

**Modeling & analyzing Location Routing in  
Sensor Networks.  
&  
Design & Analysis of (HIT) for Sensor Networks**

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## 1-Introduction

Why Modeling analyzing Impact location  
inconsistence?

- wireless communication devices are gaining more popular.
- Location information has important meaning especially in Sensor networks.
- In mobile ad-hoc networks nodes moving, routing is a challenging task.
- Geographic routing for its several merits is better than topology-based routing.

## 2- Background and related works

- Existing ad-hoc protocols can be divided into two approaches
  1. topology-based routing , uses link information of the networks to perform packet forwarding.
  2. Position-based routing, uses physical location information to perform packet forwarding.

2.2 – geographic routing can be categorized into three approaches depending on the forwarding strategies:

2.2.1 – Greedy packet forwarding.

2.2.2 – restricted directional flooding.

2.2.3 – Hierarchical routing.

## **3- Inconsistency metrics**

3.1 – Absolute Location Inaccuracy

3.2 – Relative Distance Inaccuracy.

3.3 – Absolute Location Inconsistency.

3.4 – Relative Distance Inconsistency.

Inaccuracy	Absolute Location Inaccuracy	$\sqrt{(x_i - (x_i + \Delta x_i))^2 + (y_i - (y_i + \Delta y_i))^2}$
	Relative Distance Inaccuracy	$\Delta Dist \cdot \Delta Dist_{error} \leq 0$
Inconsistency	Absolute Location Inconsistency	$\sqrt{(x_k^i - x_k^j)^2 + (y_k^i - y_k^j)^2}$
	Relative Distance Inconsistency	$\Delta Dist_{error}^i \cdot \Delta Dist_{error}^j \leq 0$

## 4 – Simulation of Greedy Forwarding

- Tools

- 1- the original NS-2 code for GPSR was used.

- 2- 250m of radio range.

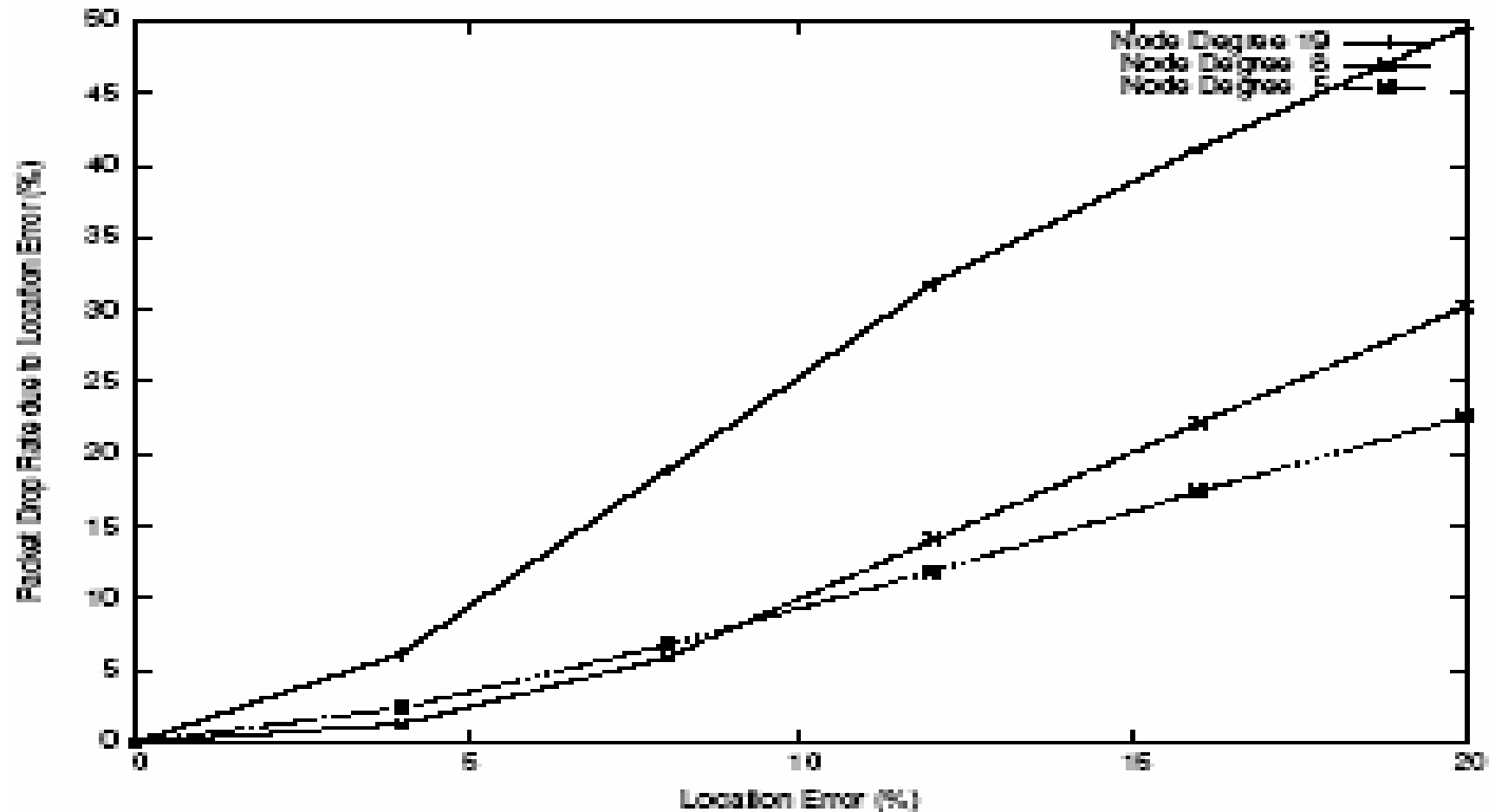
- 3- Gaussian distribution (with zero mean), with different standard deviation to generate location inaccuracy.

