Integrated discussion session:

Are we already at the dead end of context modelling and retrieval?

Thomas Strang <thomas.strang@dlr.de>

Why do we want to use context?

Context is a **filter** striking against the everyday information overload

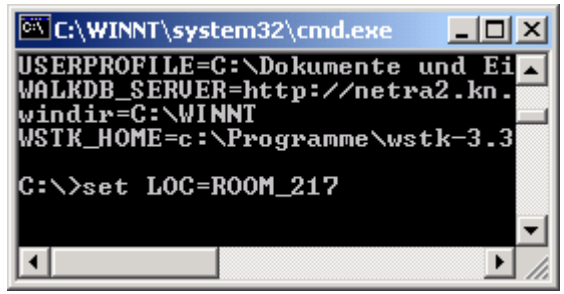
Why do we want to use context?

Context Modelling and Retrieval

A well designed **context modell**
is a key accessor to the context
in any context-aware system!

Context Modelling Approaches (1/3)

- Key-Value-Pairs Models
  - most simple category of models
  - not very efficient for more sophisticated structuring purposes
  - exact matching, no inheritance



Environment Variables: Key-Value-Pairs

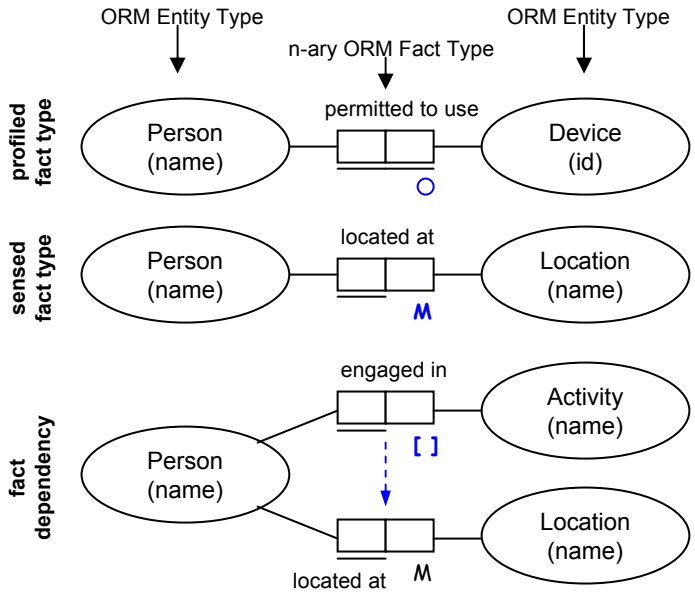
- Markup Scheme Models
  - scheme implements model
  - typical representatives: *profiles*
  - Examples:
    - Extensions of
      - Composite Capabilities/Preference Profile (CC/PP)
      - User Agent Profile (UAProf)
    - Comprehensive Structured Context Profiles (CSCP)
    - Pervasive Profile Description Language (PPDL)
    - Centaurus Capability Markup Language (CCML)

```
<?xml version="1.0"?>
<rdf:RDF
   xmlns:rdf = "http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   xmlns:cscp  = "http://example.org/CSCPProfileSyntax#"
   xmlns = "http://example.org/SessionProfileSyntax#"
   xmlns:dev = "http://example.org/DeviceProfileSyntax#"
   xmlns:net = "http://example.org/NetworkProfileSyntax#">
   <SessionProfile rdf:ID="Session">
      <cscp:defaults rdf:resource=
        "http://localSessionContext/CSCPProfile/previous#Session"/>
      <device><dev:DeviceProfile>
        <dev:hardware><dev:Hardware>
          <dev:memory>9216</dev:memory>
        </dev:Hardware></dev:hardware>
      </dev:DeviceProfile></device>
   </SessionProfile>
</rdf:RDF>
```

CSCP Instance based on RDF

Context Modelling Approaches (2/3)

- Graphical Models
  - particularly useful for structuring, but usually not used on instance level
  - Examples:
    - Well known: *UML*
    - *Contextual Extended ORM*



Contextual Extended ORM

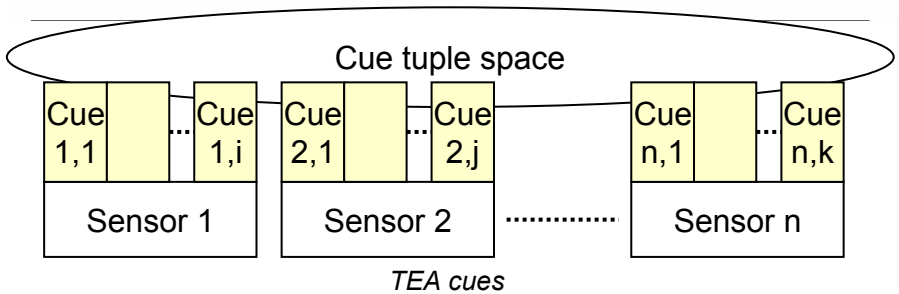
- Logic Based Models
  - Logic defines conditions on which a concluding expression or fact may be derived from a set of other expressions or facts (reasoning)
    → context is defined as facts, expressions and rules
  - High degree of formality
  - Examples:
    - McCarthy's *Formalizing Context*
    - Akman&Surav's *Extended Situation Theory*

$$S_1 = [\dot{s} \mid \dot{s} \models\!\!\ll bird, \dot{a}, 1 \gg]$$
$$S_2 = [\dot{s} \mid \dot{s} \models\!\!\ll flies, \dot{a}, 1 \gg]$$
$$B \models\!\!\ll present, air, 1 \gg \wedge \ll penguin, \dot{a}, 0 \gg \wedge \ldots$$
$$C = S_1 \Rightarrow S_2 \mid B$$

