KBM – Context

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Intro knowledge - summary

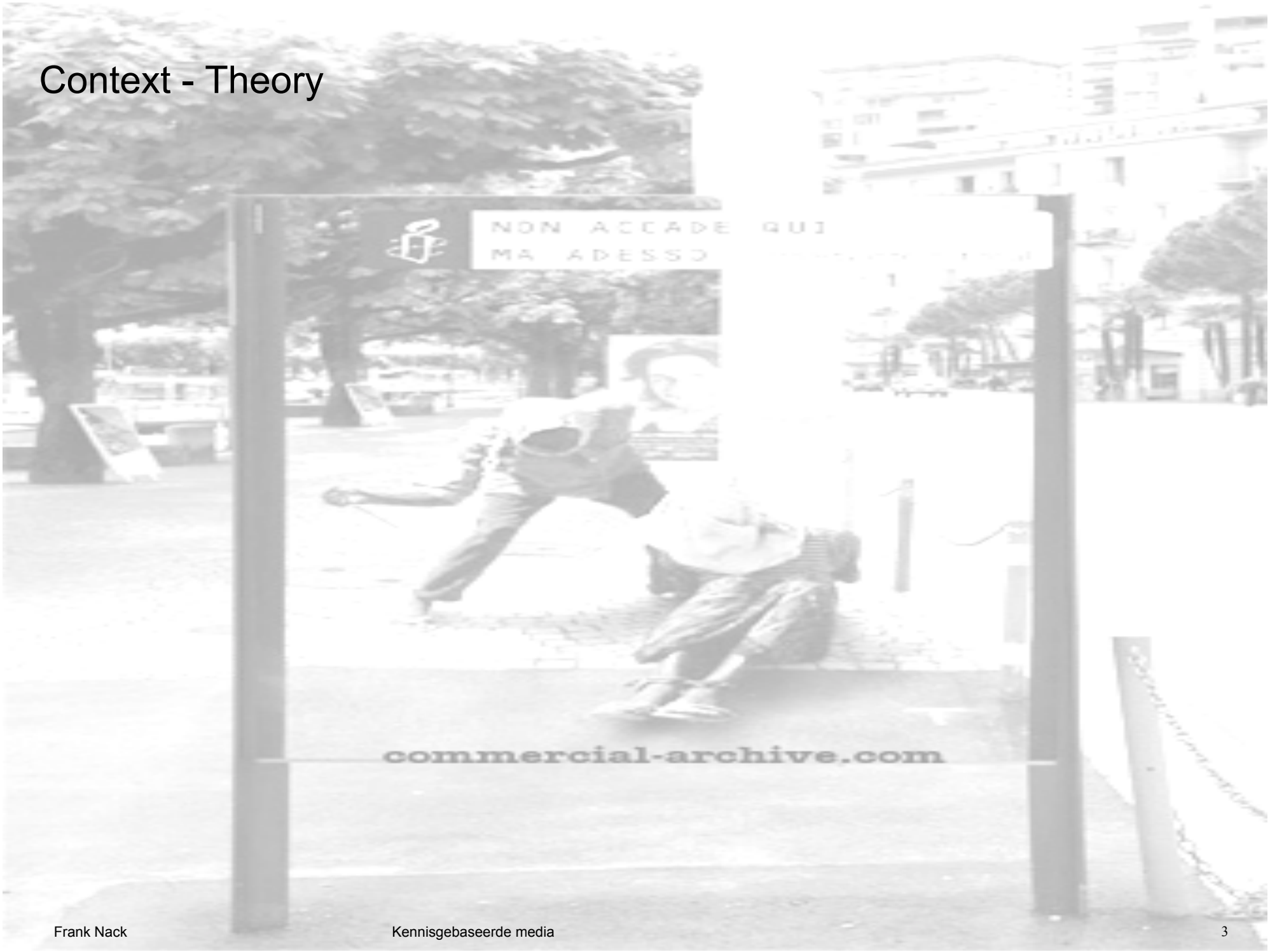
Investigated

- Different types of knowledge, epistemological aspects of knowledge, in particular constructivism, and established knowledge representation methods

Findings

- Knowledge, as part of communication, has to be situated, reliable, and justifiable
- A knowledge representation is a surrogate that provides a set of ontology commitments to be able to state things about a domain.
- There are already a large variety of knowledge representation techniques available, of which most follow the epistemological understanding of knowledge by focussing on propositional representations.

Context - Theory



Context

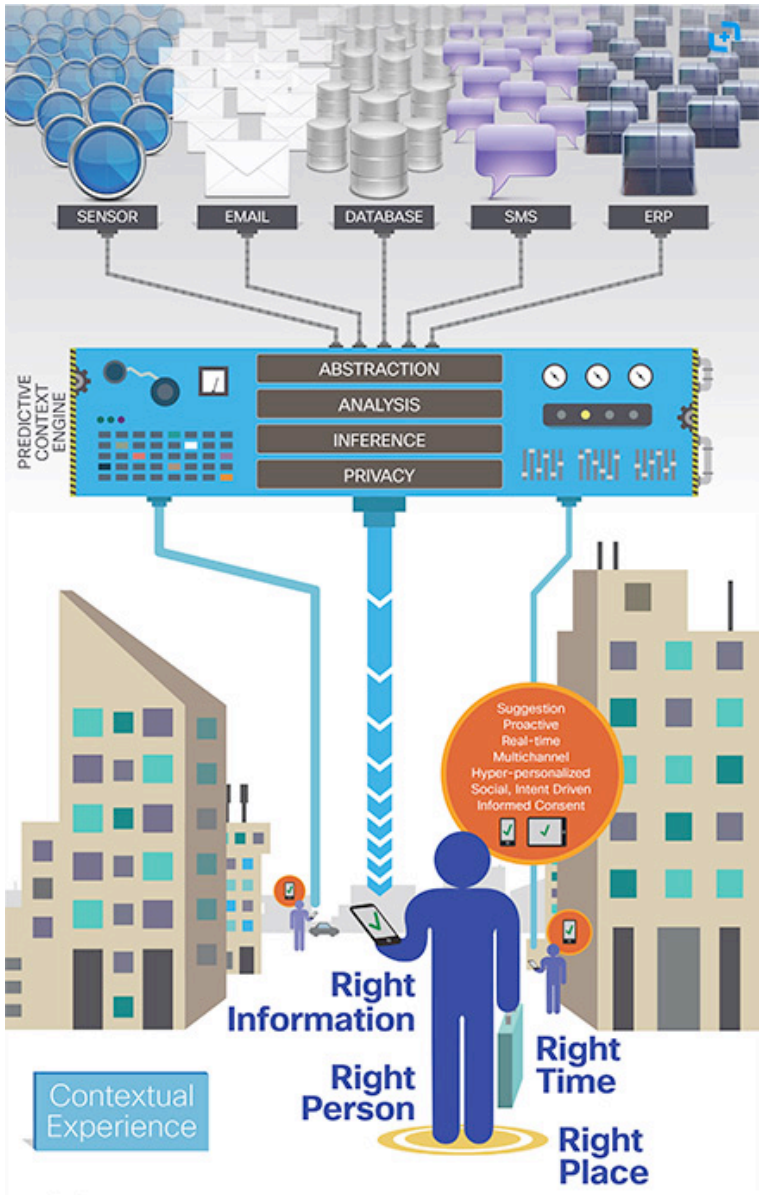
https://www.youtube.com/watch?v=jt8JqVdaTqI

https://www.youtube.com/watch?v=5jzAAPccBaU

https://www.youtube.com/watch?v=peSYIJIg14E

Context is the surroundings, circumstances, environment, background, or settings which determine, specify, or clarify the meaning of an event.

Context – in location



Context

- A context describes a situation and the environment a device or user is in.
- A context is identified by a unique name.
- For each context a set of features is relevant.
- For each relevant feature a range of values is determined (implicit or explicit) by the context.

Albrecht Schmidt,Michael Beigl,Hans-W Gellersen (1999). There is more to context than location. Computers & Graphics (Elsevier) 23 (6): 893–902

https://techradar.cisco.com/technology/predictive-context

Context – in media

Context in language:

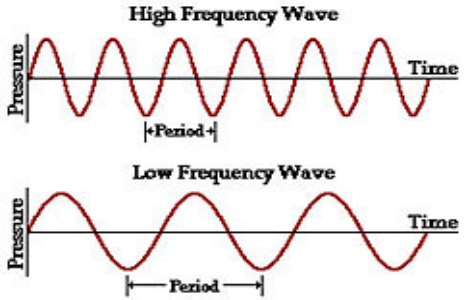
- Verbal => the surrounding text or talk of an expression (word, sentence, conversational turn, speech act, etc.) that influences the way we understand the expression.
- Social => objective social 'variables', e.g class, gender or race, which define the social identity being construed and displayed in text and talk by language users.
  Also see the current gender and equality discussions:

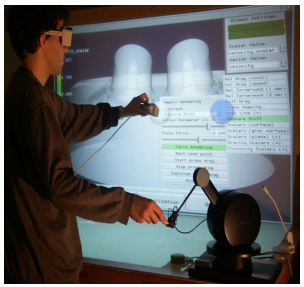
  http://www.spectator.co.uk/features/9432602/the-march-of-the-new-political-correctness/
  http://www.spectator.co.uk/features/9432672/an-a-to-z-of-the-new-pc/
- The relevant properties of social situations can only influence language use as subjective definitions of the situation by the participants, as represented and updated in specific mental models of language users: context models.

Context – in media

Context in temporal media

Internal



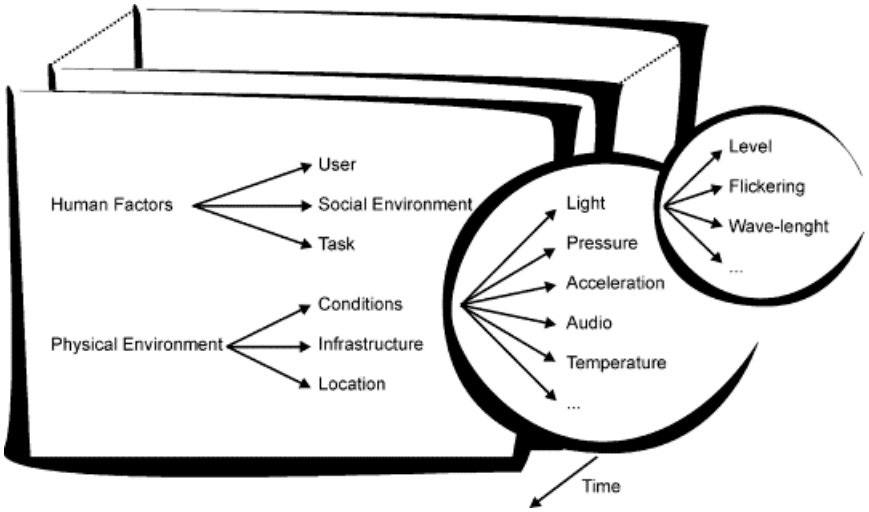


External

- Created by whom/what ?
- Created where?
- Created when?
- Created why?
- Created how?

