

The use of ontologies for communication purposes in urban environmental information engineering

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(Reporting on the results of a STSM)

Objectives: work and prepare a report on

The use of ontologies for communication purposes

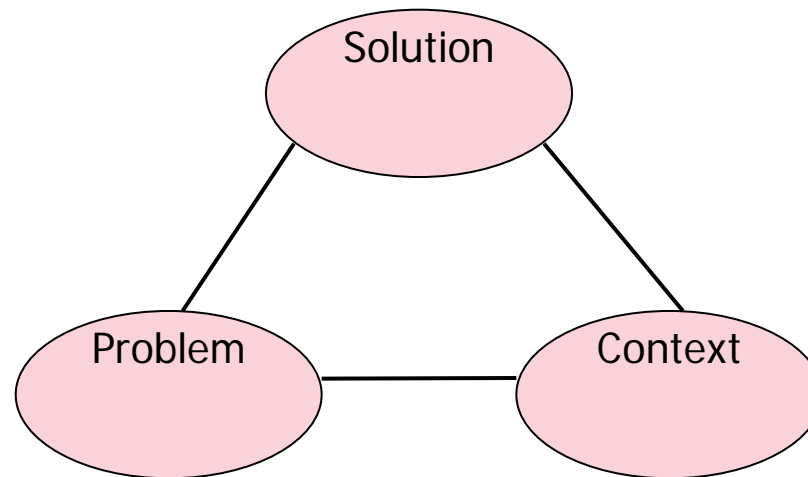
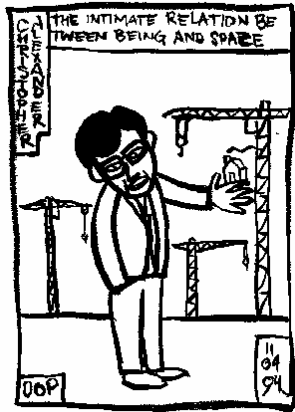
- ❑ Analyse the way that environmental information (air quality in particular) is related to urban structures
- ❑ Investigate the spatial and temporal urban dimensions of the perception and interpretation of environmental pressures from the citizens point of view
- ❑ Suggest presentation and communicating methods of environmental information (air quality example) to optimise its use and effectiveness towards quality of life
 - This will be materialised with the aid of a participation exercise-workshop. MSc and PhD students will be asked to join and suggest ideas for communicating single or few words concepts (associated with the status/quality of the urban environment) with the aid of drawings and other graphical-multimedia methods and tools.





Design patterns

What is a design pattern?



A **Solution** to a **Problem** in a **Context**

Alexander defines a pattern as follows:

".... Each pattern describes a **problem** which **occurs over and over** again **in our environment**, and then describes the core of the **solution** to that problem, in such a way that you can **use this solution a million times over**, without ever doing it the same way twice"

[Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel, S. (1977). A Pattern Language. Oxford University Press, New York.]

Patterns Can ...

- ❑ Capture expert design practice within specific context
- ❑ Provide common nomenclature for designers
- ❑ Provide “shorthand” for effectively communicating complex principles
- ❑ Help documentation and justification of the rationale
- ❑ Capture the most important aspects of a problem solution in a standard format with a formalism
- ❑ Show multiple examples of solutions
- ❑ Become a tool for collaboration among peers who are interested in designing activities

The collaboration exercise

- **Goal: To design of a web portal for providing environmental information (AQ) to citizens (which info are of interest, home town experience, basic information portal design and usability aspects)**
 - Investigate agreements and disagreements of concepts
 - Mockups of presentation methods and services (on paper plus electronically if possible)
 - Brainstorming for future electronic env. information services, to capture the shifting between location related information to location based information service

This is usually a 4 phase project

1. Specifications:

- ❑ Application purpose definition
- ❑ Users identification
- ❑ User requirement/needs identification
- ❑ Main services/modules/functionalities /content
- ❑ **Mock up is used**
- ❑ Interface structure
- ❑ Functionality specifications
- ❑ Technical specifications
- ❑ Design specifications

2. Construction

- ❑ Databases
- ❑ Dataflow - exchange
- ❑ Functionalities
- ❑ Templates/pages

3. Content population

- ❑ Data
- ❑ Text
- ❑ Graphics/pictures

4. User testing

- ❑ Simple user testing
- ❑ Usability lab testing

Basic issues

- Some of the issues to be addressed:
 - Content
 - Communication mode (pull-push)
 - Communication strategy
 - Ease of use for members of the general public
 - Basic concept for layout, visual design and interaction design

