SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECE402- WIRELESS ADHOC AND SENSOR NETWORKS

IV ECE / VII SEMESTER

UNIT 4 WIRELESS SENSOR NETWORKS

Topic 6- Location Discovery

Location Discovery

- During aggregation of sensed data, the location information of sensors must be considered.
- Each nodes couple its location information with the data in the messages it sends.
- GPS is not always feasible because it cannot reach nodes in dense foliage or indoor, and it consumes high power
- We need a low-power, inexpensive, and reasonably accurate mechanism.

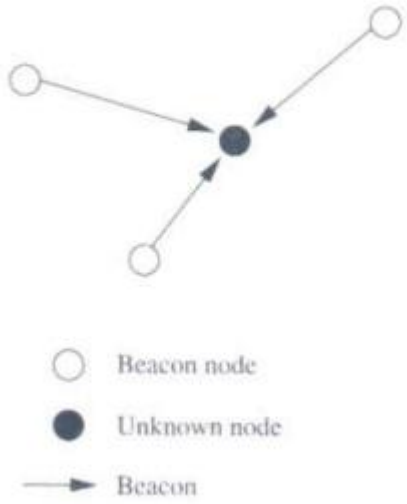
Indoor Localization

- Fixed beacon nodes are placed in the field of observation, such as within building.
- The randomly distributed sensors receive beacon signals from the beacon nodes and measure the signal strength, angle of arrival, time difference between the arrival of different beacon signals.
- The nodes estimate distances by looking up the database instead of performing computations.
- Only the BS may carry the database.