Context Expression from Extended Situation Theory

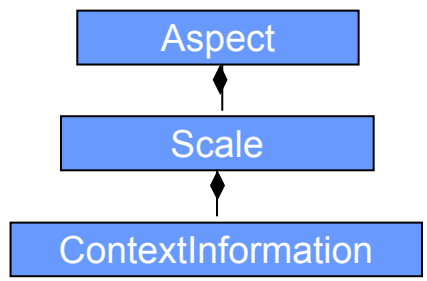
Context Modelling Approaches (3/3)

- Object Oriented Models
  - Intention behind object orientation is (as always) encapsulation and reusability
  - Examples:
    - *Cues* (TEA project)
    - *Active Object Model* (GUIDE project)



TEA cues

- Ontology Based Models
  - Ontology used as explicit specification of a shared conceptualization
    → strong in the field of normalization and formaliy
  - Context is modelled as concepts and facts
  - Examples:
    - CoBrA system
    - ASC model of Context Ontology Language (CoOL)
    - CONON; cont-el ontologies



ASC Model of CoOL

Context Retrieval

Modelling Approach	Standard Retrieval Method
Key-Value-Pairs Models	Linear Search
Markup Scheme Models	Markup Query Language
Graphical Models	Transformation
Logic Based Models	Inferencing
Object Oriented Models	Algorithm
Ontology Based Models	Reasoning

Integrated discussion session

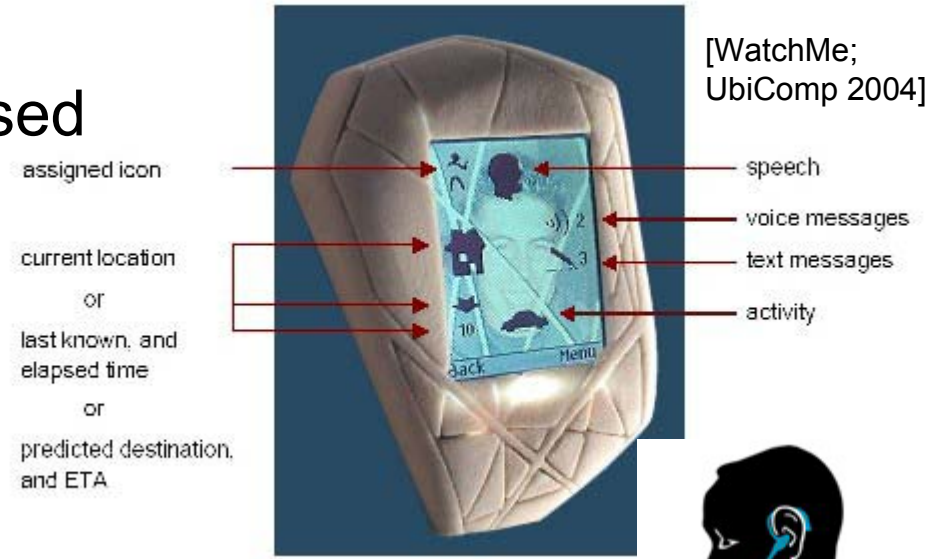
Let‘s get interactive ...

Location vs. Context

- Is context really more than location? [Schmidt et al. 1999]
  - spatial pre-filter („location is primary access path for context“) [Becker and Nicklas 2003] always applicable?
- Other primary aspects (available in more or less all modells)
  - time
  - identity
  - activity
- Are there interesting other ones?
- More than time-space-correlation for context fusion?

Do we use the right examples?

- Predominantly: Location based
  - Outside
    - Tourist Guide
    - Restaurant Finder
  - Inside
    - Museum



[WatchMe; UbiComp 2004]

- Communication channel establishment

- eLearning

  Location is irrelevant at all!

- Are there other interesting ones?

Solid vs. Hybrid; Experience Transfer

- Is one modelling and retrieval technology optimal for all purposes?
  - pro‘s / contra‘s of each technology
  - how promising are hybrid approaches?
- What can we learn from other research areas?
  - e.g. Semantic Web
  - e.g. Artificial Intelligence
  - e.g. Robotics

Are they addressed in current models?

- Security / privacy
  - information bluring / lies
- quality of context, ambiguity, uncertainty
- Traceability of retrieval

Summary

- A lot has been done in the context modelling and retrieval area
- Different approaches with different characteristics
- **But...** still a lot of open issues & challenges

Thank you!