Steps to be followed

1. Application purpose definition

- Why, What, How, When, etc
- Search for similar sites on the web
- "Hometown" experience



Guiding Assumptions

- ❑ The average citizen wants specific information tailored to his or her immediate, everyday concerns
- ❑ The average citizen is not a scientist, nor an environmental campaigner
- ❑ The average citizen does not understand the air quality science, nor does s/he necessarily want to
- ❑ Simplification of the science-based information equals neither banalisation nor invalidation
- ❑ No simplification equals no communication
- ❑ Everyday utility is more relevant than scientific detail

Steps to be followed

1. Application purpose definition

- Why : legislation!
- What: Air pollution plus meteo (temperature, rel. Humidity, UV, etc)
- How: text and graphs
- When: continuously





The workshop results

Users

2. Identify user “personas”



- Who is Mrs/Mr X?
 - Age: 10 – old age
 - Family: married with children
 - Job: various, medium and up financial status
- Knowledge about air quality
 - Dont know, not need to know, not aware of problems
- Knowledge about Internet/ICT
 - some
- Other aspects:
 - Respiratory problems, turists, sport activities.

Requirements

3. User requirement/needs identification



- Everyday life
- Planning whether to commute by bicycle
- Investigating a local ozone episode
- Relative's child diagnosed with pollution-induced asthma
- Investigating politician's claims for local regulation and air quality
- Planning a holiday abroad
- Planning cross-border relocation

Communication mode

4. Main services/modules/functionalities/content



- Pull/push: both!
- Which media
 - Portal with text, graphs, maps of ultimate importance
 - In favour of SMS warnings
 - Links to related info of interest
- On-line, real time, near real time, forecasting: yes to all, in relation to availability and political decisions
- Verbal info, graphics, multimedia? Maps with coloured points, and with interpolation results
- Georeferencing? Yes if possible





STSM : first results

Urban life and ontologies

- An ontology is a formal, explicit, and *equally communicative concerning its content*, specification of a conceptualisation
 - Urban life may be envisaged via the human centric principle concerning the relationship of the being with the world surrounding it, as stated in Plato's *Kritias* in the section on the *cave metaphor*

AQ and urban structures (1/3)

