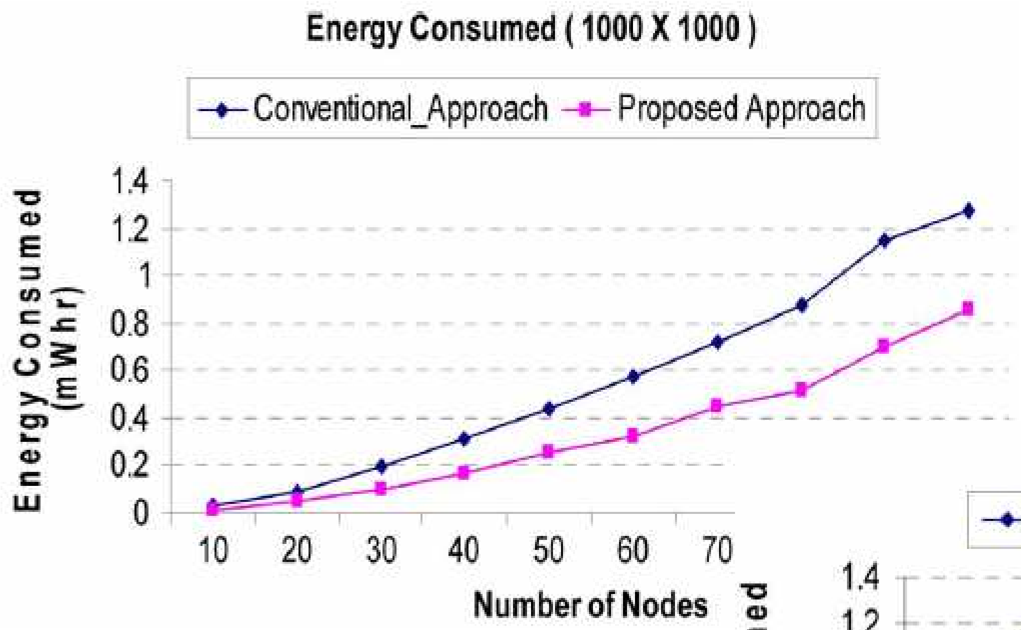
   Send acknowledge with K.

