

Emotion Bike

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Holistic UI

High-level Goals

Individual Preferences and Abilities

Context-based Interaction

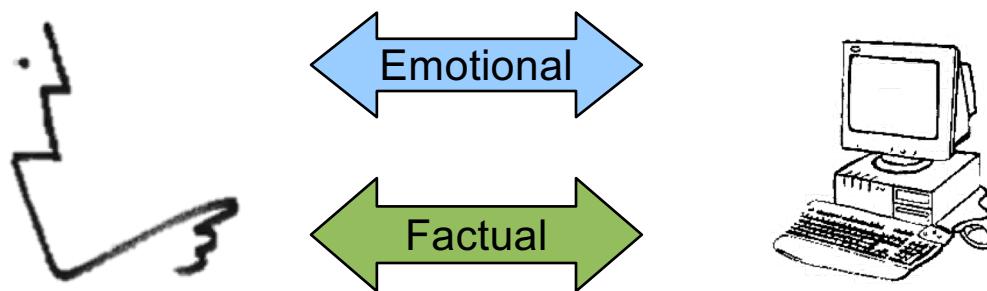
Concrete Goals

Multimodal Communication and Interface

Human-Human Communication inspired Interfaces (nonverbal/verbal)

Individual and Immersive Experiences

Physical, Emotional and Cognitive Body Model



Holistic Interfaces Approach

Cognitive Science-based Human Models

- Personal Preferences
- Individual provoked Responses/Reactions
- Personal Mood and Influence
- Stress, Motivation, Excitement, Trust, Tolerance
- Facial Expression
- Physical Effort and Ability (Dexterity, Strength)
- Cognitive Load and Ability
- Sense of Beauty, Attraction
- Humor, Horror, Phobia
- Learning from User Actions



**greater intimacy
better control**

Applications

Health Devices (e.g. Fitness Trainer, Quantified Self)

Entertainment, Serious Gaming

Personal Assisted Living

Mobility Interfaces (Driver Assistance)

Collaborative Work, Emergency System

Machine and System Control, Manufacturing

Why now? Emerging Technology

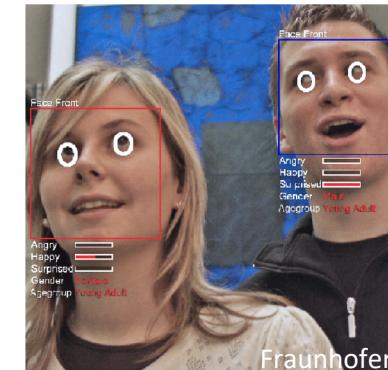
Better Sensors/Computing

- New Image sensors: TOF; Lidar, Depth-field, Thermal
- Ubiquitous and Powerful computing (GPU, Cloud-based)

Better Models

- Emotions from speech prosody, body posture, Facial expression
- Many exciting AI Tools Algorithms for Image Processing, Fusion,

Smart Environments and mobile



Example: Driver Assistance

Outside Monitoring Driver Monitoring

- Stanford University 2009
 - Automatic Fatigue Detection System
- U Darmstadt and Continental since 2012 (Proreta)
 - Road attention tracking

2019 : For New car EU to make speed limiters, driver monitors mandatory (drunk or distracted or drowsiness)



Application Scaling



Driving Assistance[1]



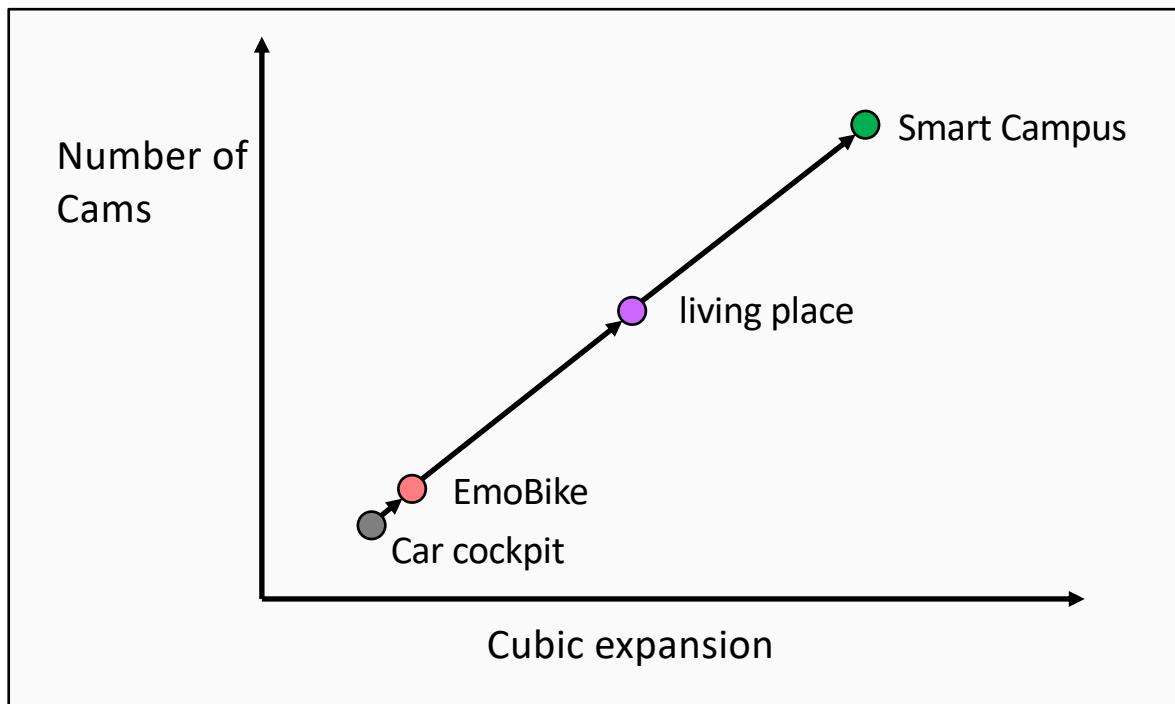
EmoBike exergame (HAW)