- 4- Location inaccuracy is added to true location.

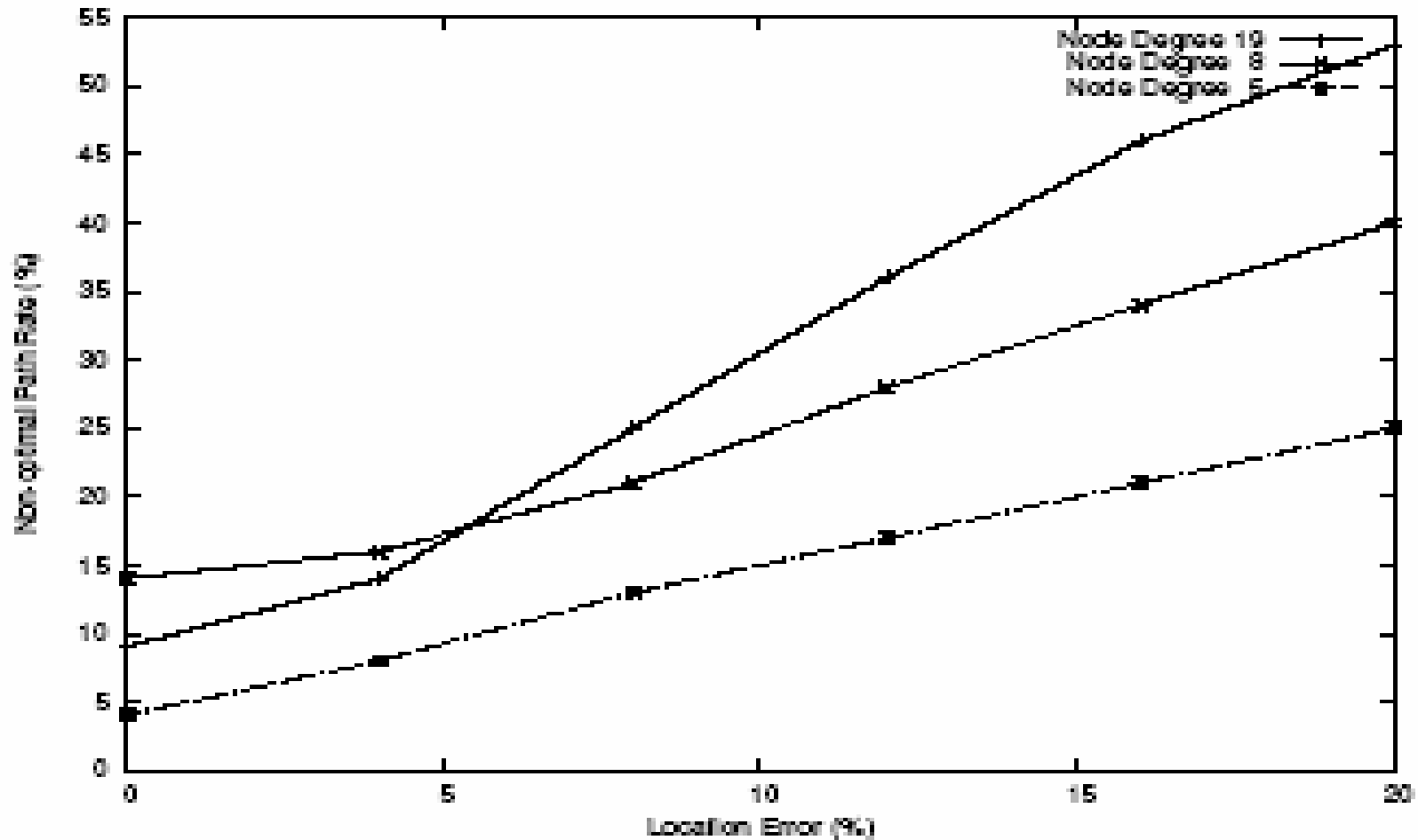
## 4.1- Simulation Parameters

Parameter	Value
Radio Range	250m
Standard Deviation of Inaccuracy	0,10,20,30,40,50m
Location error	0,5,10,15,20 %
Node Degree	5,8,19( area : 1350mx1350m )
Network Diameter	750mx750m,1050mx1050m,1350mx1350m
Traffic Sources	30