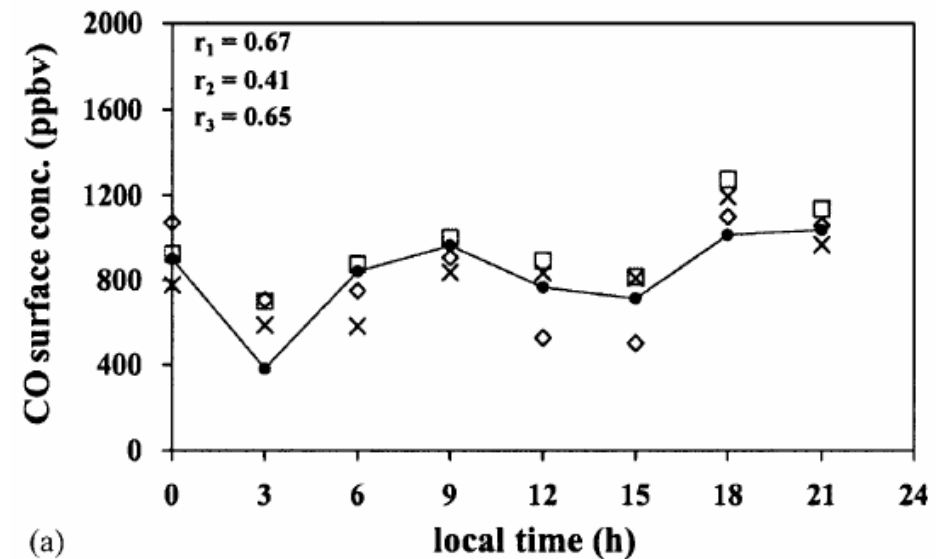
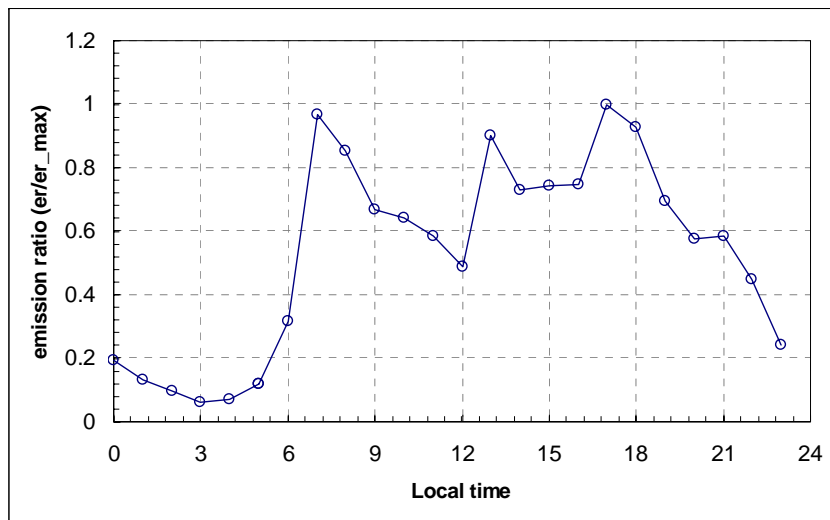
- “The urban surface is a continuous screen, or a series of overlapping screens, onto which representations are projected” (Dewdney, 1998)
- Perceived residential quality was found to depend on physical neighbourhood attributes, such as noise and air pollution, on psychosocial characteristics, like safety or crowding, and on the availability and quality of neighbourhood facilities (Van Poll, 1997)
- Increased people’s feeling for access to services, facilities and amenities, play an important role in the perception of quality of life (Sénécal, 2002)
 - ↪ urban air quality management and information systems may support decision makers towards environmental management for a sustainable society, and may also “trigger” the creation of new, user-friendly, **human-centric environmental information services that advance the improvement of the general quality of life in the city** (Karatzas, 2003)

AQ and urban structures (2/3)

- Urban structure typology plays an important role in the way that people perceive the quality of the environment they live in.
- One basic typology is the distinction between **inside and outside spaces**, the **public versus the private** and the **physical relationship** between those spaces. One of the typological elements that we identified was that of a **threshold or a buffer zone (doorways, entrances, etc)**. This element is directly related to the way that people communicate with their environment and with each other, and its existence was identified **to prepare the individual towards entering the proper communication mode and physical interaction mode**.
 - ↳ As a consequence of that, such buffer zones act as “smootheners” of environmental information towards the individual. This finding also led us to suggest that **open spaces (parks, squares, open markets, etc) are actually an ensemble of communication functions that are clustered together on the basis of their resemblance and scope** (marketing goods, communicating with people of similar interests, exchange of information concerning social matters, take part in major social events, etc)
 - ↳ **The spatial dimension is of high importance in relation to perceived environmental pressures**

AQ and urban structures (3/3)

