

# Human Ambience

integrating human knowledge in  
ubiquitous computing environments

Michel Klein  
and Tibor Bosse, Mark Hoogendoorn  
Jan Treur et. al.

February 26, 2010



# About us

- Department of Artificial Intelligence
  - move focus towards applying AI technology for supporting human functioning
- Diverse applications
  - many abstract / theoretical
  - not specifically security domain



# Contents

- What is human ambience
- Example projects
  - attention support
  - depression therapy
  - emergency scenario
  - medicine intake monitoring
- Discussion



# Contents

- What is human ambience
- Example projects
  - attention support
  - depression therapy
  - emergency scenario
  - medicine intake monitoring
- Discussion



# What is Human Ambience?

- Ambient Intelligence with human-like understanding and personal care
- How?
  - supportive environments need to “understand” human needs at a specific moment
  - understanding requires:
    - assessment of invisible states
    - knowledge about effect of support measures

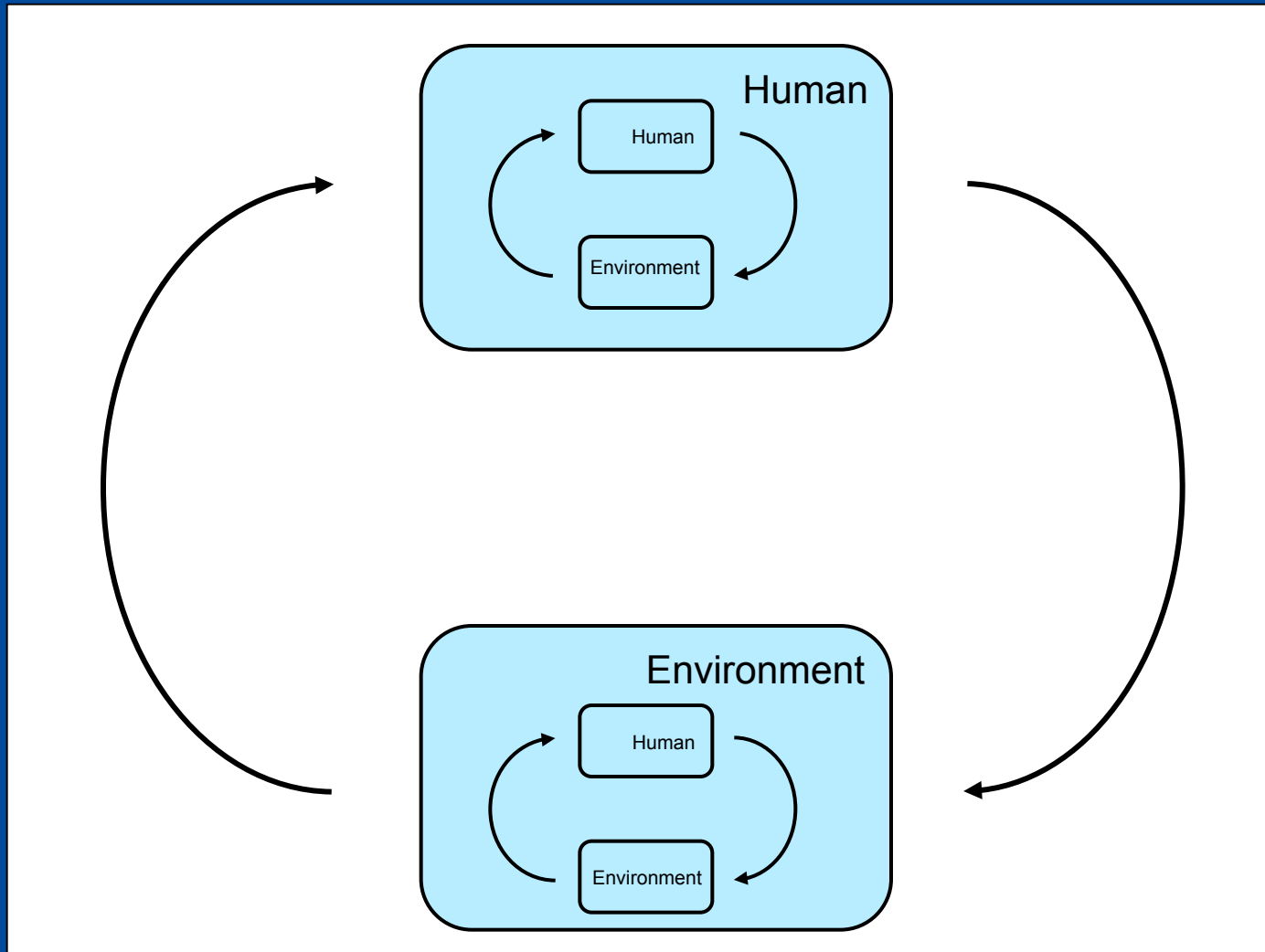


# More formal description

- Jan Treur. *On Human Aspects in Ambient Intelligence*, M. Muhlhauser et al (eds), Constructing Ambient Intelligence, CCIS 11, 2008.
- Multidisciplinary approach
  - human-directed sciences (medical, psychology, sociology)
  - artificial intelligence (agent and knowledge modeling and simulation)
  - computer science (distributed systems, sensor systems)
- Reflective coupled human – environment systems
  - humans and environments reflect over their states and interaction



# Reflective Coupled Human – Environment Systems



# Human Ambience

- Narrow:
  - applying computational models about human functioning to create supportive environments
- Wide:
  - using knowledge about human functioning to create intelligent environments



# Related areas

- Ambient Intelligence
- Ubiquitous / pervasive computing
- Human Computer Interaction
- Cognitive Modeling
- Behavioral informatics
- Persuasive computing
- Affective computing
- Augmented cognition



# HA in practice

## 1. Use (often informal) models about human processes from other domains

- psychology                      emotion generation  
   depression theories
- neuro-psychology
- sociology                      leadership
- criminology                      hotspot-theory
- physiology                      exhaustion, critical point



# HA in practice

2. Formalize informal models into computational models
  - often via temporal relations
3. Use observations / sensors as input for models
  - or assumptions about possible inputs...
4. Use model to reason about required support
  - values of “hidden” states
  - predictions if no support is given
  - effect of different measures



# Computational modeling

- Main concepts of a process are identified
- Main influences between concepts are identified
  - e.g. A affects B
- Concepts become variables with a logical (true/false) or numerical value (0...1)
- Relations between concepts are defined as mathematical formulas
  - Between current value or value in a previous time step



# Contents

- What is human ambience
- Example projects
  - attention support
  - **depression therapy**
  - emergency scenario
  - medicine intake monitoring
- Discussion