livingplace Hamburg (HAW)



Public Displays (HAW)



EmotionBike Scenario

Computer-controlled Fitness Bike

Physical Effort and Emotion Provocation are controlled

Natural Interface fulfills User Expectation

Visual and Physiological Sensors

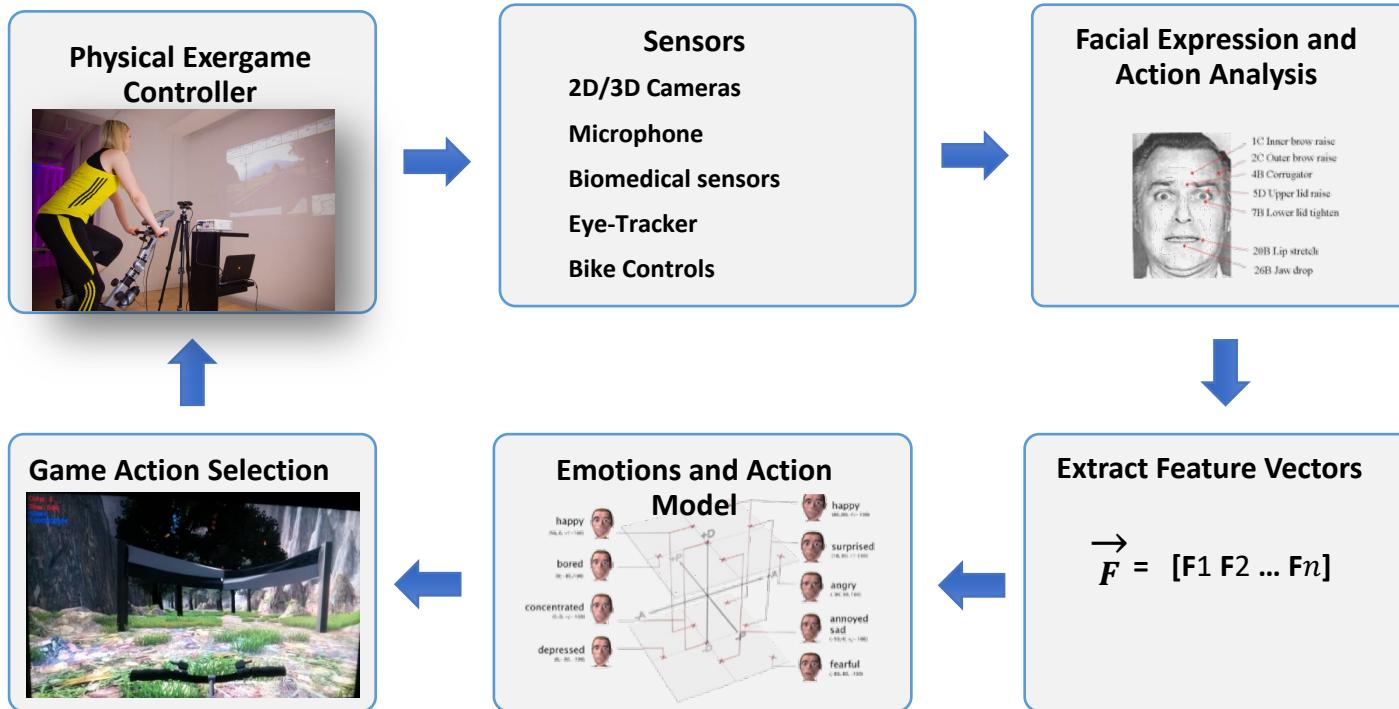
Constraint Subject Movement simplifies Sensing

Context-controlled in Game Simulation

Ground Truth from Databases and Experiments with Reference Content-Sets



EmotionBike Reference System Design



Lessons learned

- Affective Computing does not work out of the box
- What works: Provoke Emotion Responses by design
- Add Context: Attention, Stress, Frustration
to build better Applications
- Active Application Domain for AI

Thanks you! Time for Question

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