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User based indoor climate control based on agent technology in the Flexergy project

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The focus of this presentation is on:

User based *indoor climate control based on agent technology*

in the Flexergy project
Background

Either Global warming or not, it is necessary to look for new possibilities to save energy and to generate sustainable energy for comfort in the built environment.

A major portion of primary energy consumption, about 40%, is due to create thermal comfort in buildings by heating, cooling, ventilating, and lighting.

The goal of the Flexergy project is to create practical solutions for a new generation of control technology in which the end-user behavior is integrated to reduce energy consumption and increase at the same hand.

By applying Agent Technology it is possible to integrate user behavior into the indoor climate control system and to improve energy efficiency of buildings.
Our focus is on office Buildings

Comfort level ↔ Use of Energy

Increased comfort level
- well being
- effect on productivity

Environmental effects
- global warming
- local energy sources

Goal: comfortable indoor environment,
with minimum use of Energy resources
Main objectives of the Flexergy project

Caring Buildings
- Individual comfort control

FLEXible enERGY infrastructure
- Optimal use of local energy generation
  - Local storage
  - Controllable load
  - Purchasing energy on market
A control system is developed with technology based on agent mediated communication over local networks and the Internet.

These agents are capable of searching and sorting information from the Internet (e.g. weather forecast, availability of energy and price level of energy) in order to perform certain tasks for this the user they represent.

Multi-agent systems provide the essential technology for this ICT-infrastructure:
- large numbers of actors are able to interact, in competition or in cooperation;
- local agents focus a local interests and negotiate with more global agents;
- communication between actors is minimized to generic information to generic information exchange between agents.
Field case: User control by voting  

Office Building (Kropman)

Workspaces
Central HVAC-unit
Climate control on each floor
User control “Voting”
Open building concept: separation of construction and infill

Habraken and Bax
The IFD concept
Integral Design
Functional Hierarchical decomposition of the built environment

Design process:
Different levels of Functional abstraction
Different users = different needs

Individuel adjustment

Different demands: heating, ventilation, light, electricity
Human aspects: - temperature; light; air

Thermal demand person(s)

Light Demand

Supply → Distribution → Generation light

Ventilation Demand

Supply → Distribution → Transport air
## Abstraction levels:
- Built environment
- Building
- Floor
- Room
- Workplace
- Human

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<thead>
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<th>Aspects:</th>
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<tbody>
<tr>
<td>Generation</td>
<td>Cooling</td>
</tr>
<tr>
<td>Distribution</td>
<td>Heating</td>
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<tr>
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<td>Electricity</td>
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<td>Light</td>
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