Modeling Location for Pervasive Environments

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Overview

- Aspects of Location-Aware Computing
- Developments in Location Modeling
- Seven Challenges
- Our approach: *SpaceSemantics*
Location-aware Computing

- Location Sensing and Modeling
  - Important for context awareness and pervasive systems.
  - Not dependent on each other
  - But useful combined

- PhD Focus: Location Modeling
  - Development of models
  - Challenges ahead
  - Proposed approach
Developments

- Several specific model types
  - Geometric
  - Symbolic
  - Hybrid

- Aspects for comparison
  - Accuracy
  - Comprehension
  - Complexity
Geometric Model

- **GPS WGS84** [1]
  - ie $(20.04, 51.3, 0)$

- **Pros:**
  - Accurate
  - Uniform

- **Cons:**
  - Absence of meaning
  - Dependence on sensor technology (GPS)
Symbolic Model

- Active Map Service [2]

- Pros:
  - Understood by human and machine
  - Simple requirements

- Cons:
  - Lacks precision
  - Choice of ontology
Hybrid Model

- Leonhardt [3], Project Aura’s ALI [4]

- Pros:
  - accurate and readable

- Cons:
  - Complexity of requirements
  - Limits of inference
Some Thoughts...

- What is still needed?
  - Models have evolved but they can go further.

- What challenges have to be overcome?
  - 7 significant challenges have been identified.
Seven Challenges

1. Scale of environment
2. Suitable ontology
3. Aggregation of and abstraction over sensor technologies
4. Multiple / transient environments
5. Inference beyond position
6. Open and extensible model
7. Privacy and security
Our Approach...

- Outline of *SpaceSemantics*
  - Organization of model
    - Graph topology of typed nodes and typed relationships between nodes.
    - Model conceptual, logical and physical aspects.
Our Approach...

- Architecture supporting model
  - Decentralized solution across open networked database.
  - Participatory approach similar to P2P or WWW.
  - Various parties supply sections of model which can be joined or overlaid.

- Querying over model
  - Graph traversal over typed relationships.