- Watched with whom?
- Watched where?
- Watched when?
- Watched why?

Context – Ambience



Albrecht Schmidt,Michael Beigl,Hans-W Gellersen (1999). There is more to context than location. Computers & Graphics (Elsevier) 23 (6): 893–902.

Human factors related to context:

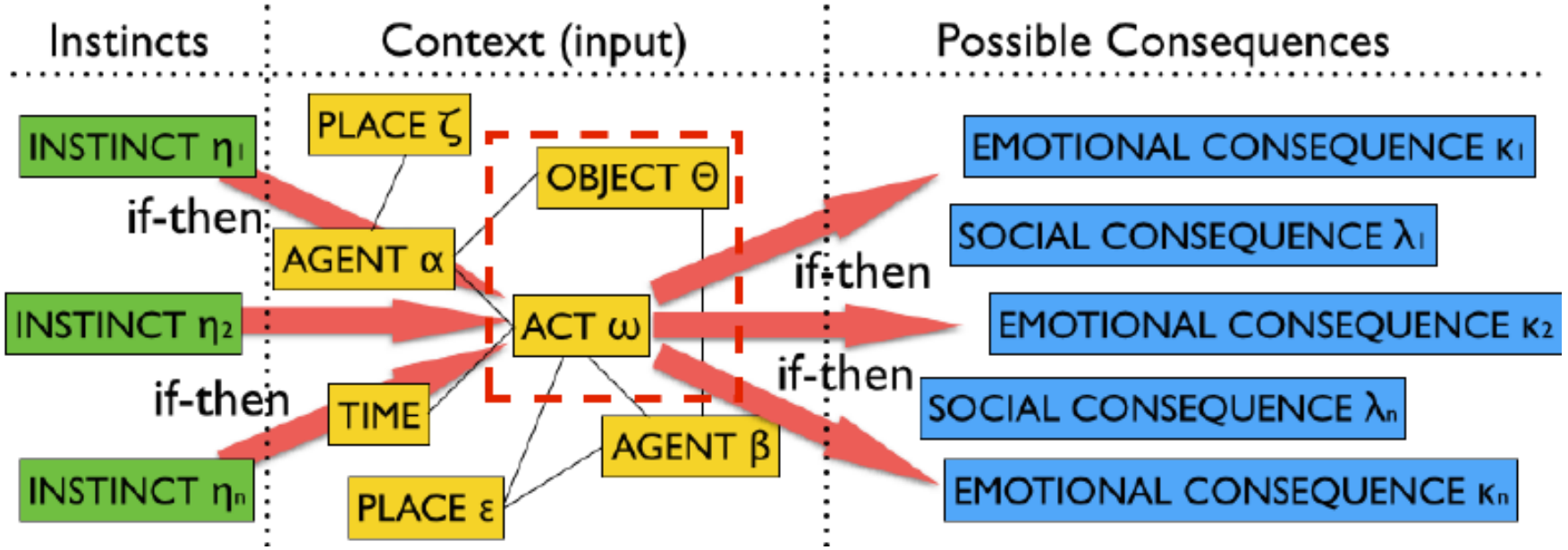
- Information on the user
  knowledge of habits, emotional state, bio-physiological conditions, ...
- the user's social environment
  co-location of others, social interaction, group dynamics, ...
- the user's tasks
  spontaneous activity, engaged tasks, general goals,...

Environmental factors related to context:

- Location
  absolute position, relative position, co-location,...
- Infrastructure
  surrounding resources for computation, communication, task performance
- physical conditions
  noise, light, pressure,...

Context - Representations

Context

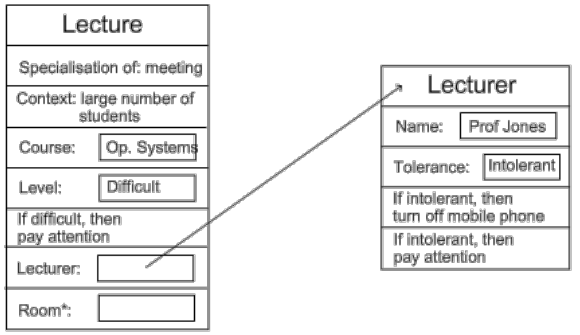


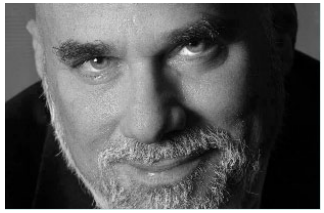
https://www.researchgate.net/figure/280613125_fig1_Figure-1-Context-representation-with-possible-instinctive-reasons-and-emotionalsocial

Event presentations

Frame

Minsky, M. L. (1988). The Society of mind. London: Picador.



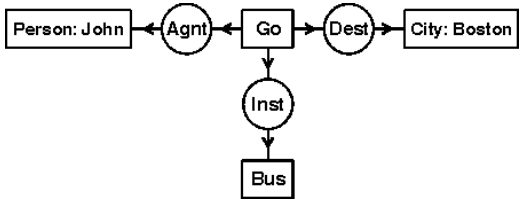


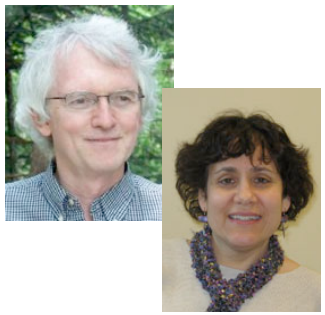
Scripts, Plans, Goals

Schank, R. C., & Abelson, R. (1977). *Scripts, Plans, Goals And Understanding.* Hillsdale, New Jersey: Lawrence Earlbaum Associates.

Conceptual Graphs

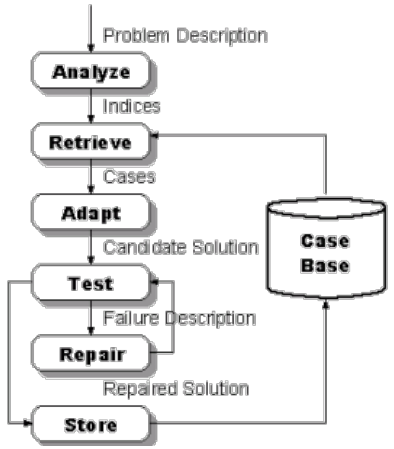
Sowa, J. F. (1984). *Conceptual Structures: Information Processing in Mind and Machine. Reading, MA: Addison-Wesley Publishing Company.*



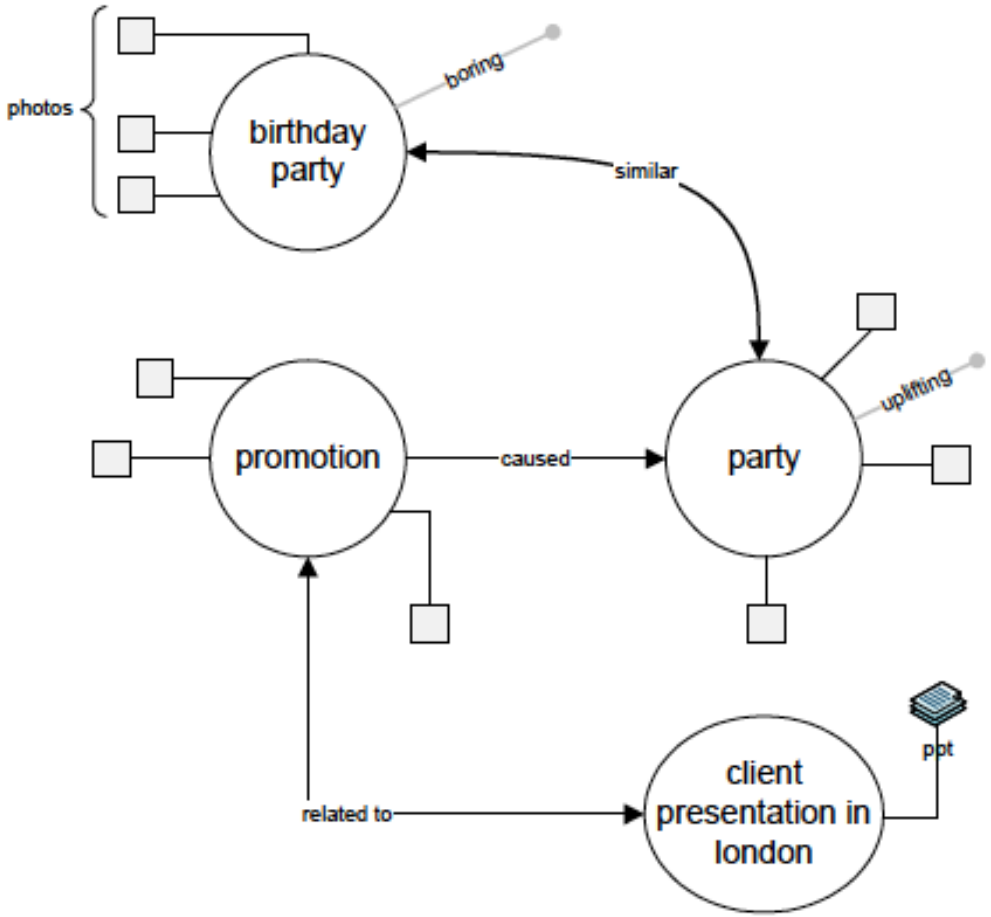


Case-based Reasoning

Riesbeck, Christopher, and Roger Schank. *Inside Case-based Reasoning*. Northvale, NJ: Erlbaum, 1989.
Janet Kolodner. Case-Based Reasoning, Morgan Kaufmann Publishers, San Mateo, CA, 1993.