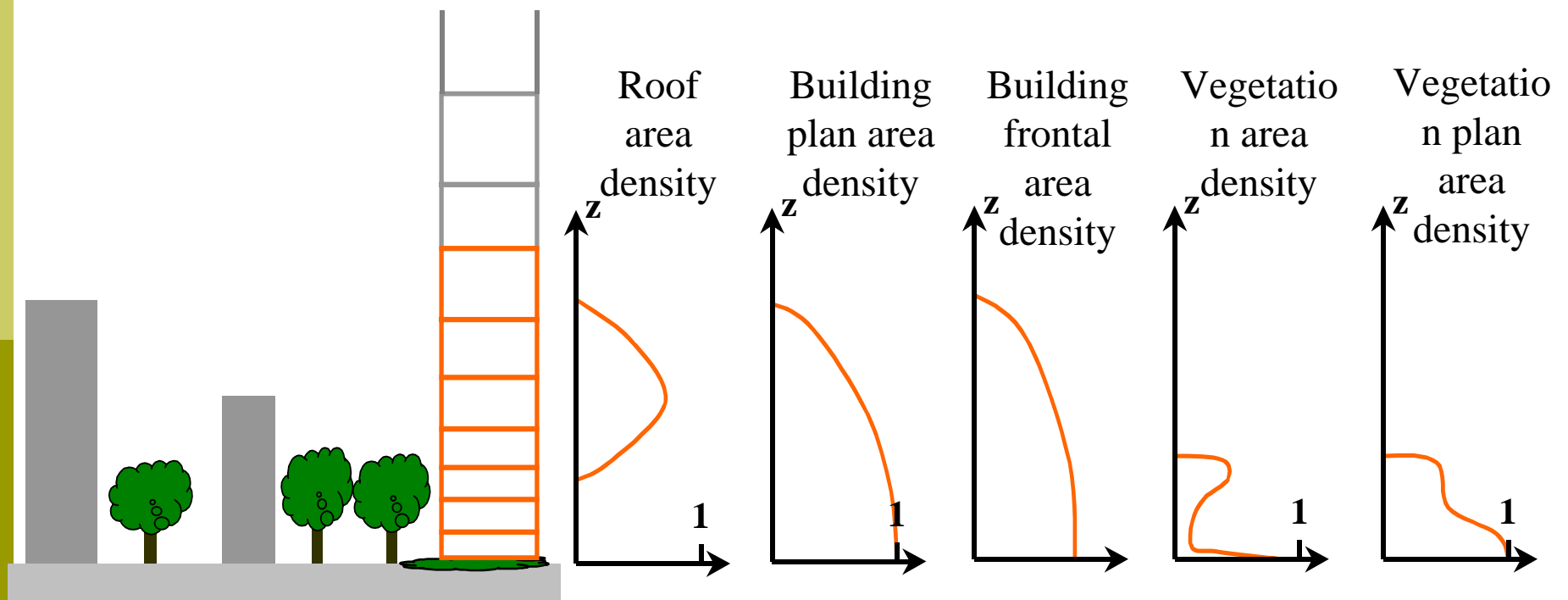
- Land use types are related with expectations concerning environmental pressures
- Urban operational profiles are linked with env. pressures



- Temporal scale is related to human activity and plays an important role in AQ perception

Urban morphology

The knowledge of the vertical and horizontal distribution of the different surface types is necessary.



Related human perception

- Regardless of the lack of knowledge and the quantitative assessment of the impacts, **people realized early enough that bad AQ may affect them and their surroundings!**
- Thus, the **decline on the quality of the environment** as a result of increasing pressures than man had begun to place on his surroundings **was expressed via literature** (among others)

John Gay (1685-1732): Trivia; or, the Art of Walking the Streets of London

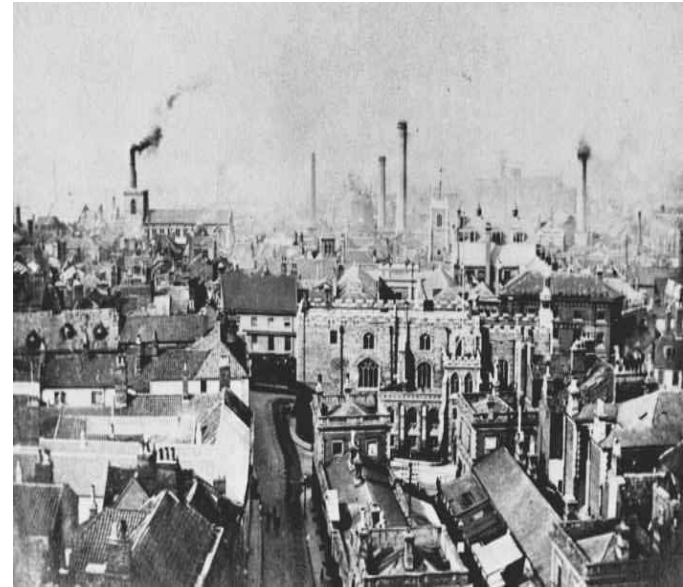
The dust-man's cart offends thy clothes and eyes,

When through the street a cloud of ashes flies;