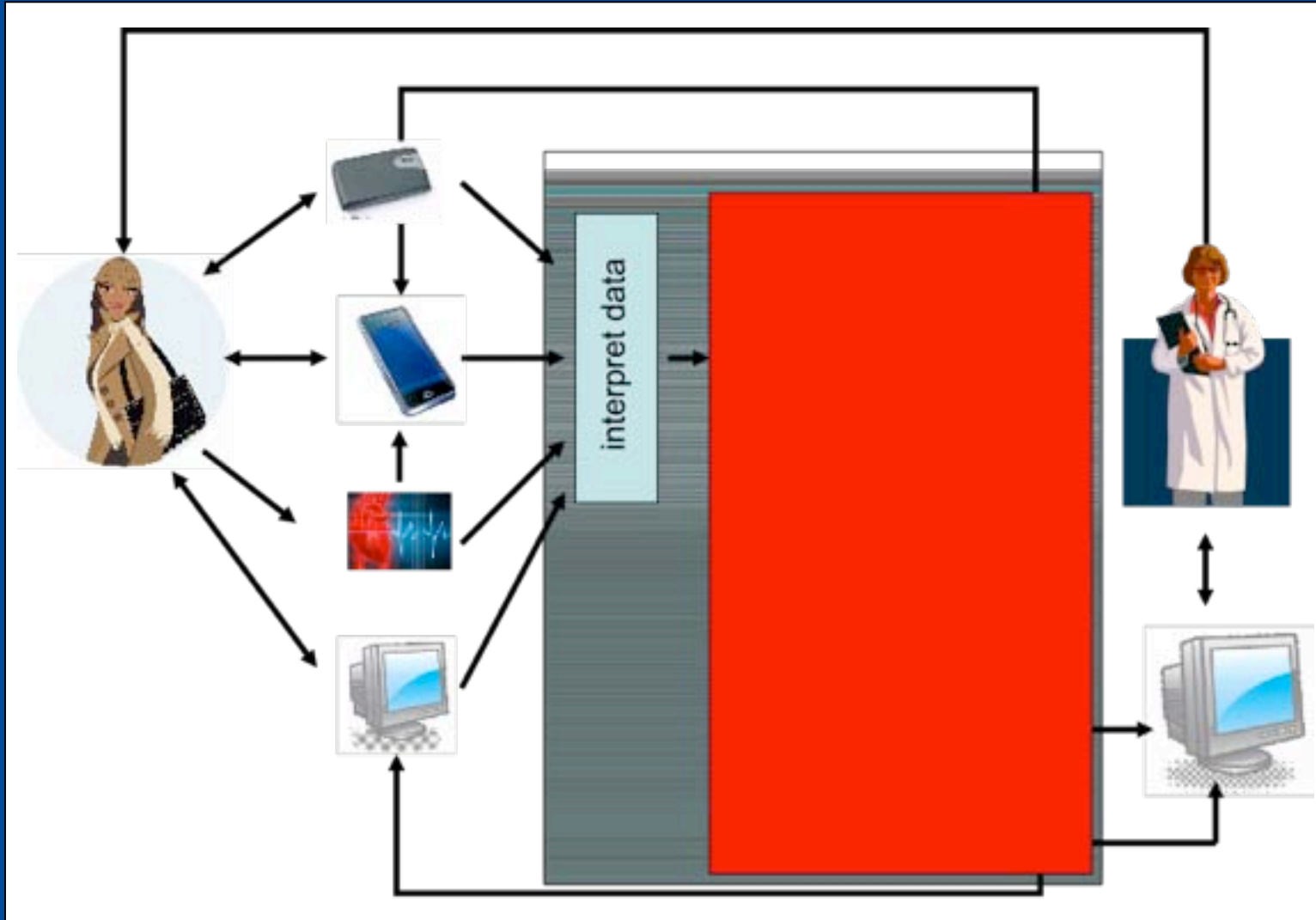


- Depression is a major issue:
  - 8-17% at least once before 40
  - 121 million people currently
- Many interventions, activity scheduling via internet very helpful
- EU FP7 project: ICT4depression
  - more intelligent support using sensor information
  - assess state of patient and give advise