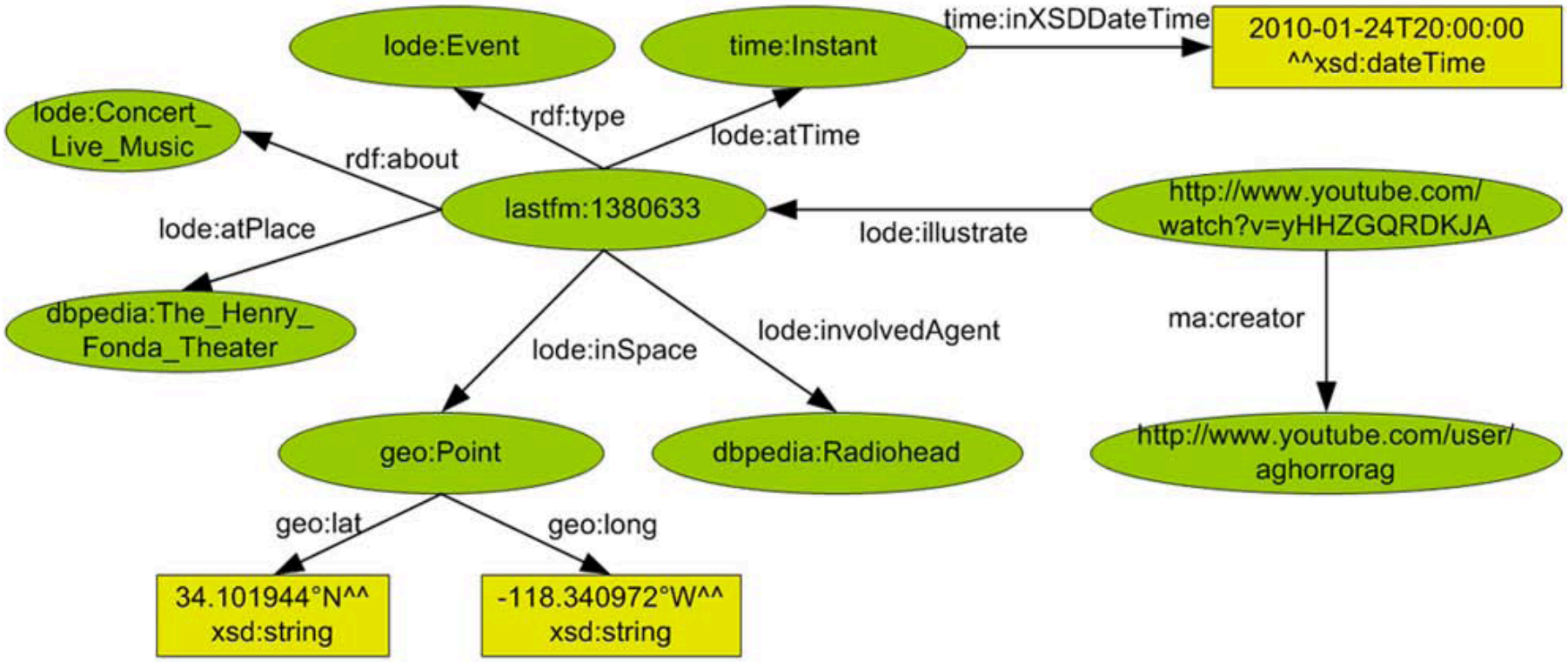
Event - Eventory



An Event Based Media Repository with event description in MySQL

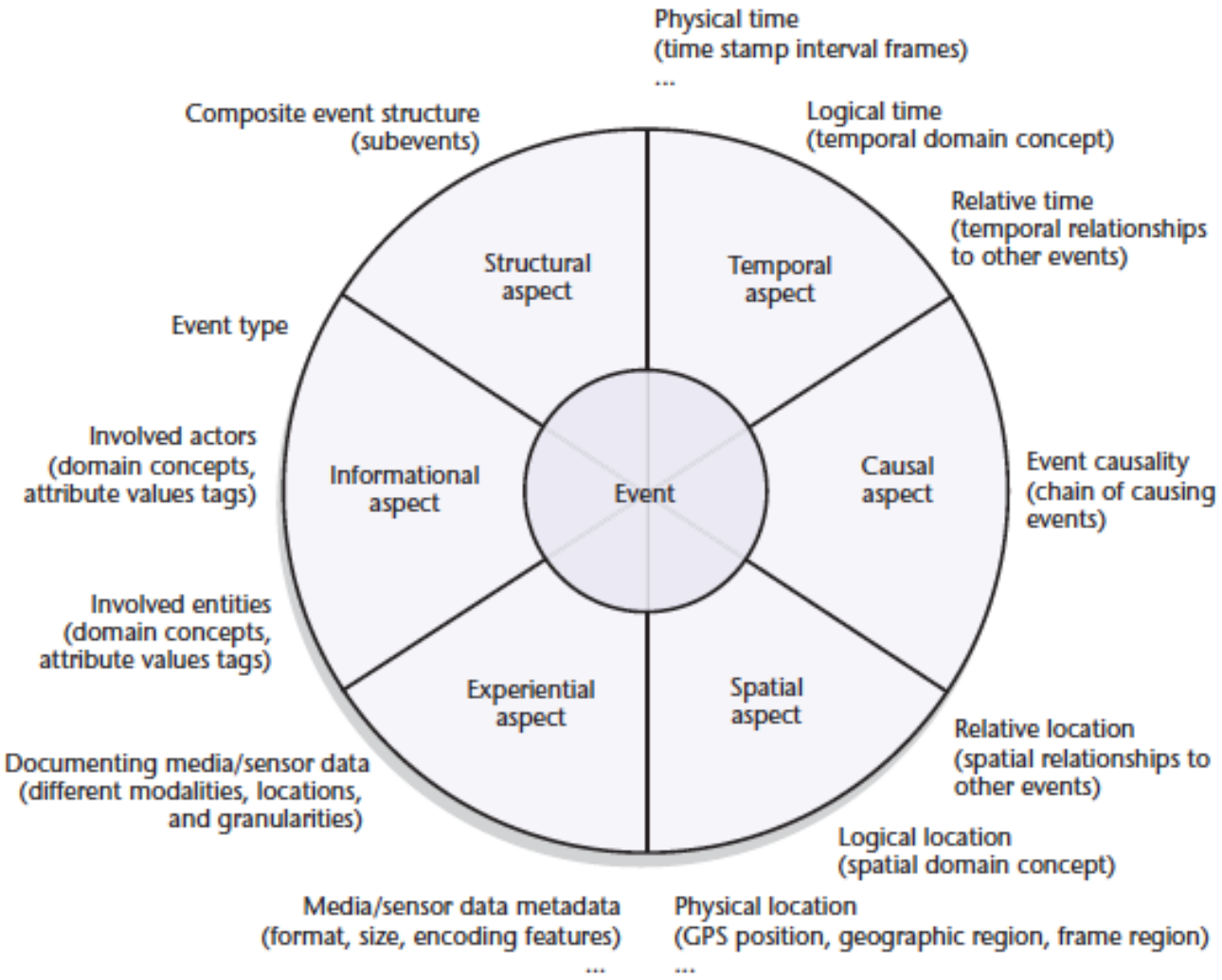
X. Wang, S. Mamadgi, A. Thekdi, A. Kelliher, and H. Sundaram. Eventory – an event based media repository. In *Semantic Computing. IEEE, 2007*

Event - LODE



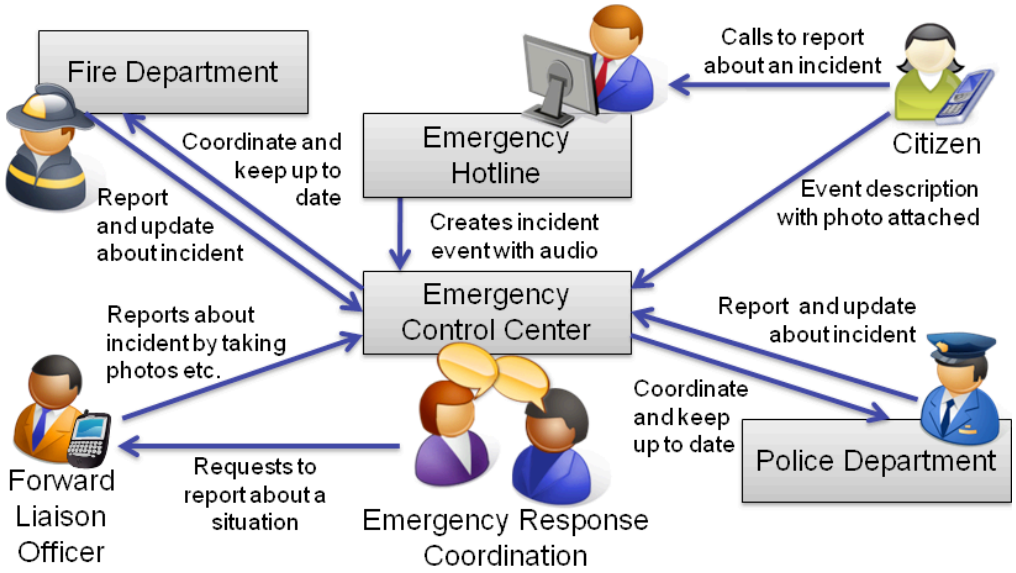
Raphaël Troncy, Bartosz Malocha and André Fialho. Linking Events with Media. In the Open Track of the Linked Data Triplification Challenge, colocated with the 6th International Conference on Semantic Systems (I-SEMANTICS'10), Graz, Austria, September 1-3, 2010