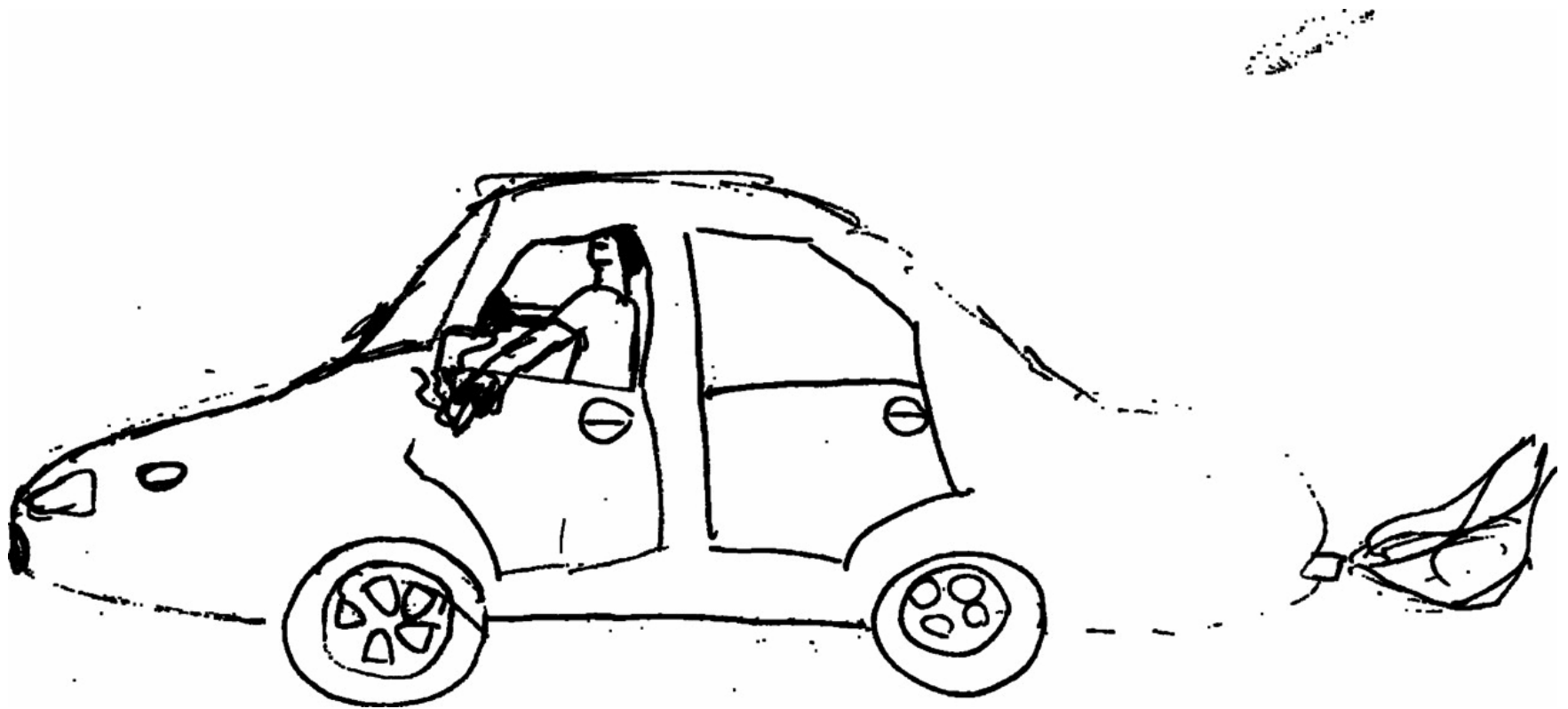
Related human perception

Yet a smoking chimney and a smoking car exhaust were the symbols of some of the enthusiasts of the industrial era

- *Sydney Morning Herald*, 1 May 1930, p.6 : A caricature of a little boy offers Australians a bright, secure, and productive future, holding the symbols of productivity: a **smokestack** and a **plume** of **smoke!** (Robert Crawford, 'A Slow Coming of Age: Advertising and the Little Boy from Manly in the Twentieth Century', *Journal of Australian Studies*, no. 67, 2001, pp. 126–143)



A child's view of a car driver...