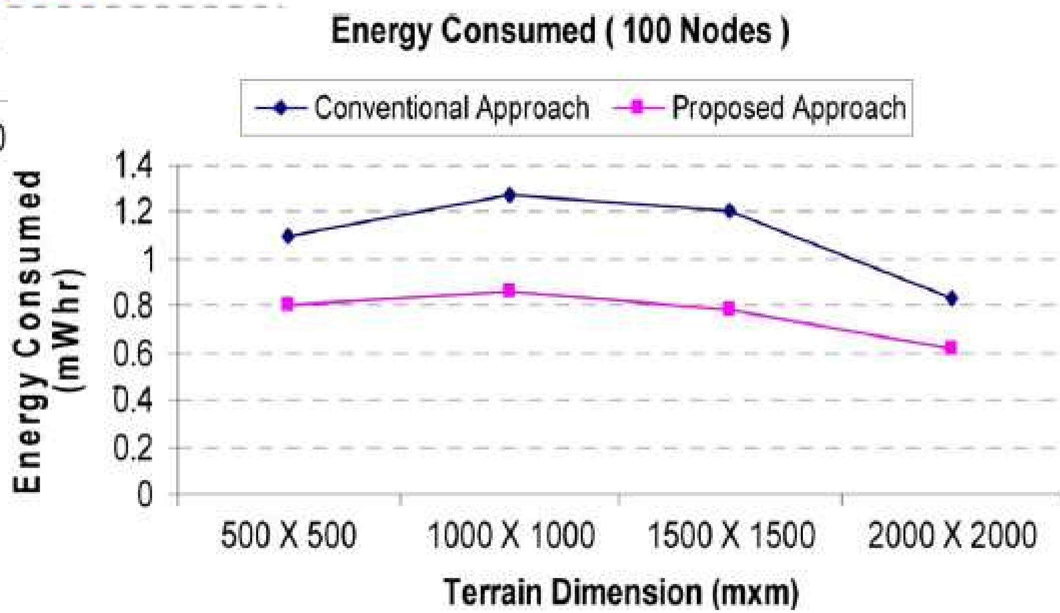
   }

   Else

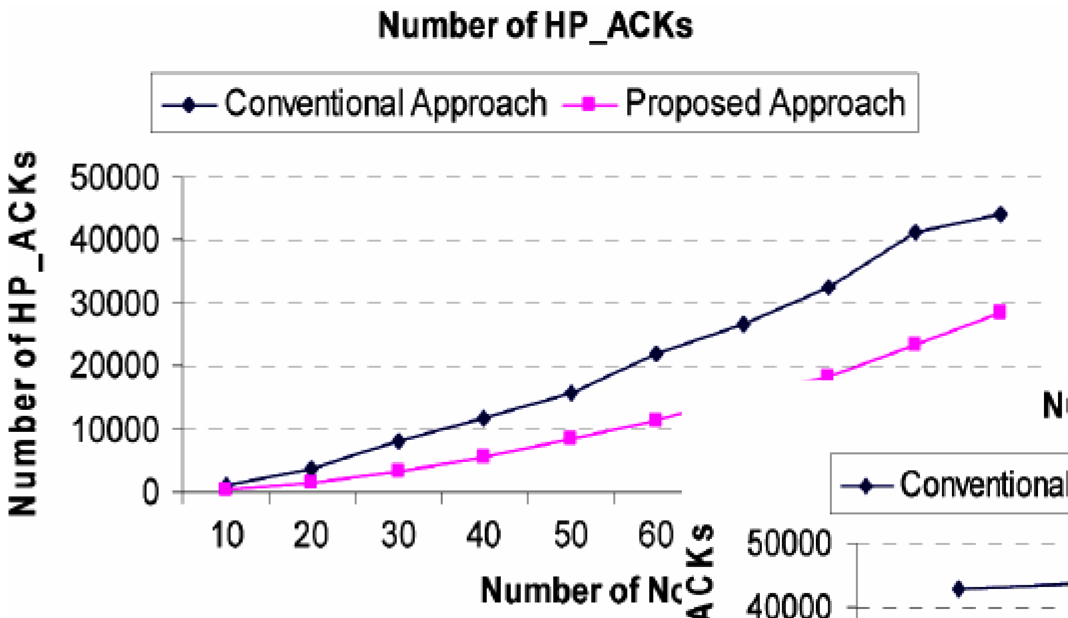
   Ignore the Hello packet.