# Project overview

depression therapy



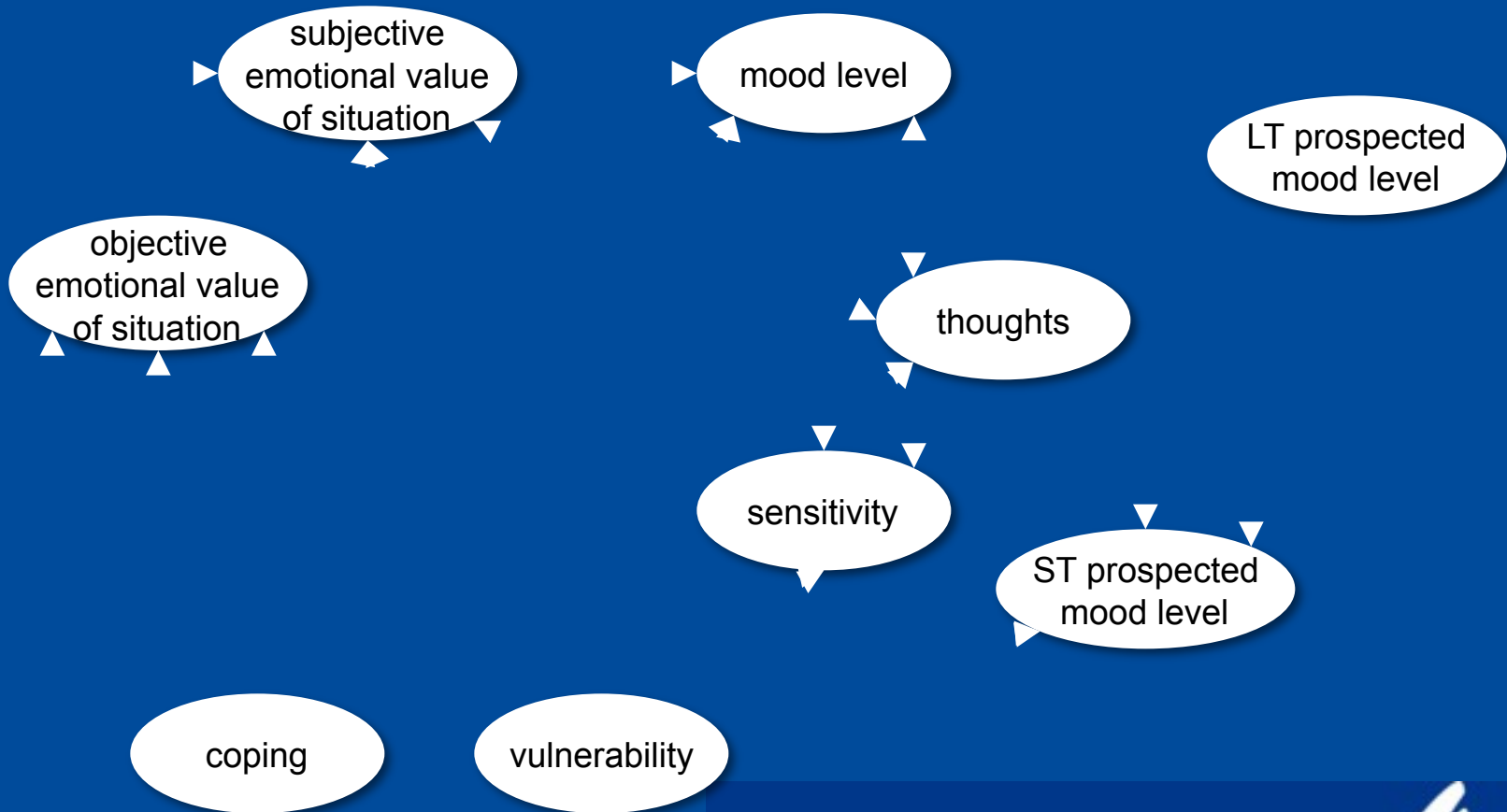
- Developing treatment modules suitable for ICT support
- Development of technology to measure therapy progress:
  - Non-intrusive physiological sensors
    - heart rate, galvanic skin response
  - Mobile phone (with sensors)
    - GPS, sounds
  - Medicine intake monitoring
  - Mood rating via mobile phone
- Development of techniques to reason about progress and give feedback



- Activity monitoring
  - are they with other people?
  - did they go out?
  - are they physically active?
- Mood change detection (experimental)
  - hearth rate variability
  - galvanic skin response

# Dynamic model

depression therapy



# First developed intervention depression therapy

- Activity scheduling: doing more pleasant activities increases mood
- phase 1:
  - write down pleasant activities and rate mood level
  - observe the correlation
- phase 2:
  - schedule pleasant activities and rate mood level
  - learn the correlation



# Communication patient

depression therapy

<i>website</i>	<i>mobile phone</i>
background information lessons homework: fill agenda with activities activity list reward list plan for future weekly feedback	view agenda rate mood and activities motivational remarks receive reminders for activities rating mood rating activities



# Mobile phone application

depression therapy

- Works on Java-enabled phones
  - 25 Sony Ericsson M600i
- Reminders and messages are given according to specific rules
- Motivational messages formulated with help of psychologists