Event – Model E



U. Westermann and R. Jain. Toward a common event model for multimedia applications. *IEEE MultiMedia,* 14(1), 2007.

Event – Model F - A

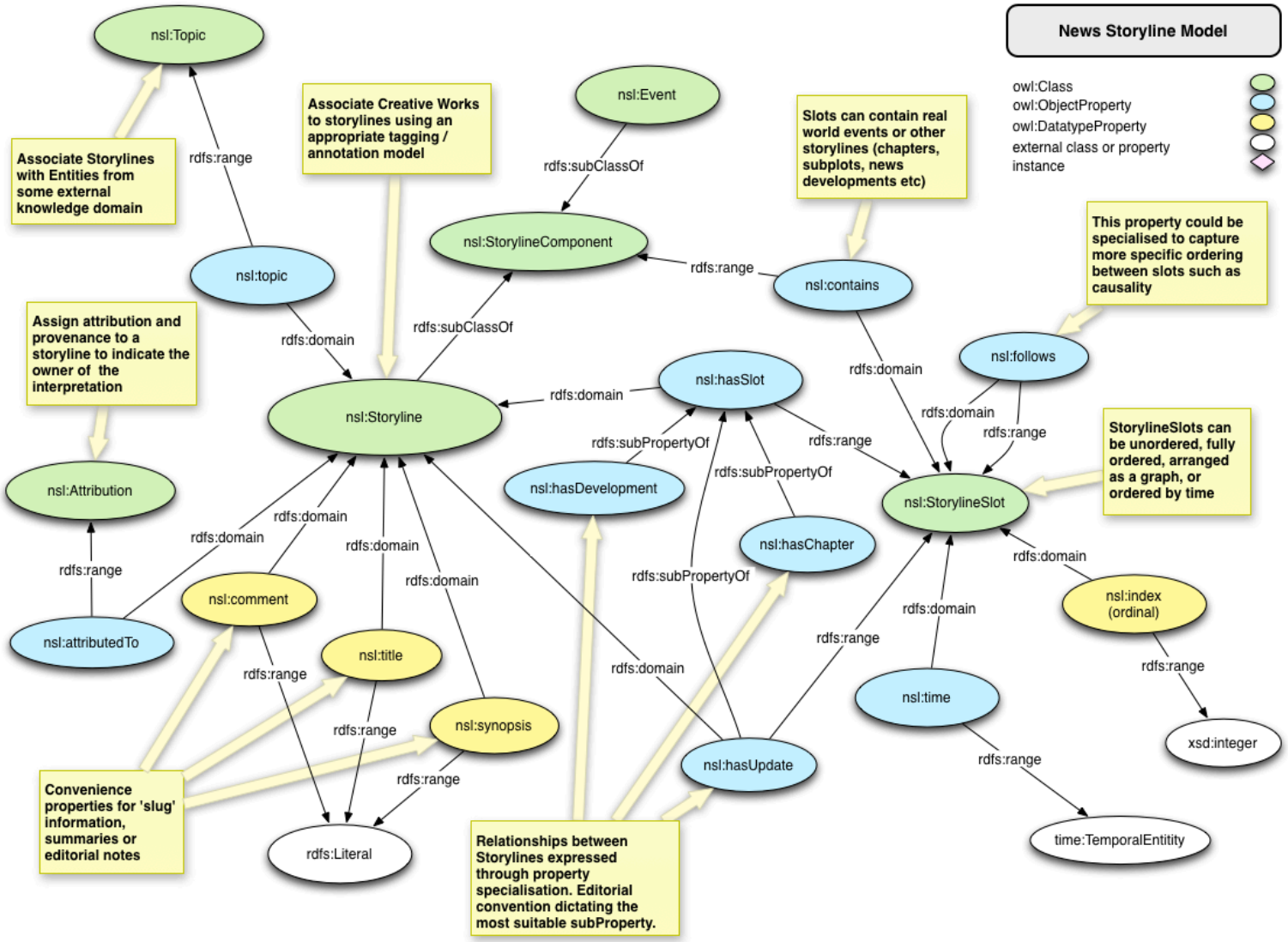


Based on DOLCE + DUL

- Participation of objects
- Temporal duration
- Spatial extension of objects
- Structural relationships
  - mereological
  - causal
  - correlation
- Documentary support
- Interpretation

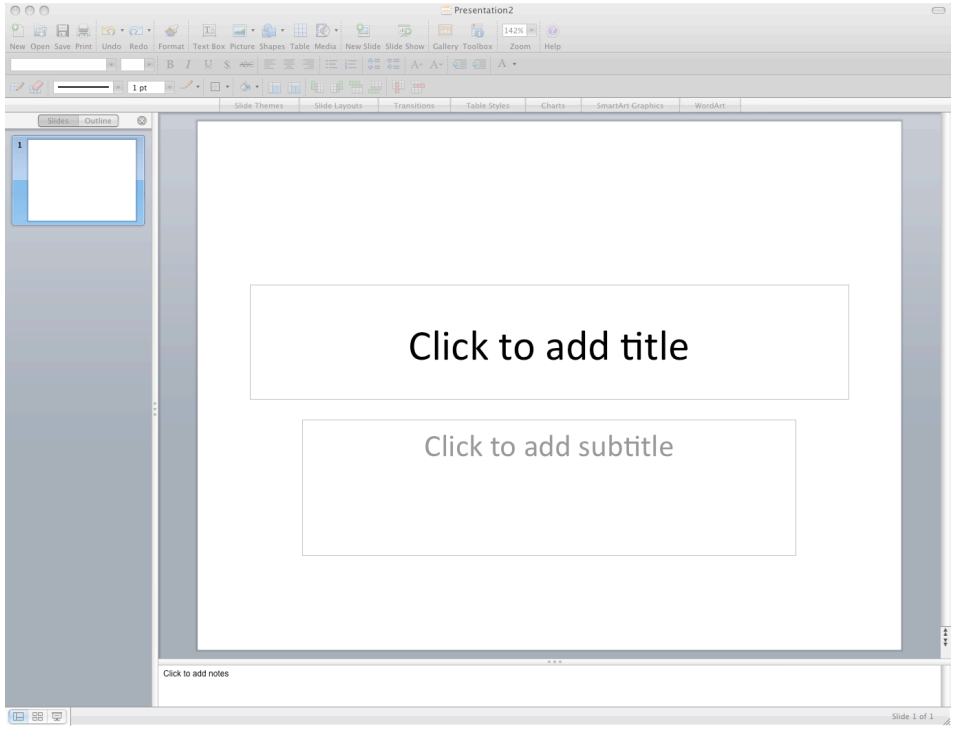
A. Scherp, C. Saathoff, T. Franz, and S. Staab: A Core Ontology on Events for the Se-mantic Representation of Human Experiences in the Real World, Multimedia Tools and Applications, Multimedia Tools and Applications, Springer, 2011.

BBC – News Storyline Ontology



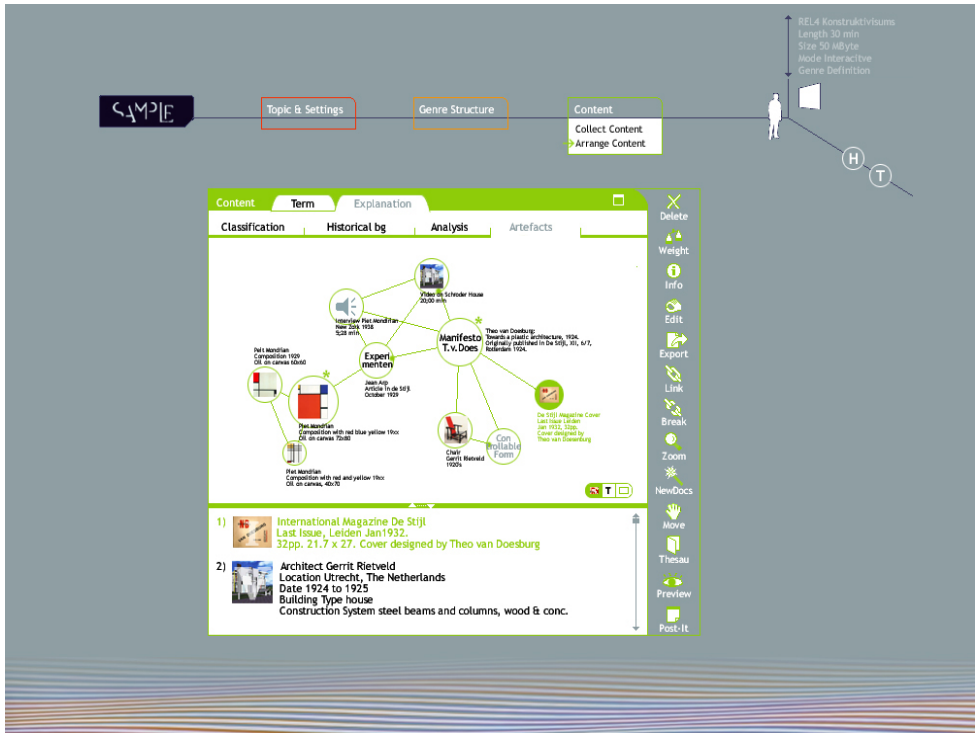
Context – Application problems

Context – task support (static)



What is the motivation of a user?
What is the preferred media by the user?
What is the problem solving plan of the user?
What is the user's level of interest in a certain topic?
What is the system's level of confidence in the user evaluation?
How reliable is the User Model?

Context – in presentation generation



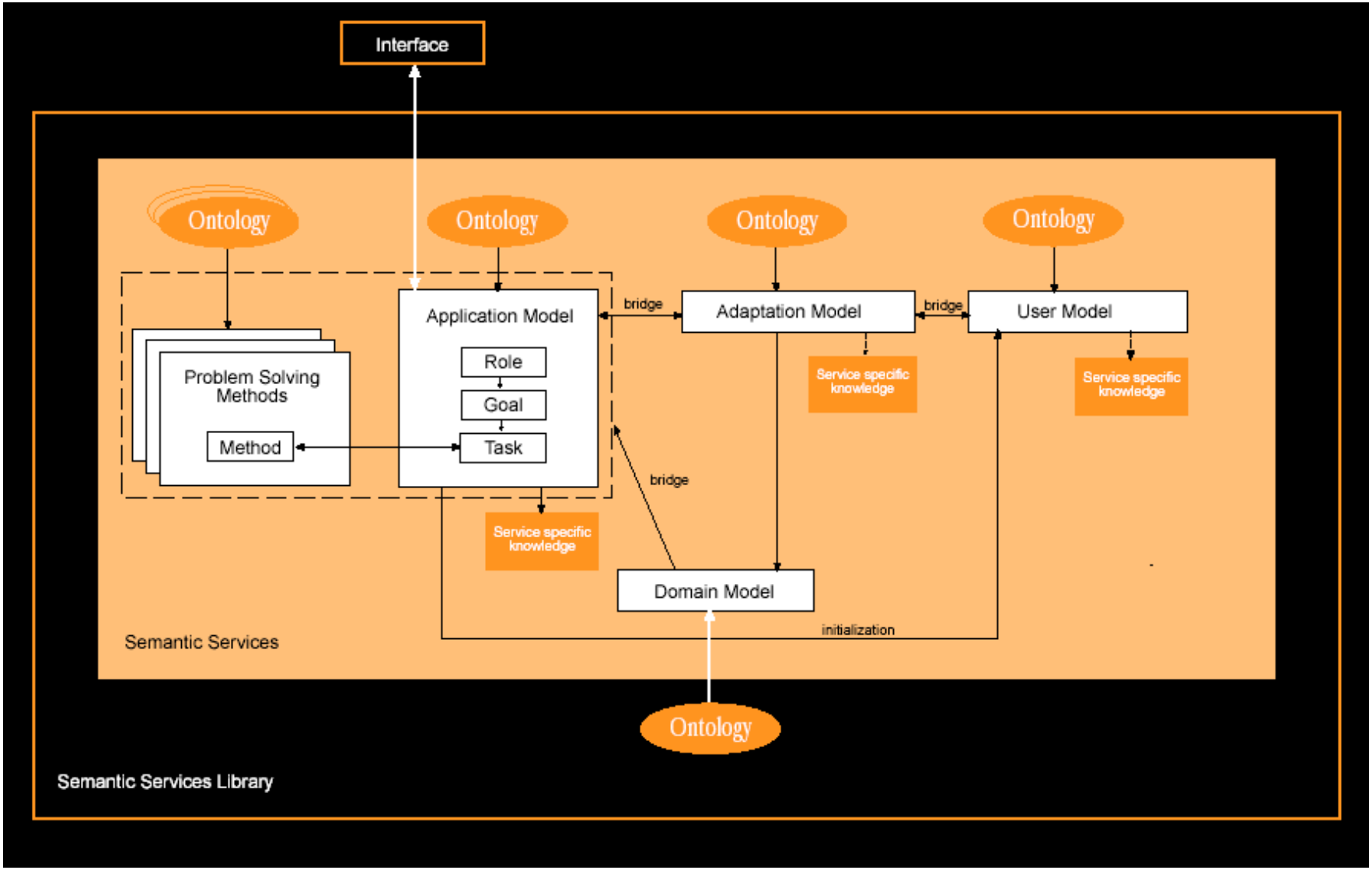
SampLe

An authoring environment that supports all the production steps and their various tasks by making use of semantic-based annotations.