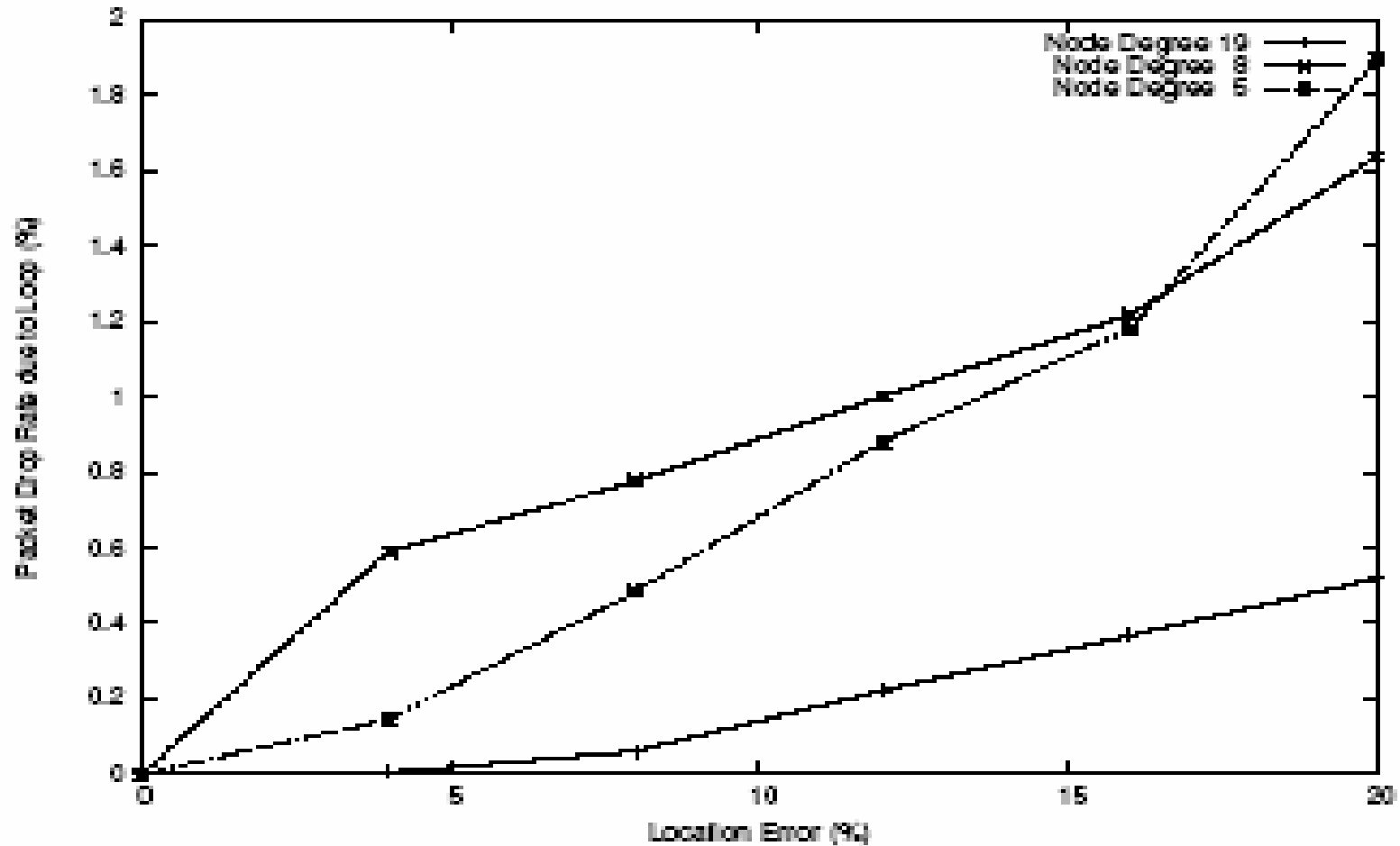
## 4.2 – Impact in Drop Rate



## 4.3 – Impact on Optimal Path



## 4.4 – Impact on looping



## Conclusions

Inaccuracy Metrics		Problem	Impact
Inaccuracy	Absolute Location Inaccuracy	Wrong Neighbor Information	Packet Drop
	Relative Distance Inaccuracy	Wrong Greedy Decision	Non-optimal Path
Inconsistency	Absolute Location Inconsistency	False Local Maximum	Packet Drop
	Relative Distance Inconsistency	Wrong Greedy Decision	Routing Loop

## **Design and Analysis of (HIT) in Micro Sensor Networks**

- 1 – Introduction .
- 2 – Basic Models.
- 3 – HIT Protocol Description.
- 4 – Performance Evaluation .
- 5 – Future Application of HIT.
- 6 – Conclusion.

# 1 – Introduction and Related Studies

- 1 – The sensor networks task is to sense the environment, and relay the information back to a remote base station, where the user can access it.
- 2 – Reducing the energy consumption is very important in these networks.
- 3 – the purpose of this paper :
  - Introduce Hybrid Indirect Transmission (HIT)
  - Testing (HIT) with a simulation test.

## 2 – Basic Models

2.1 – Data Delivery Model

2.2 – Radio Model

2.3 – Analysis of Direct and Indirect  
Transmission

2.4 – Parallel Transmission.

2.5 – Analysis of TDMA versus CSMA.