# Photo's

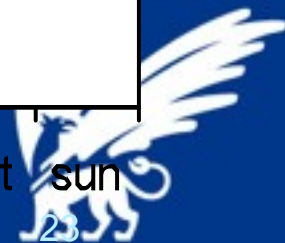
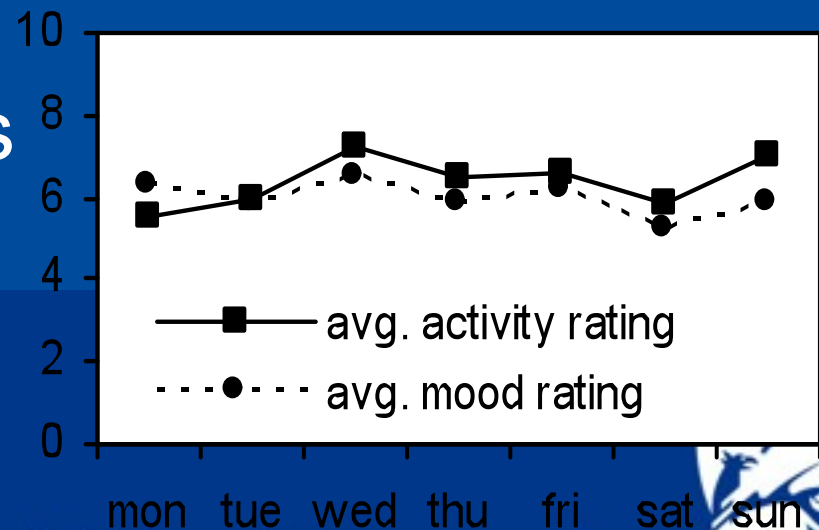
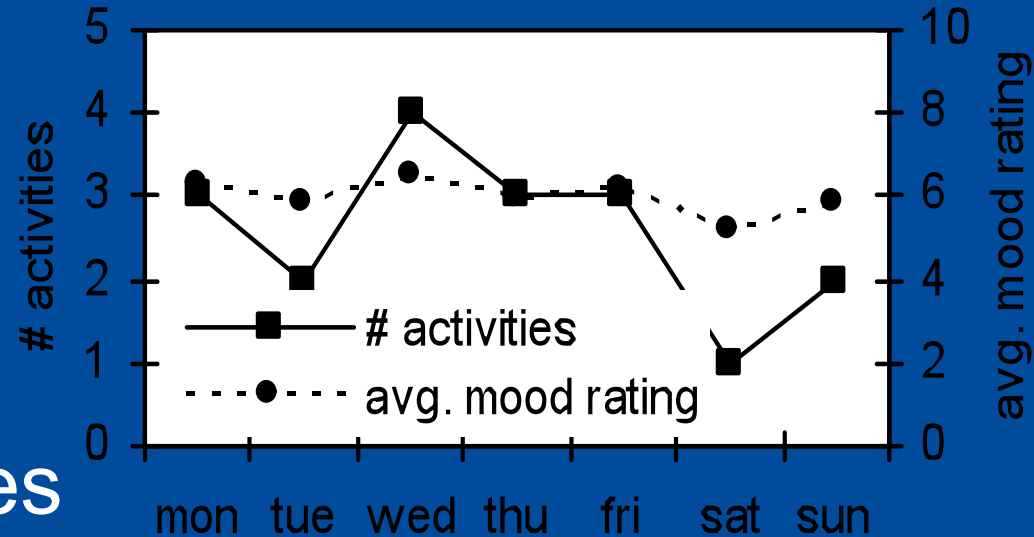
depression therapy



# Weekly feedback

depression therapy

- Graph mood – #activities
- Average mood
- Number of activities
- Graph rating mood – activities
- Goal



# Contents

- What is human ambience
- Example projects
  - attention support
  - depression therapy
  - emergency scenario
  - medicine intake monitoring
- Discussion



# Discussion

- Ethical aspects of human ambience applications
  - looking “through” people
    - discovering of hidden emotional / cognitive states
  - omnipresent data traces