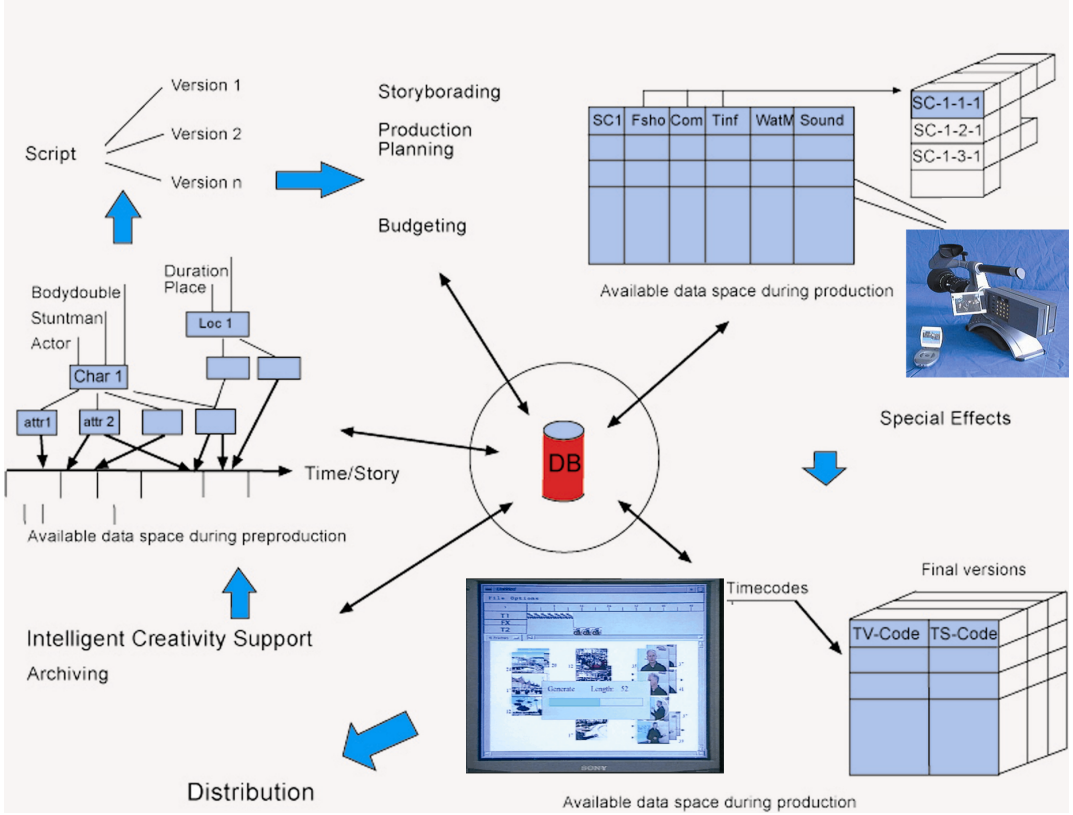
Original interface design: Jana Werner
System: Katya Falkovytch and Nack http://homepages.cwi.nl/~media/projects/CHIME

Andruid Kerne, Interface Ecology Lab http://ecologylab.cs.tamu.edu/research/index.html
Monika Schraefel, spaces http://www.ecs.soton.ac.uk/research/projects/356

Context – in presentation generation



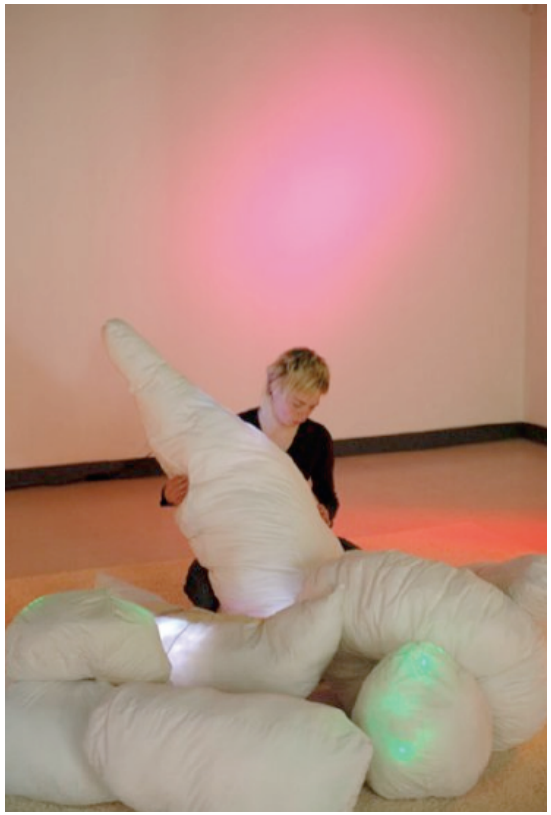
Context – task support (active)



Hardman, L., et al. (2008) Canonical Processes of Semantically Annotated Media Production. To appear in the Special Issue on Canonical Processes, Multimedia Systems Journal, 14(4), pp. ??

Nack, F. & Putz, W. (2004) Saying What It means: Semi-automated (News) Media Annotation. Multimedia Tools and Applications, 22, pp. 263 - 302,

Context – ambience (experienced-based adaptation)



Soft(n): http://v2.nl/lab/projects/soft-n

Experienced-based adaptation focuses on three major processes:

- Stimulation
- Relaxation
- Representation (Feedback)

User / Device Model

- identifier
- current biometric status,
- current action
- current interest
- current location
- likes/dislikes

Session

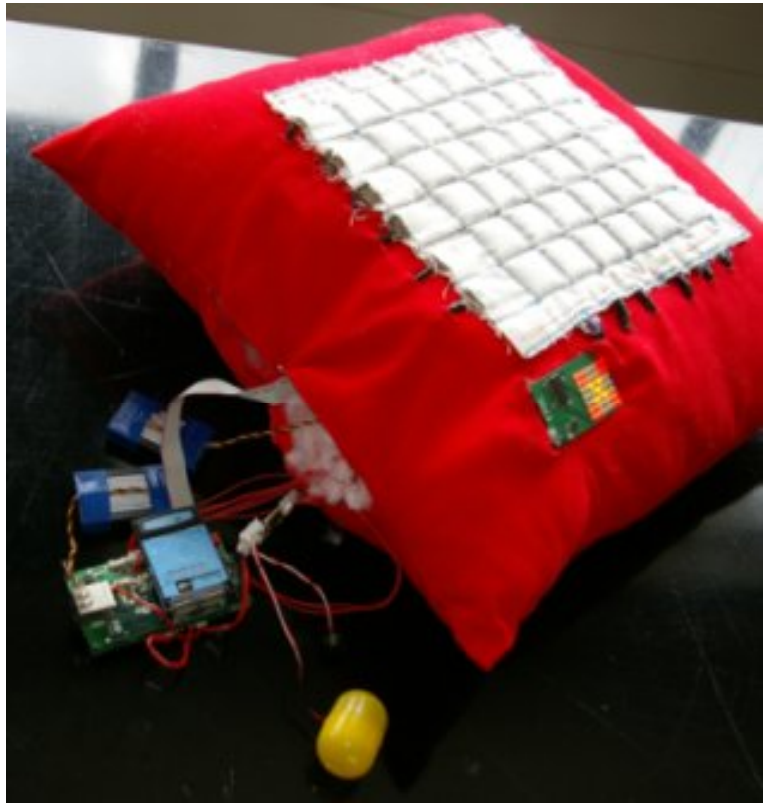
monitors the interactions between a user and a device or between devices.

History Model

an approach towards an individualized long-term memory of the interaction patterns for every user and device.

Nack, Schiphorst, Obrenovic, KauwATjoe, de Bakker, Rosillio, Aroyo (2007). Pillows as adaptive interfaces in ambient environments. Proceedings of the international workshop on Human-centered multimedia, pp. 3 – 12, Augsburg, Bavaria, Germany, 2007

Pillows Implementation - Sensors



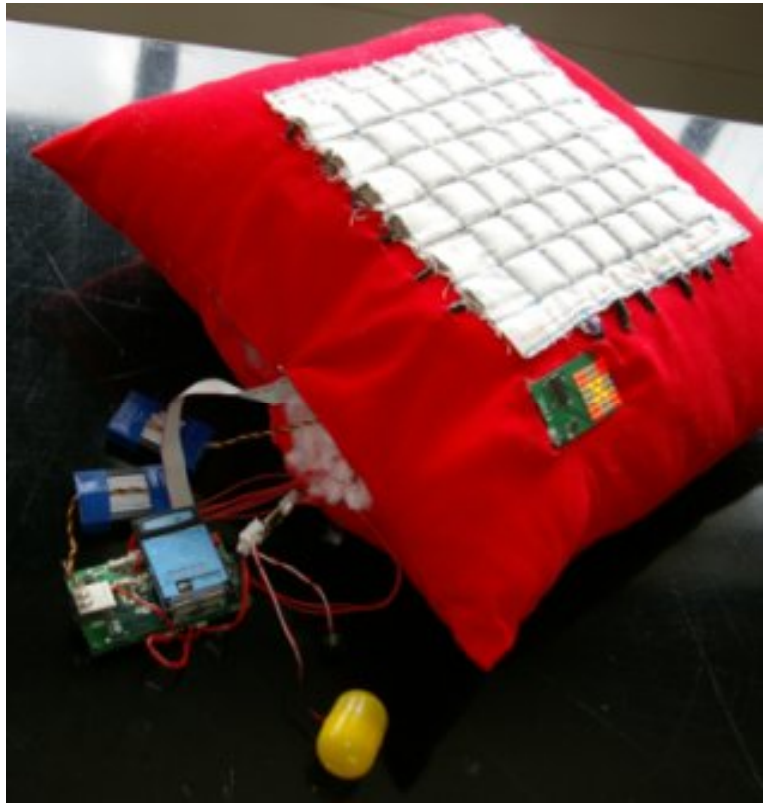
Touch-pad (64 sensitive regions) of carbon impregnated open cell polyethylene foam. Utilize to identify a point of contact or applied pressure.

Led display controlled by SPI Bus.

The processing performed by a Gumstix Connex Linux computer expanded with a SIOS (Sensor Input Output System) daughter board developed by the V2_lab.

The communication between pillow and server uses the OpenSoundControl (OSC) protocol (Zeroconf networking (http://www.zeroconf.org/) and an OSC Querying System).