## 3 – HIT Protocol Description

### ➤ Clustering Phase

1-one or more cluster-head are selected .

❖ Single Cluster, Rotation

❖ Single Cluster, Rotation, Additional Selection Criteria.

❖ Multiple Clusters, Random.

2- cluster-head Advertisement.

3- Cluster Setup using (CSMA)

## 3 – HIT Protocol Description

### ➤ Routing Phase

- 1- Route Setup: each node know the upstreams from the neighbor, from the last Phase.
- 2- have a knowlidig which is downstream nighbor, and which is upstream nighbor.
- 3- Blocking Set Computation(CSMA): each node computes the blocking set for it's downstream neighbor.

## 3 – HIT Protocol Description

### ➤ Schedule Phase

1- TDMA Schedule Setup: allows close the maximum number of nodes to communicate in parallel, computed by each node.

2- Data Transmission (TDMA) :sensing the enviroment and transmits to the upstream neighbor, following the TDMA schedule.

## 5 – Future Application for HIT

- Bioelectric Computer Interface
- HIT for EMG Sensing in Bioelectric Computer Interface.

## 6- Conclusion

- The paper has described HIT (and HIT<sub>m</sub> for multiple cluster).
- Performance evaluation has shown that HIT provides energy savings over LEACH and PEGASIS.
- This advantage becomes more significant for large areas or large number of nodes.
- HIT reduces the delay required to gather data.

Thank you for your attention!