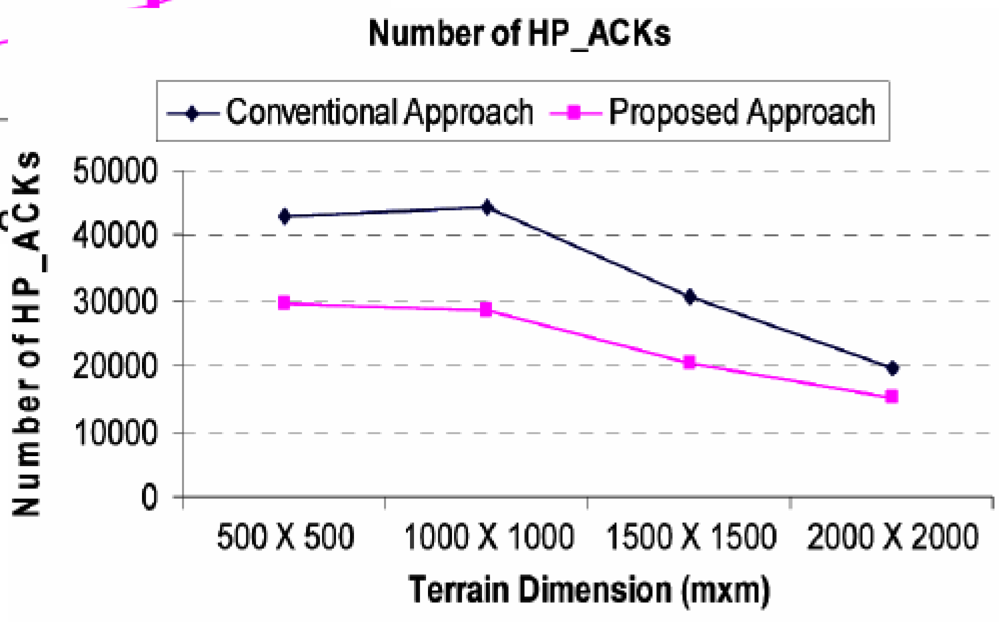
Simulation- energy consumed



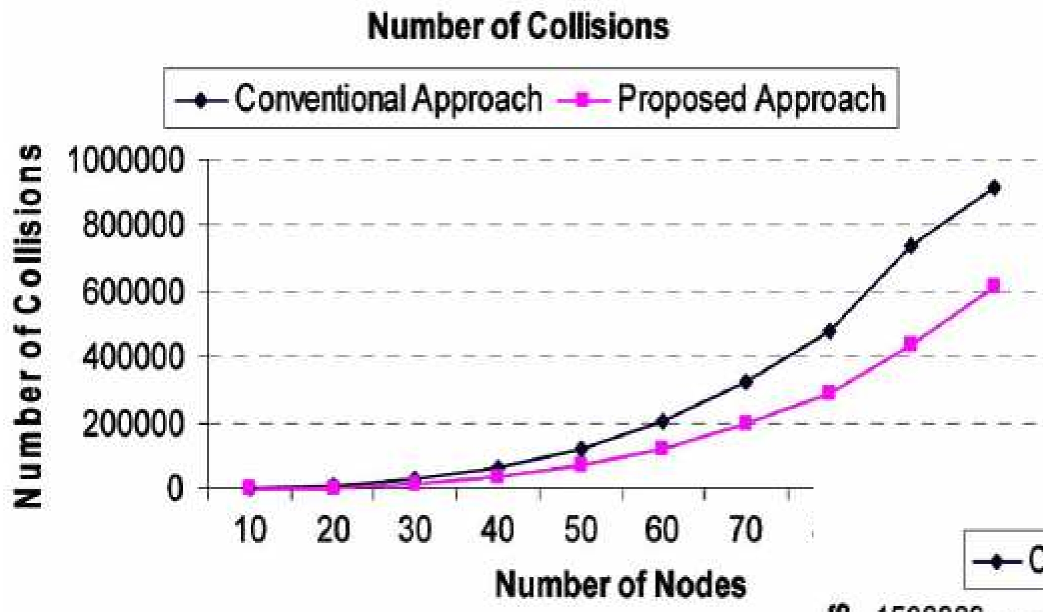


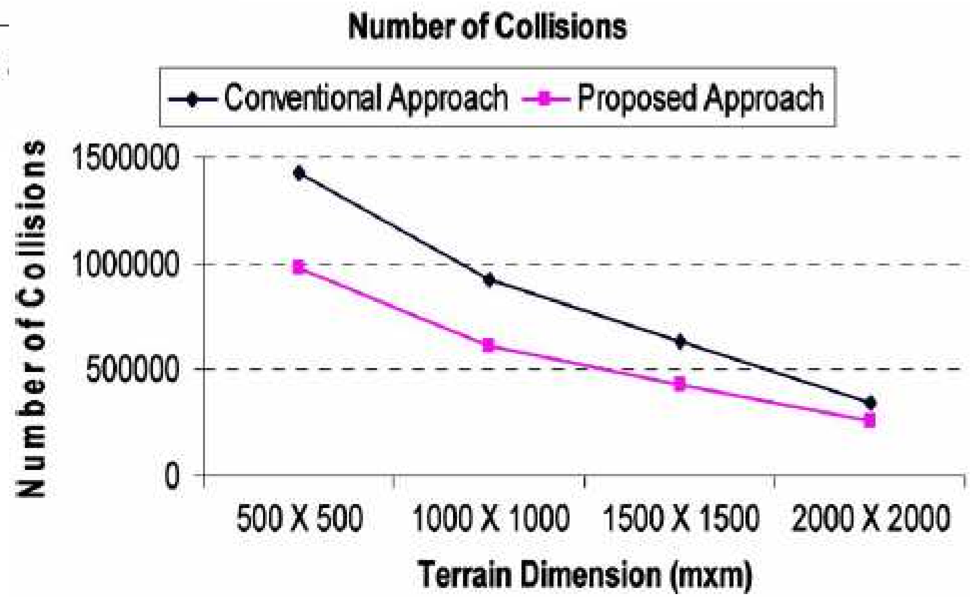
Simulation- number of Hello packet acknowledgements





Simulation- number of collisions





CONCLUSION

- The main focus of the proposed algorithm is to reduce the number of acknowledgment packets by varying the updating information of less stable nodes more frequently compared to the more stable nodes.
- The performance of this algorithm was tested on the following parameters:
  - number of Hello packet acknowledgements transmitted;
  - energy consumed;
  - number of collisions.