Pillows Implementation - Sensors

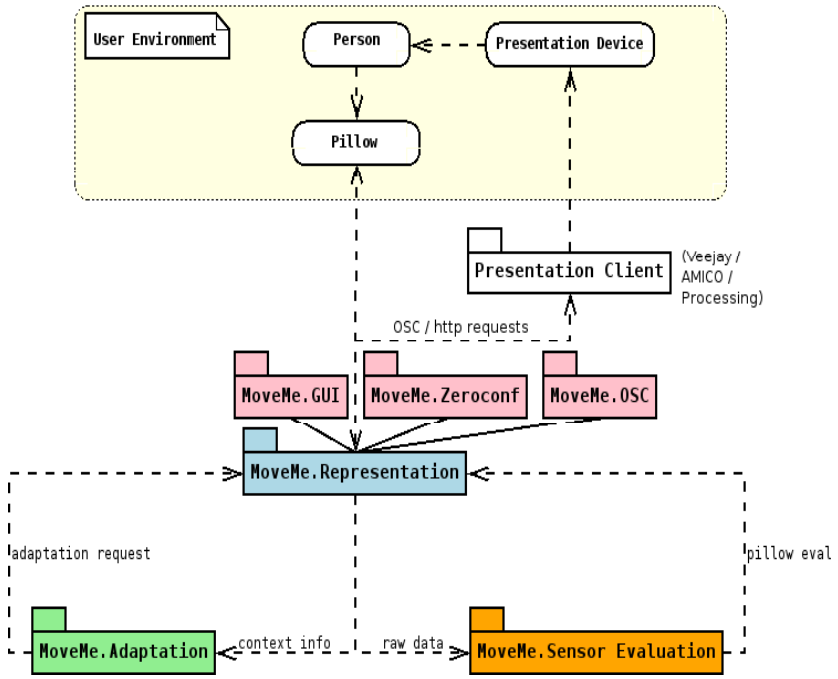


The Gumstix filters the incoming pressure data and communicates these in discrete packages to the server application.

Measurement on pressure:

- touch intensity
- size (the size of the interaction object that touches the pad),
- the speed of the touch
- the direction of the touch.

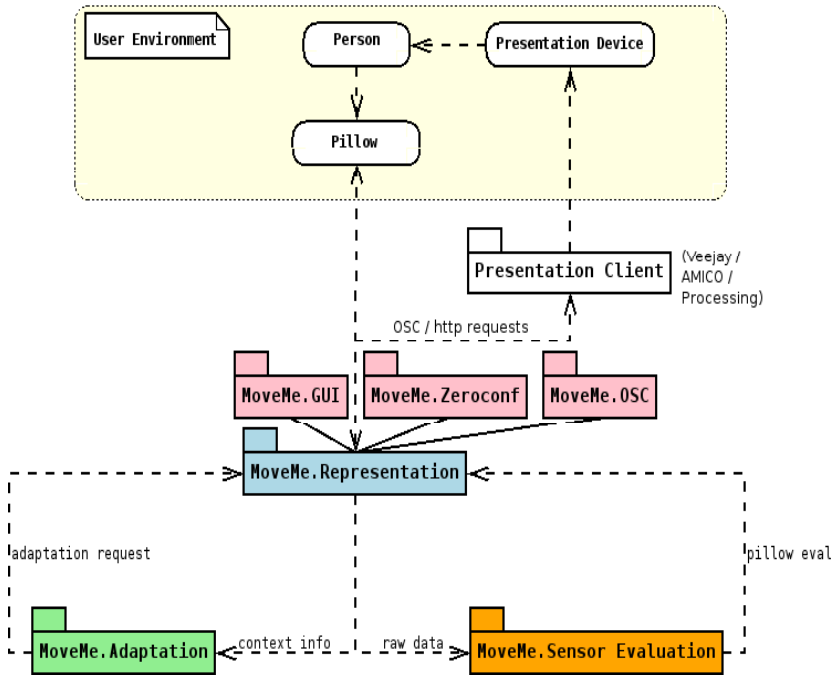
Pillows Implementation – Sensor evaluation module



Use

Instantiates the device drivers for every detected pillow and evaluates incoming raw data. Its main task is to perform some statistical analysis (some low-pass filtering and mean value calculations) in order to keep the overhead of processing load low.

Pillows Implementation – Sensor evaluation module



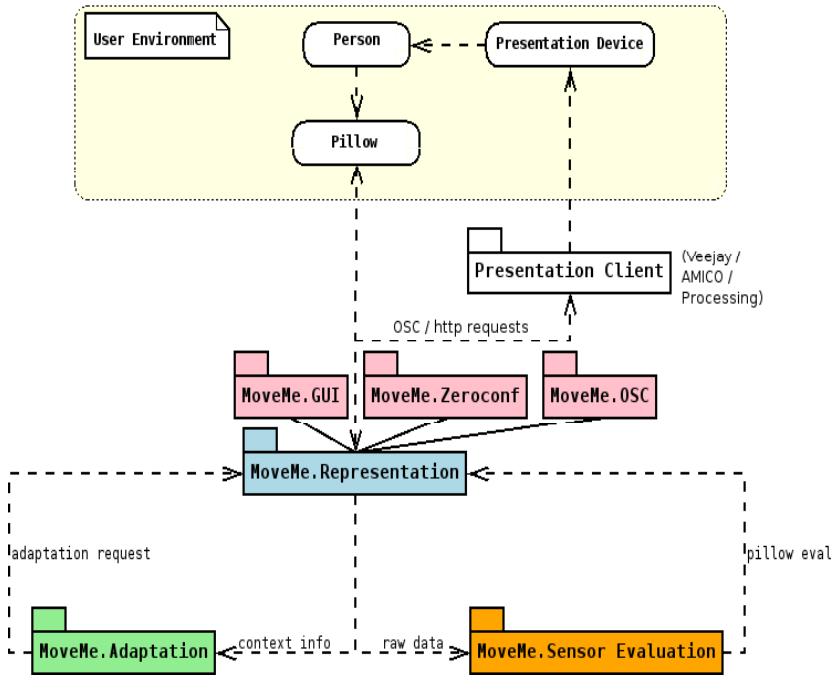
Output of sensor evaluation

A localized event description.

Changes can be related to taxels =>
a matrix of all taxels of the touch pad, where every taxel is identified as started, running or ended.

This description of position and event status is send to the corresponding session buffer of the context module, where the next level of abstraction on the results is performed.

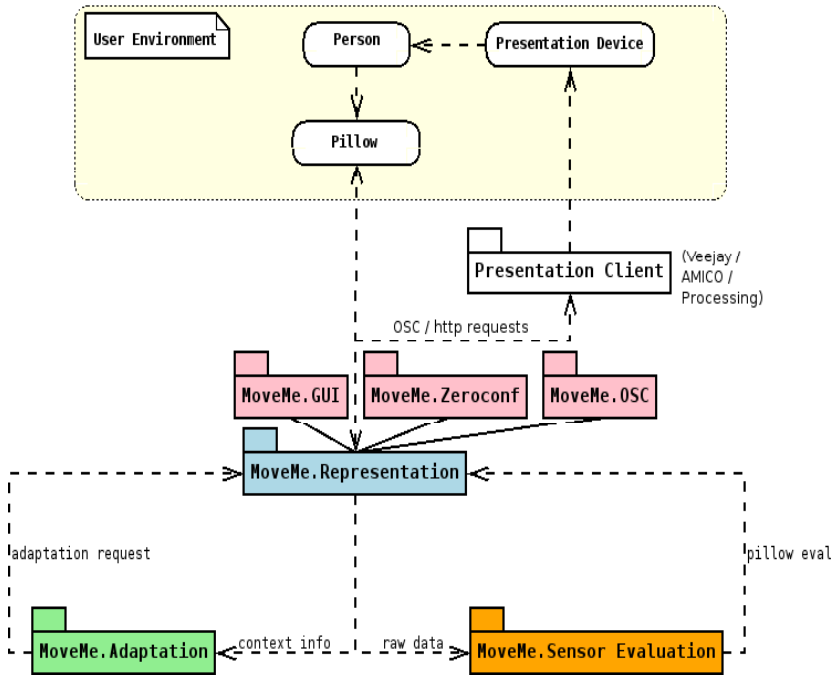
Pillows Implementation – Context module



Use

Consists of data structures describing the current context with respect to users, devices and the interactions between them.

Pillows Implementation – Context module



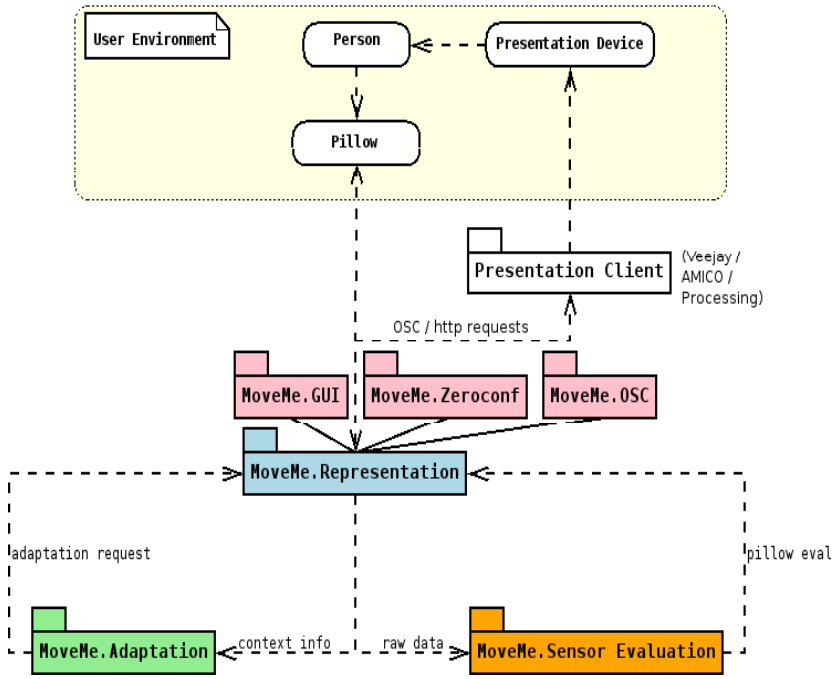
User Model

User profiles (Context User Model (CUM)) are loaded into the Context Model once their RFID is detected.

CUM reflects characteristics relevant for the current context, e.g.

- user identifier
- current biometric status,
- current action
- current interest
- current location
- likes/dislikes

Pillows Implementation – Context module



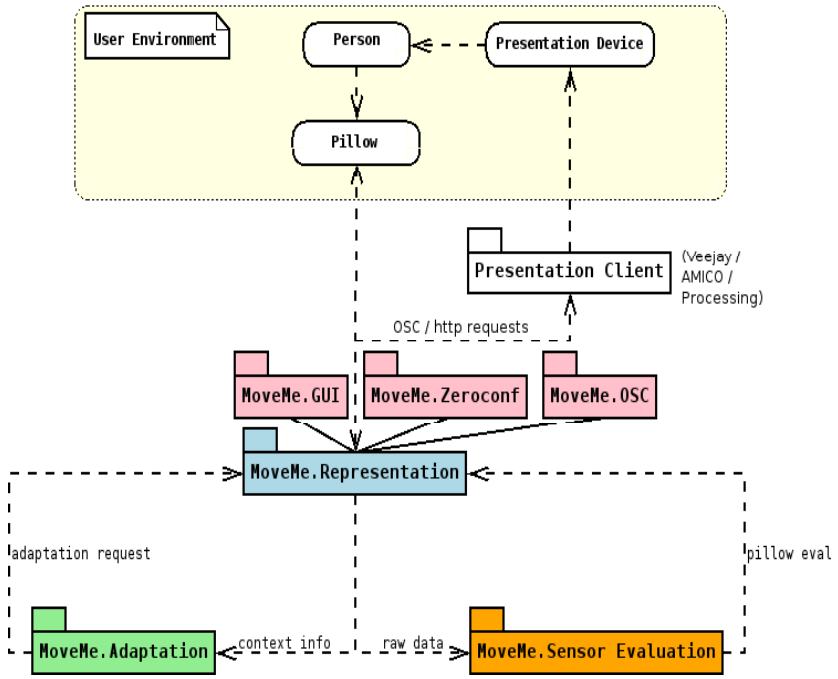
Device Model

A device profile (Context Device Model (CDM)) is loaded into the Context Model once their RFID is detected.