AQ perception

- ❑ an important parameter on human perception of air pollution is the role of sensate factors as primary predictors of concern (Elliott et. al., 1999)
- ❑ Awareness of air pollution is scientifically correlated with actual measurements; there is a distance decay of concern spreading onward from urban centres towards rural areas. Geographic locations are linked with forming perceptions (Brody et. al 2004)
- ❑ When it comes to the sociological dimension of the problem, Rydin (1998) notes that the language of air quality policy has traditionally not been placed in the context of moral responsibility to reduce harm to others, but in the context of individual responsibility for self-protection.
- ❑ **Negative perceptions are shaped by proximity to industry, measurements, and personal experiences.**

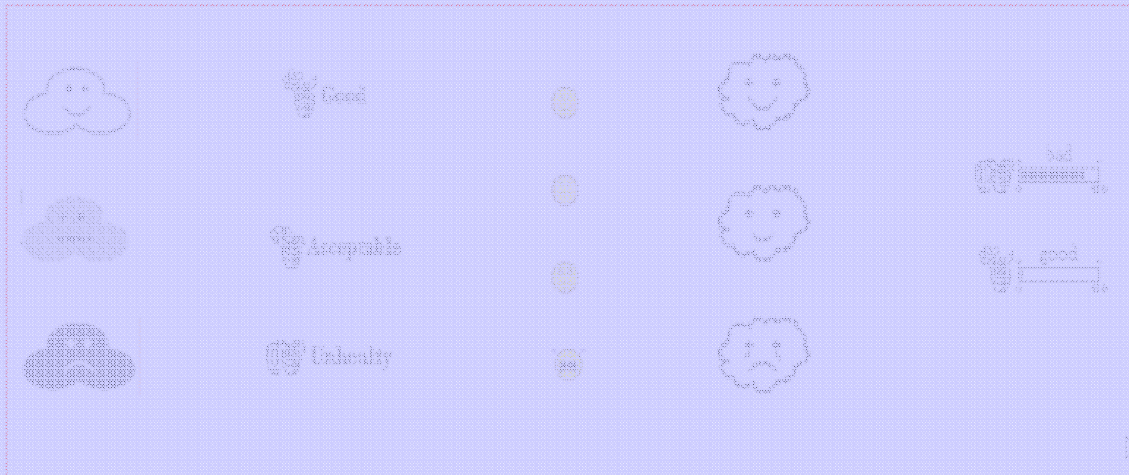
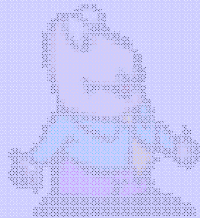
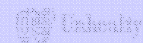
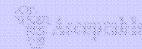
Communicating AQ information

SO₂,
NO_x,
PM₁₀



Exceeds
limit

values...



Examples: J2ME application for discomfort index



❑ Low



❑ Medium



❑ Medium-high



❑ High



❑ Very high



On symbols and AQ communication

As a community uses signs in communication, this distribution tends to change in the direction of exploiting the increasingly shared (background) knowledge of the community about the use of the signs; and hence signs become more symbolic (cf. Garrod et al., in press). This process can be exploited to create new “languages” (perhaps graphical languages, animated languages, sonic languages, etc.) that offer us new opportunities to communicate effectively and with acceptance (or “buy in”) from appropriate user groups. The ways in which these languages can emerge depend in complex ways on the nature of the devices combined with the interests, abilities and perceptions of the users. A typical example of such a development is the now familiar “text language” that has emerged among the younger generation of users of SMS messaging, which is of course restricted to the only visual messaging modality available on early mobile phones.

Ontologies for urban env. communication

Different groups within the wider community will develop their **own conceptualisations of phenomena**, based on their **perceptions**, which may differ markedly, and also on their inevitably divergent group communication histories. Therefore, there will be differences when it comes to considering **formal characterisations of these conceptualisations**, which is to say that we will need **different ontologies**. To some extent, **ontologies can be expected to characterise groups**. In the **buffer zones**, we will observe **ontological shifts**.

Ontologies for urban env. communication

- Work still in progress



Resulting publications

- ❑ S. Retalis and K. D. Karatzas (2007), Design patterns for air quality information portals, to be presented at ISESS2007 (<http://www.isess.org>)
- ❑ S. Trausan-Matu, K. Karatzas and C. Chiru (2007), Environmental information perception, analysis and communication with the aid of natural language processing, to be presented at <http://www.enviroinfo2007.org>
- ❑ Claudine, Metral, Gilles Falquet and Kostas Karatzas (2007), Ontologies for interconnecting models in sustainable urban planning, under preparation (abstract submitted for the Torino Towntology Workshop)
- ❑ Karatzas K. and Lee J. (2007), The use of ontologies for communication purposes in urban environmental information engineering (under preparation)