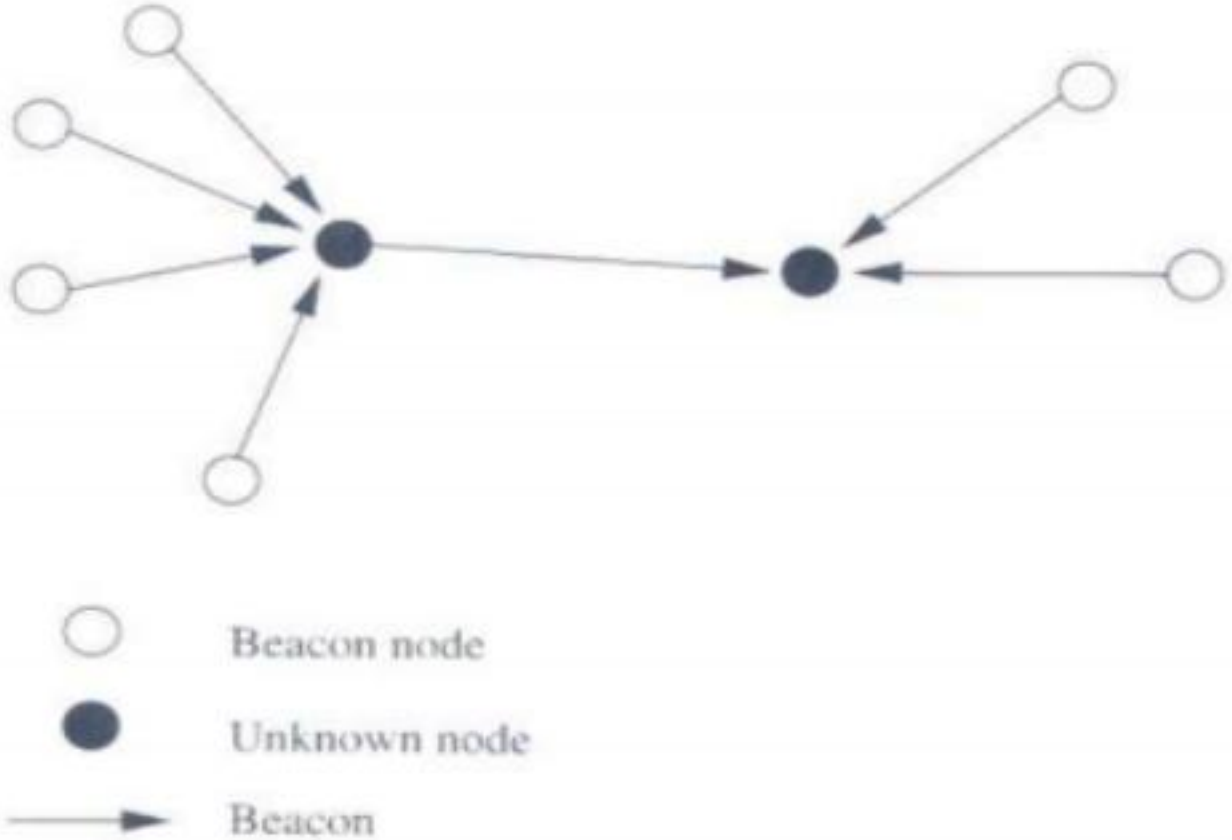
Sensor Network Localization

- In situations where there is no fixed infrastructure available, some of the sensor nodes themselves act as beacons.
- Using GPS, the beacon nodes have their location information, and send periodic beacons signal to other nodes.
- In the case of communication using RF signals, the received signal strength indicator (RSSI) can be used to estimate the distance.
- The time difference between beacon arrivals from different nodes can be used to estimate location.
- Multi-lateration (ML) techniques
  - Atomic ML
  - Iterative ML
  - Collaborative ML

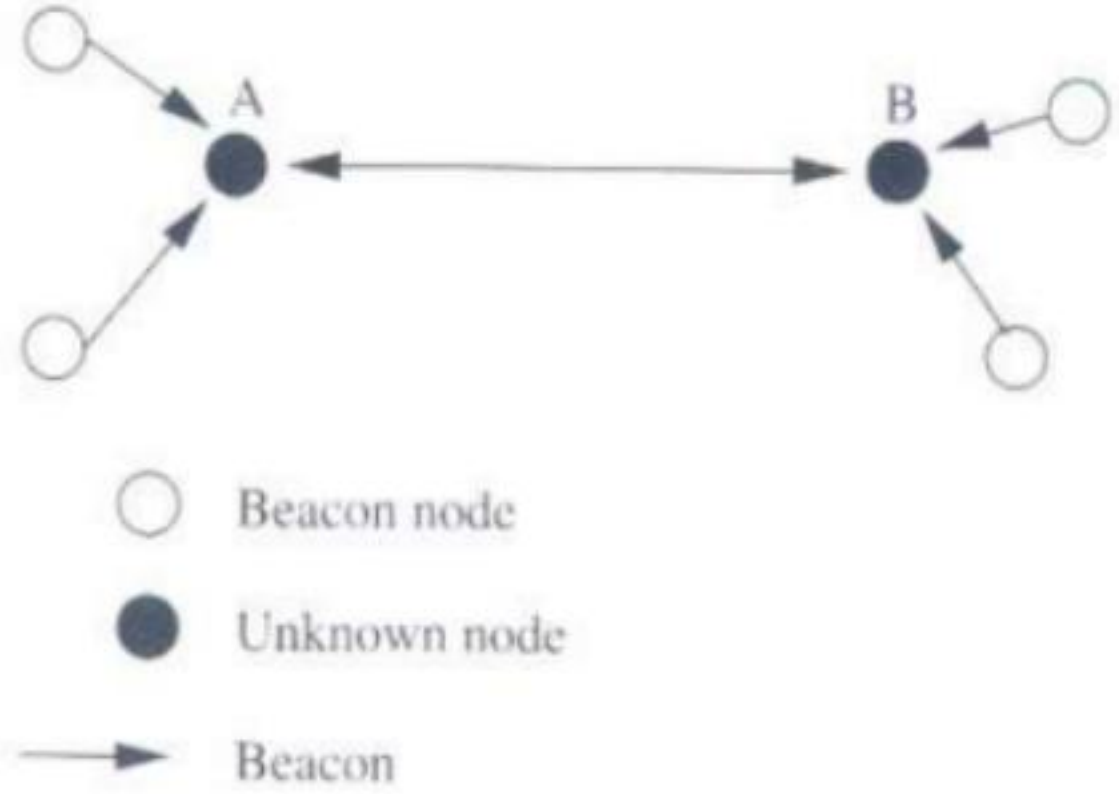
Atomic multi-lateration



Iterative multi-lateration



Collaborative multi-lateration



- A mathematical technique called multi-dimensional scaling (MDS), an $O(n^3)$ algorithm, is used to assign location to node such that the distance constraints are satisfied.
- To obtain the shortest distance between each pair of node.
- If the actual positions of any three nodes in the network are known, then the entire network can be normalize.