Device characteristics include

- the device IP
- input sensor set,
- its actuator setup
- current activity
- current state for every input sensor and output actuator
- current location
- behaviour descriptions, such as adaptability with respect to input sensors

Pillows Implementation – Context module

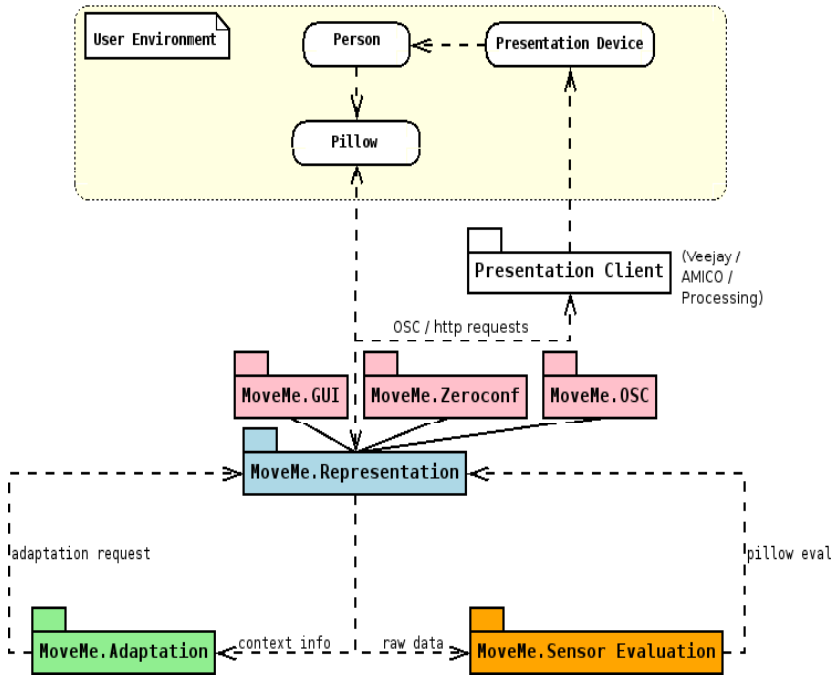


Device State

current state of pillow = ' device'

0	1	2	3	4	5	
Top left	Top left			Top right	Top right	0
Top left	Top left			Top right	Top right	1
		Center	Center			2
		Center	Center			3
Botto m left	Botto m left			Botto m right	Botto m right	4
Botto m left	Botto m left			Botto m right	Botto m right	5

Pillows Implementation – Context module



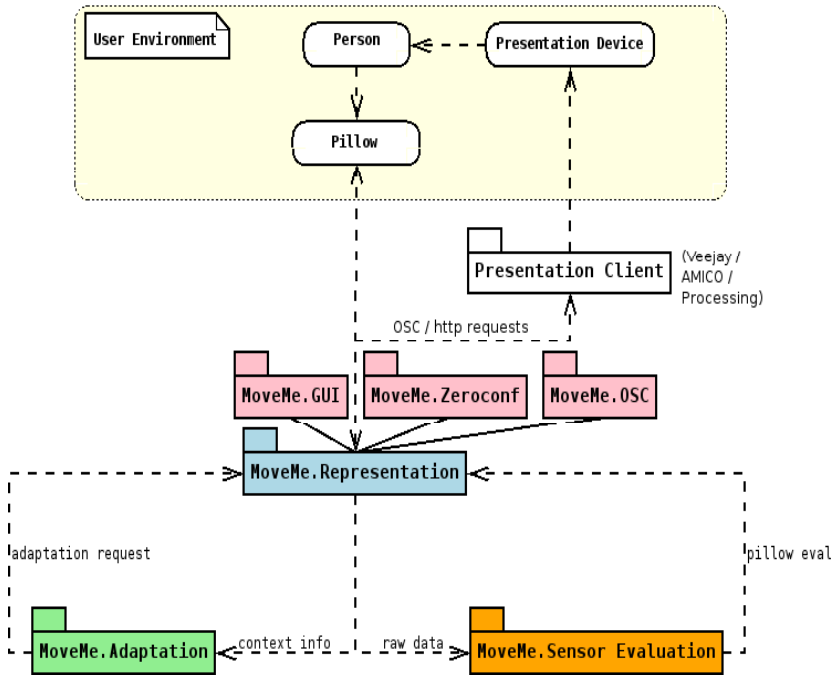
Session

monitors the interactions between a user and a device or between devices.

A data structure containing:

- identifications of the agents involved in the interaction
- start/end time of the session
- recorded sensor data
- resulting derivations such as type of pillow activation, pillow state and user state.

Pillows Implementation – Context module



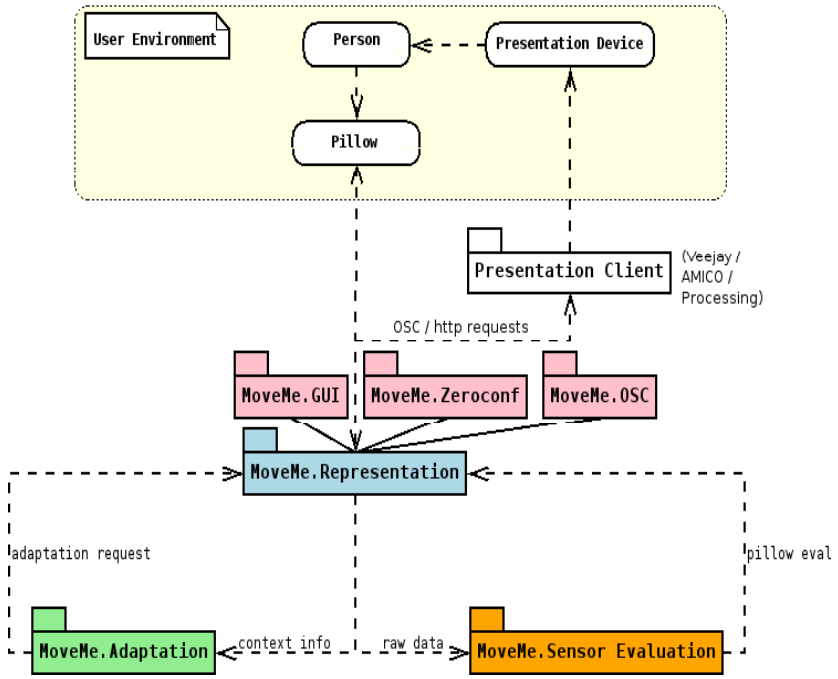
Session activation

by the Context Module once a device detects the ID of the user and the pillow sensors register relevant data.

Example:
session A: userID – pillowID
session B: pillowID – AmplifierID

Result : Session A + Session B

Pillows Implementation – Context module



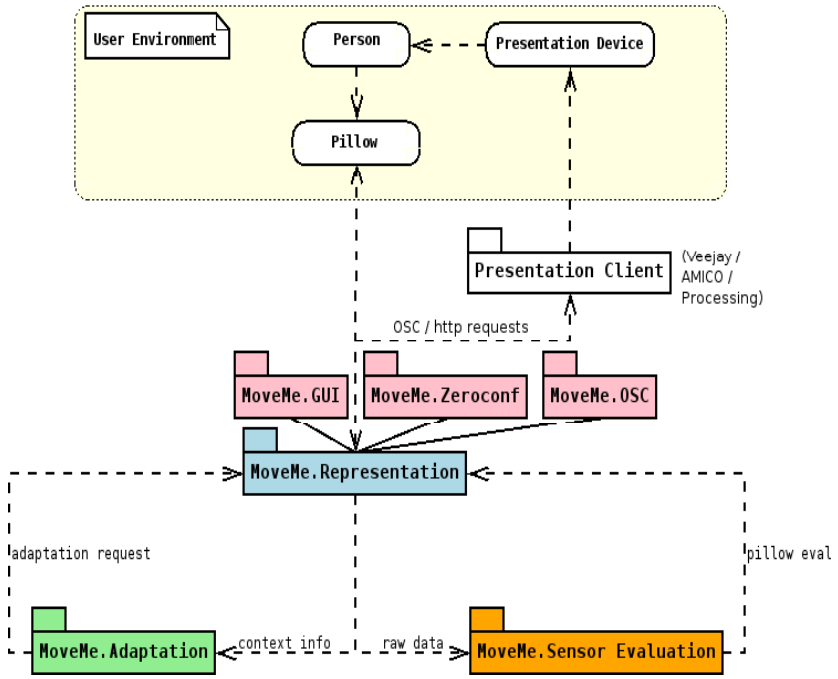
History Model

an approach towards an individualized long-term memory of the interaction patterns for every user and device.

Available data sets:
identification
[userid or deviceid / context type / indate / outdate]
session
[agent1 / agent2 / context type / actionlist / datalist /adaptationlist].

Real instant or post evaluations (e.g. at the end of a day, week, month, etc) still need to be developed.

Pillows Implementation – Adaptation module

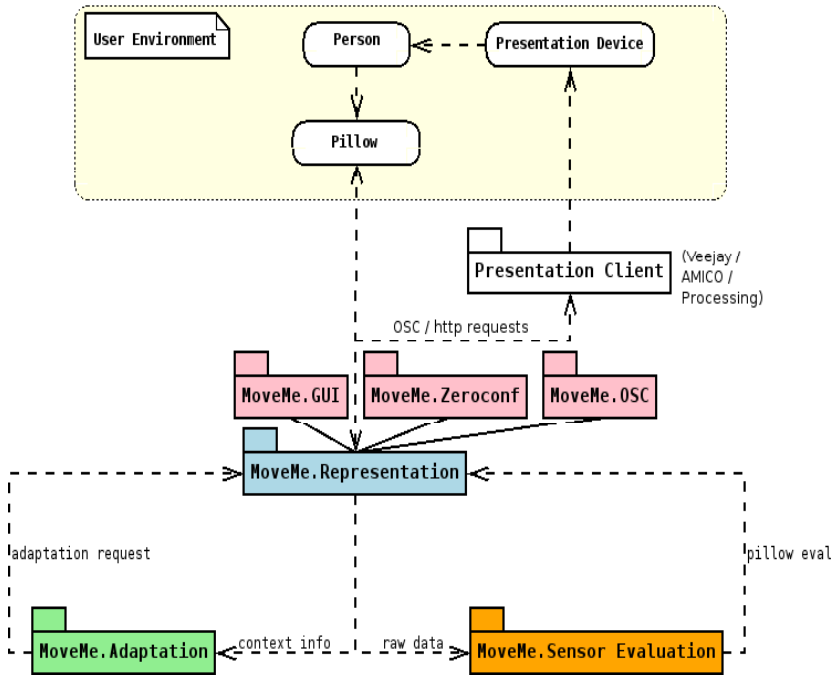


Use

establish a mapping between detected action and the appropriate environment adaptation.

