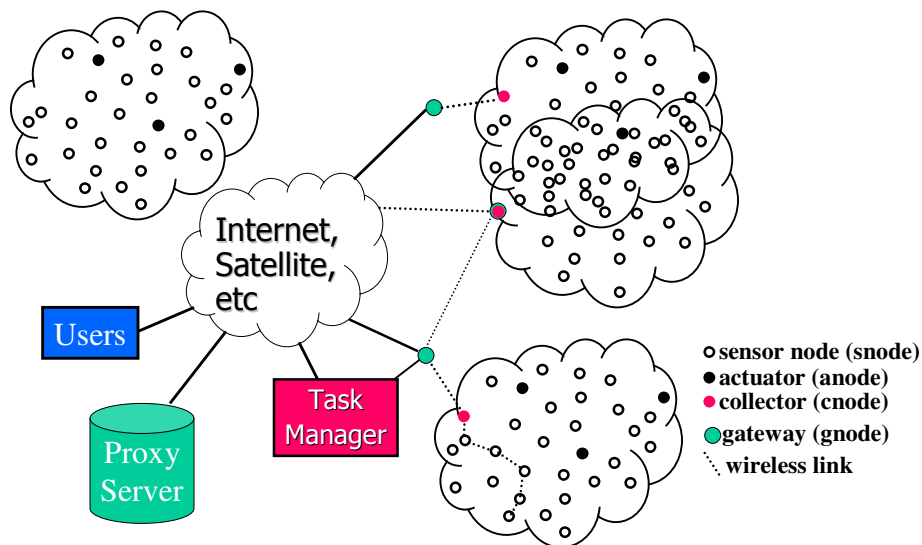


Node Addressing in Wireless Sensor Networks

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Sensor Networks



Addressing in Sensor Networks

Motivation:

Unique node addresses cannot be used in many sensor networks;

- sheer number of nodes,
- energy constraints,
- data centric approach.

Node addressing is needed for;

- node management,
- sensor management,
- querying,
- data aggregation and fusion,
- service discovery,
- routing.

Addressing in Sensor Networks

1. Attribute based naming and data centric routing,
2. Spatial addressing,
3. Query mapping.

Attribute Based Naming

1. W. R. Heinzelman, J. Kulik, and H. Balakrishnan, "Adaptive Protocols for Information Dissemination in Wireless Sensor Networks," *Proc. of the ACM MobiCom'99*.
2. C. Intanagonwiwat, R. Govindan, and D. Estrin, "Directed Diffusion: A Scalable and Robust Communication Paradigm for Sensor Networks," *Proc. of the ACM MobiCom'2000*.

- nodes that measure certain amplitude for a specified attribute are addressed.

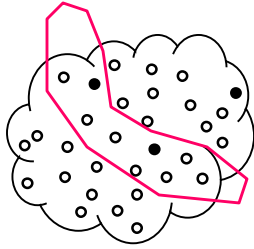
Example:

"nodes that measure more than 35°C temperature"

Spatial Addressing

1. Polygonal Addressing,
2. Sectoral Sweepers,
3. Quadtree/Octree Addressing,
4. Modulus Addressing.

Polygonal Addressing

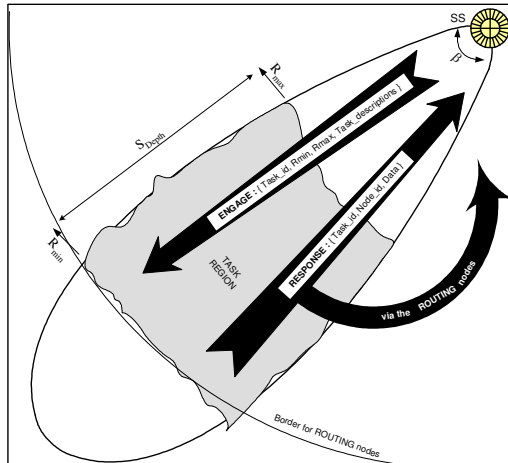


1. Distributed Edge Detection

K.K.Chintalapudi and R.Govindan, "Localized Edge Detection in Sensor Fields," Proceedings of the SNPA2003.

