



P2P Networks – Exercise Solution For Exercise # 13

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P2P Gaming



12.1) Neighbor Discovery (1/2)

- Need to be connected to peers (players) close in the virtual world
 - In area of interest (AOI) – vision or interaction range of a player
 - Not close in the identifier space of an overlay network
- Chord
 - Would require a mapping between virtual world (2D or 3D) to 1D chord identifier space
 - Players move a lot
 - Frequency changing communication structure
 - Need constantly changing position in the chord ring and adapt the neighborhood of nodes



12.1) Neighbor Discovery (2/2)

CAN

- Density problem: highly populated areas result in small CAN cells
- Player dynamics
 - Frequent changes in communication infrastructure
 - Need constantly change of position in the identifier space and adapt the neighborhood of nodes
- Players at hop distance of 2, 3, or 4 might be in vision range
- Only $O(2 * d)$ links per nodes
- Could use multi-dimensional identifier space and correctly map the virtual world to the identifier space



12.2) Information Dissemination Overlays

- Unstructured P2P Overlay
 - Should allow for fast and frequent transmission of update messages to other peers in vision/interaction range
- Basic ideas
 - Define an Area of Interest (AOI)
 - Communicate with peers with in the AOI
- Concept
 - Connectivity: all, server, supernode, AOI neighbors, nearest neighbor, N-Tree
 - Neighbor discovery: server introduction, peer notification, list exchange, DHT query, overlay multicast

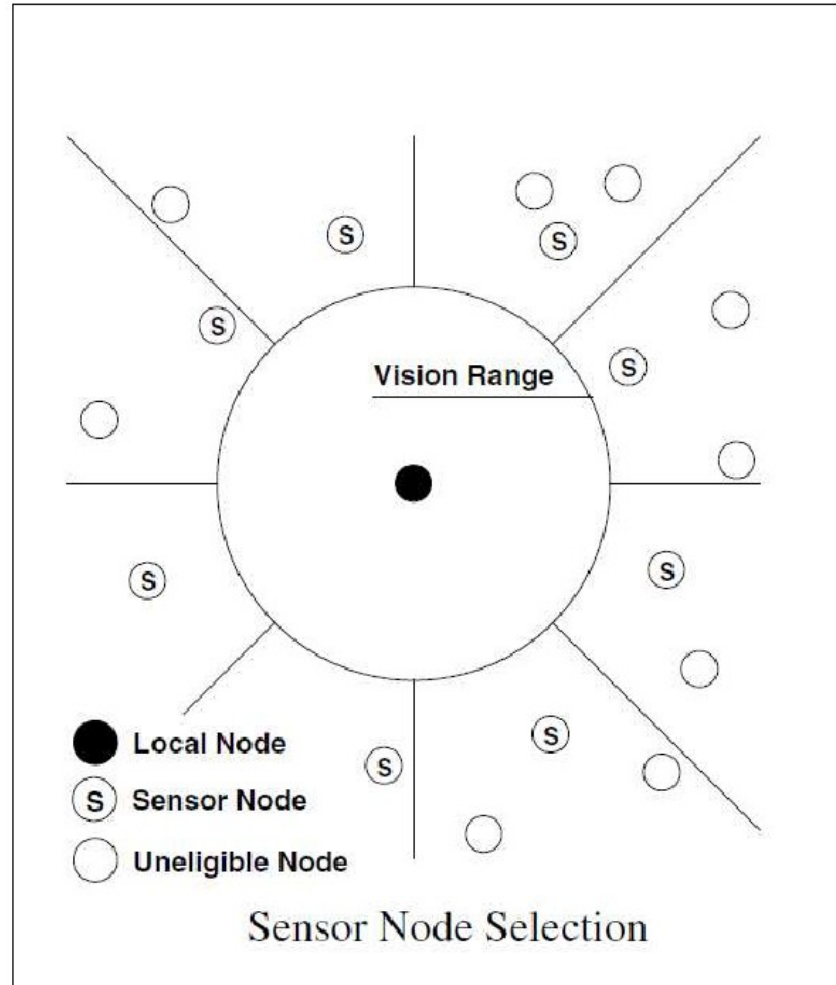
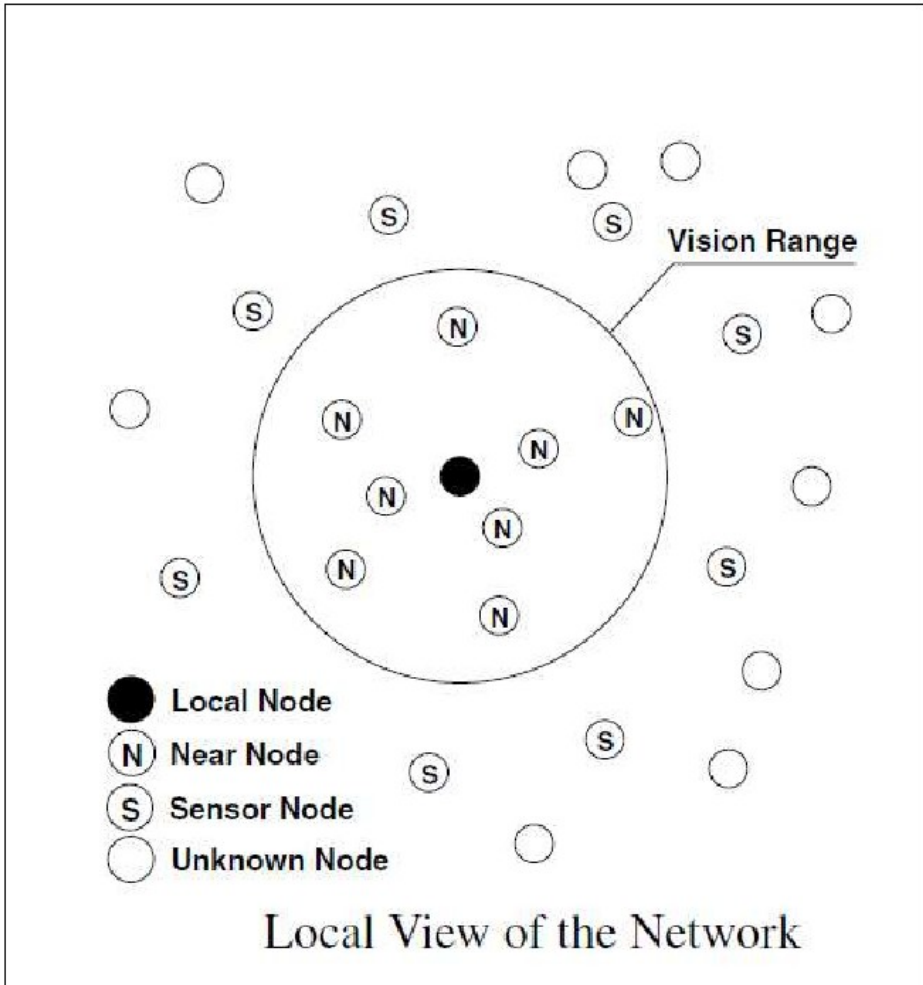