It also conveys instructions about the source to be adapted and the means of adaptation to the other components.

Pillows Implementation – Adaptation module



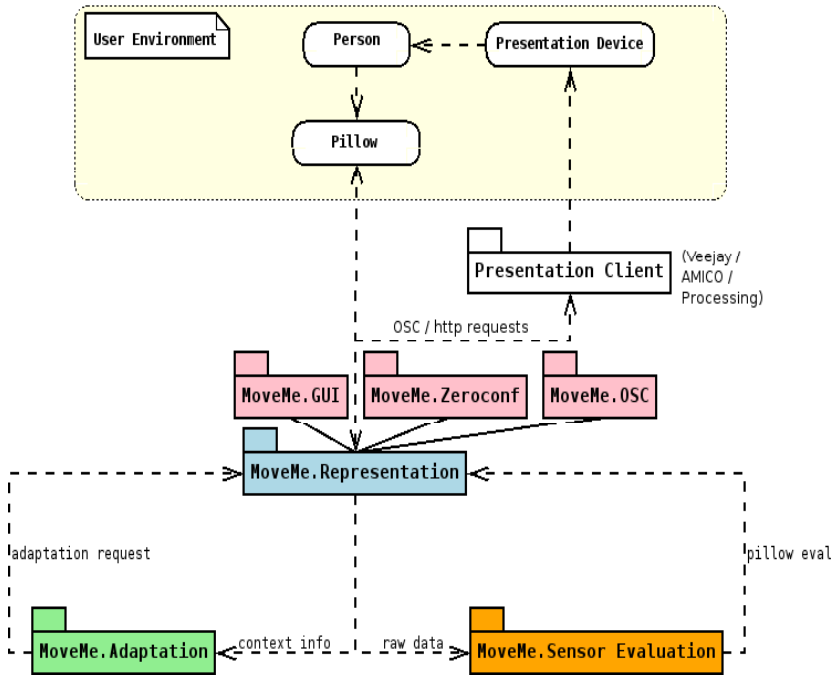
Process oriented

Adaptation focuses on three major processes:

- Stimulation
- Relaxation
- Representation (Feedback)

The adaptation engine, therefore, constantly evaluates data from the Context Module, and reacts on changes only if they are outside the provided constraint set.

Pillows Implementation – Adaptation module



Mechanism

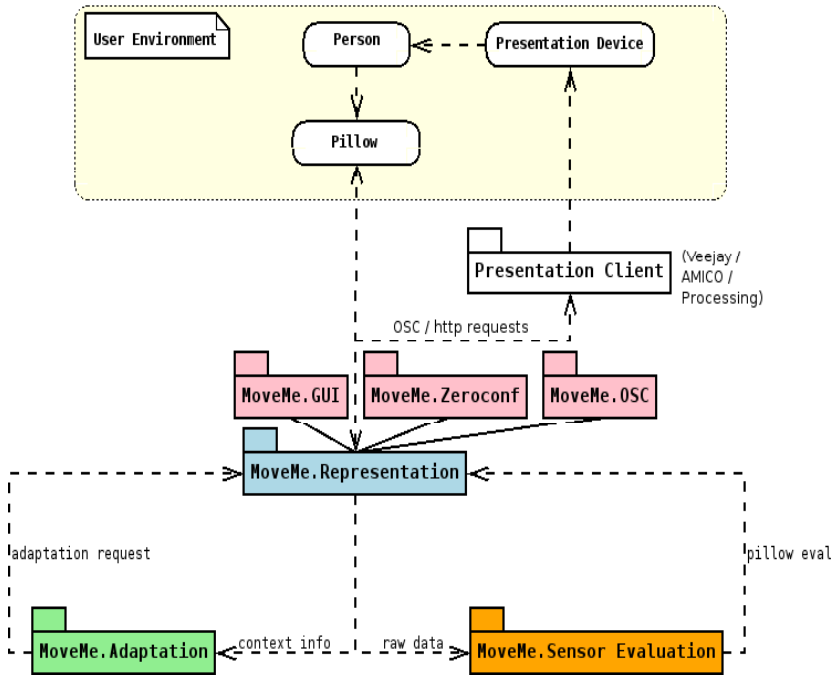
The adaptation process is based on a finite state machine (FSM):

states => CUM, CDM, Session

transitions => constraints (excitement level, time)

actions => adaptation performed at a given moment

Pillows Implementation – Adaptation module



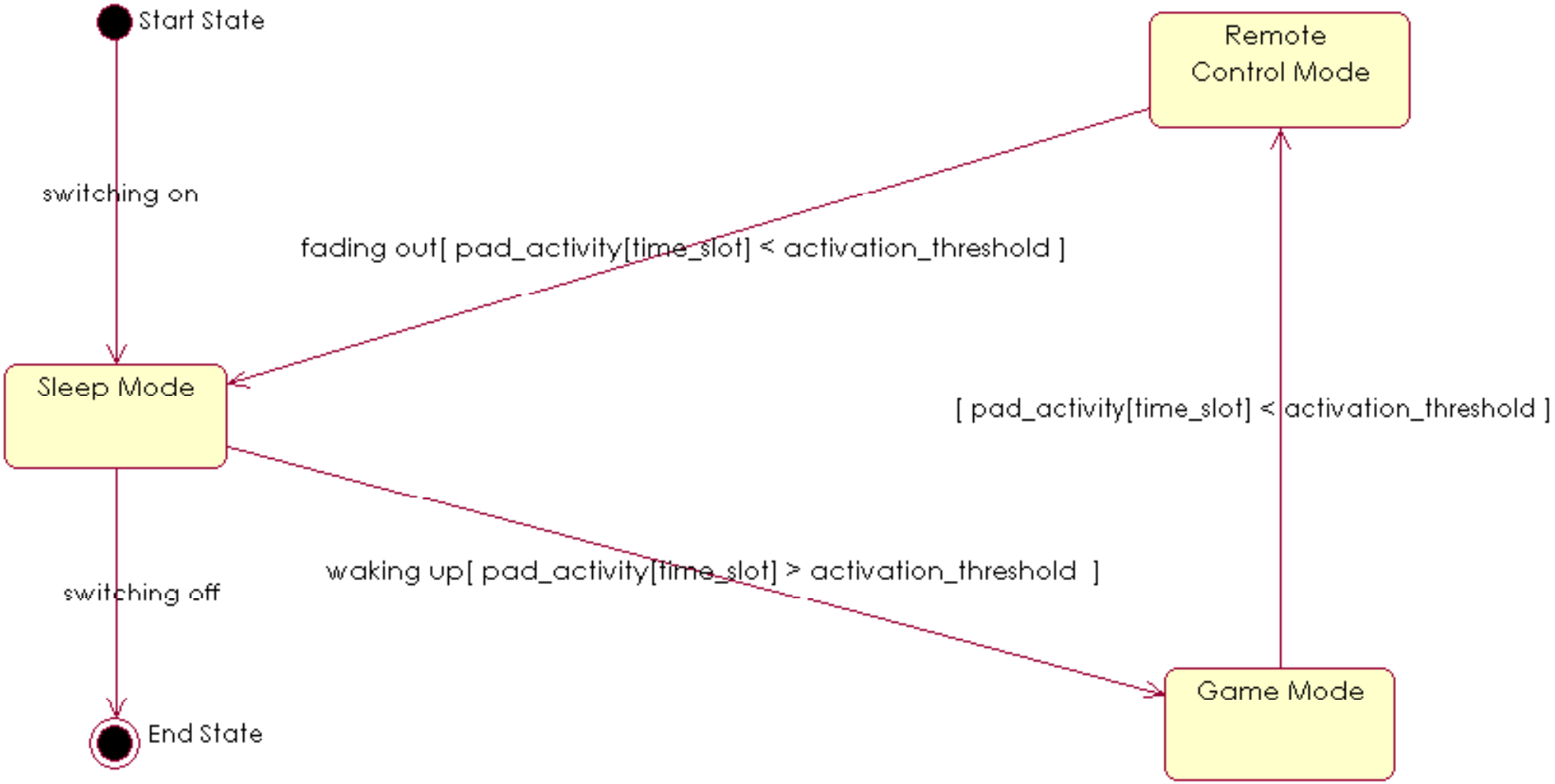
Actions

set of rules and context scripts:

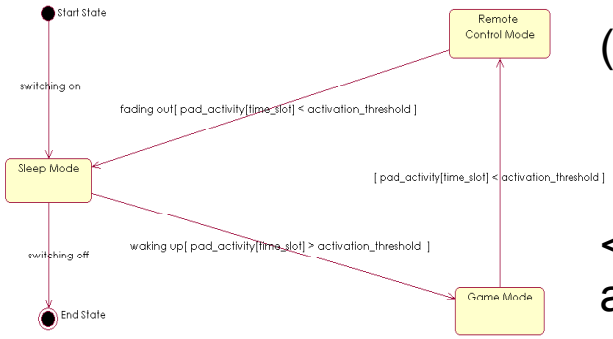
Rule:
<proposition> ::= if <input-statement> then <output-statement> else <output-statement>

Statement:
<input-fact> ::= <corner-touch>
<output-fact> ::= <animate-icon-7>

Pillows Implementation – Adaptation module



Pillows Implementation – Adaptation module



Precondition	Result
<sleep-state>	<purr> every 30s <show-asleep> every 30s <amico-sleep-mode>
<sleep-state> and (session – userid - pillowid)	<transition-buzz> <show-loading> <amico-waking-up-mode>
<clockwise-movement> and length > n	<amico-play-movie-next> <show-next>
<c2-touch>	<amico-fullscreen> <show-fullscreen>
<remote-control-state> and <number-of-events> > 0 and (standard_deviation < threshhold) for > 30s <showunloading>	<amico-fading-out-mode> <transition-buzz>
<remote-control-state> for > 30s	<sleep-state>

Context – Summary

- The access of information depends on the personal, spatial and temporal context in which a user is situated.
- Context requires the synchronisation of several models (e.g. user, presentation, knowledge, location, etc).
- Modelling context requires a clear understanding of the tasks performed by the user, as it is them that determine the detail required in the content description of the media items => one approach towards restricting descriptions (reduce complexity).
- Keeping track of events in time is essential to allow a system to adapt to the user through learning (history model).

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