2. Location Series

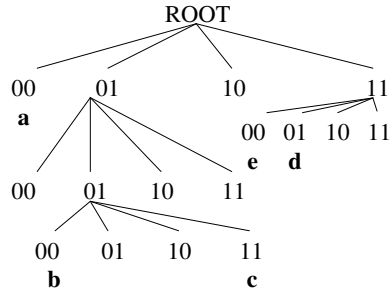
Sectoral Sweepers



A. Erdogan, E. Cayirci, V. Coskun, "Sectoral Sweepers for Sensor Node Management and Location Estimation in AdHoc Sensor Networks," Proceedings of the MILCOM 2003.

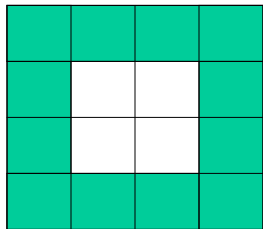
Quadtree/Octree Addressing

| | | | | | |
|------|------|------|--|------|--|
| +a | | 0100 | | +b | |
| 00 | | | | +c | |
| | | 0111 | | 0110 | |
| +e | +d | 10 | | | |
| 1111 | 1110 | | | | |

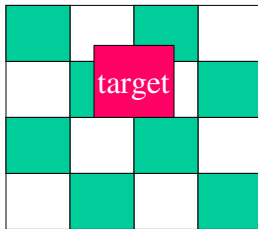


C. Cimen, E. Cayirci, V. Coskun, "Querying Sensor Fields By Using Quadtree Based Dynamic Clusters And Task Sets," Proc. of the MILCOM 2003 .

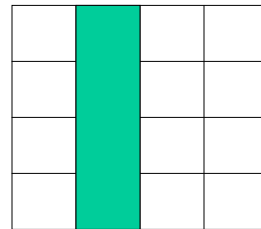
Quadtree/Octree Addressing



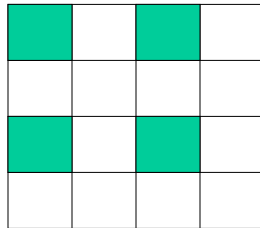
$0*0* + 1*1* + *1*0 + *0*1$



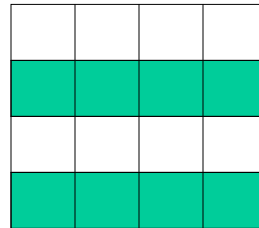
$***0$



$01** + 10** + ***0 + ***1$

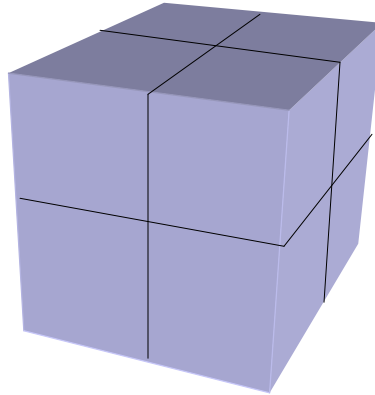


$**00$ (higher left quadrants at level 2)



$**1*$ (lower quadrants at level 2)

Quadtree/Octree Addressing



Modulus Addressing

E. Cayirci, "Data Aggregation and Dilution by Modulus Addressing in Wireless Sensor Networks," IEEE Communications Letters, August 2003.

$$f(x) = x \text{ div } m \quad (1)$$

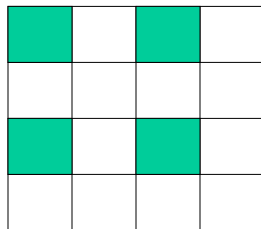
$$f(x) = (x / r) \text{ mod } (m / r) \quad (2)$$

where

x is the grid location of a node relative to one of the axes,

r is the resolution in meters, and

m is the dilution or aggregation factor.



Select [task, time, location, [distinct | all], amplitude,

[[avg | min |max | count | sum] (amplitude)]]

from [any , every , aggregate m , dilute m]

where [power available [$<|>$] PA |

location [in | not in] $RECT$ |

$t_{min} < \text{time} < t_{max}$ |

task = t |

amplitude [$<|=|>$] a]

group by task

based on [time limit = l_t | packet limit = l_p |

resolution = r | region = xy]

Query Mapping

Needed for;

- the Internet users that query remote sensor networks,
- service discovery, etc.

To the best of our knowledge, this field is
UNTOUCHED.

Conclusion

New node addressing schemes that fit the requirements of all layers including

- **application and**
- **transport layers**

are needed for sensor networks.

This is an interesting research area with some points still untouched.