12.3) pSense and Donnybrook (1/6)

- Players mainly connected to other close to them in the virtual world
 - Position based multicast
- Mainly connections to two different kinds of nodes
 - Near nodes: peers within the vision range
 - Sensor nodes: peers outside the vision range
 - Select closest node for each segment outside the vision range
- Localized multicast
 - Updates are sent directly to nearby nodes and sensor nodes
 - Also forwarded to peers further away



12.3) pSense and Donnybrook (2/6)





12.3) pSense and Donnybrook (3/6)

Donnybrook

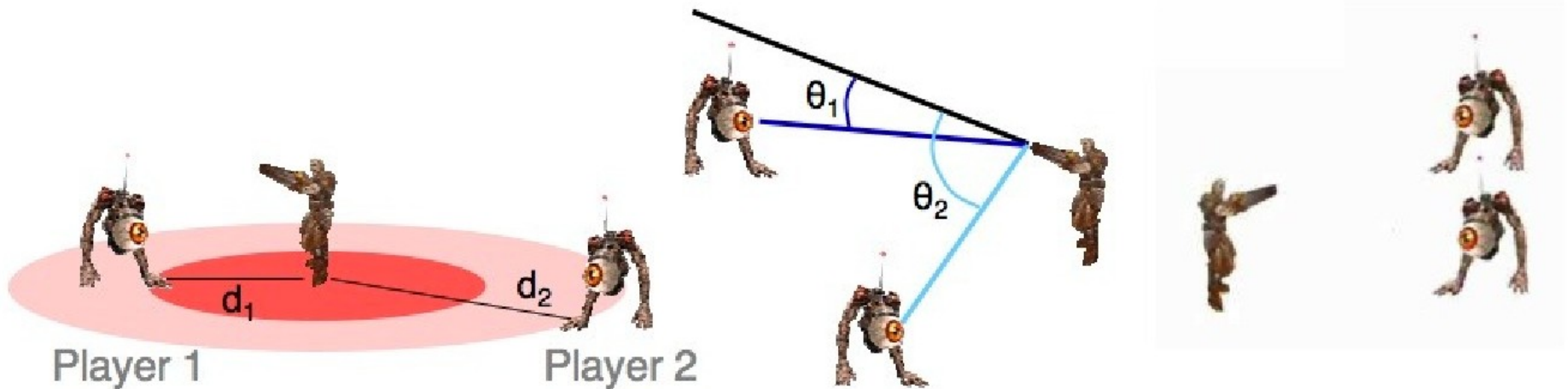
- Goal
 - Real time connectivity (<150 ms)
 - Large scale (1000 players, but not more)
- Main idea
 - Use full mesh topology
 - Reduce update rate for players currently not in the interest set
- Interest set
 - Other player O may be part of player's P interest set if
 - O is close to p in the virtual world
 - P is aiming at O (or close for bad player)
 - P and O recently interacted



12.3) pSense and Donnybrook (4/6)

Attention(i) =

$$f_{\text{proximity}}(d_i) + f_{\text{aim}}(\theta_i) + f_{\text{interaction-recency}}(t_i)$$





12.3) pSense and Donnybrook (5/6)





12. 3) pSense and Donnybrook (6/6): Differences

- Number of connections
 - pSense: depend upon current players in vision range
 - Donnybrook: always maintain connection to all players
- Number of concurrent players supported
 - pSense: no limit for the total number of players
 - Neighboring nodes are constrained by the size of update message, their frequency, and available bandwidth
 - Donnybrook: only 1000 concurrent players
 - Actual number depends on the size of update messages, their frequency, and the available bandwidth
- Application scenarios
 - Large virtual world with many small clusters of players
 - Small world where interest set changes frequently



Next Exercise

- Due on 07.02.2012
- Place: C110
- Time: 14:25-16:05