Human Computer Interaction

User Modeling in HCI

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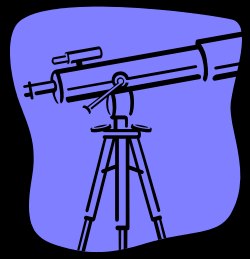
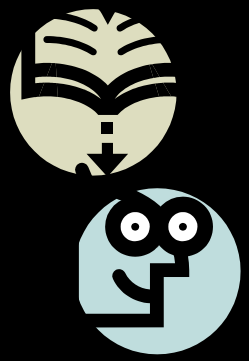
Model

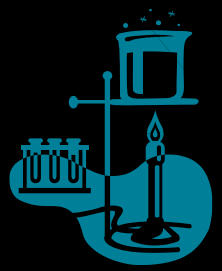


Theory

MODEL

Observations





Outline

- Types of Models
- HCI Models
  - Introduction
  - Variations
  - Characteristics
- Open Questions

Types of Models

- Exploratory
  - Observation -> Model
- Predictive
  - Model->Prediction

User Model

Modelling Human

- Fitts' Law, Hick's Law, Marr's model of Vision
- Command Language Grammar @ Xerox Parc
- Model Human Processor

HCI Models

- GOMS
- Formal Grammar
- Cognitive Architectures
- Mixed approaches
- Application specific models

GOMS

- Goal
  - Open a folder
- Operator
  - Move mouse
  - Click mouse
  - Press <enter>
- Method
  - Double click on the icon
  - Select the icon and press <enter>
  - Right click on the icon, select <open> from the pop-up menu
- Selection

Variations

- CMN-GOMS
  - The original GOMS

- KLM: the simplest one, no method, only 6 operators
    - Pressing a key
    - Moving the pointing device to a specific location
    - Making pointer drag movements
    - Performing mental preparation
    - Moving hands to appropriate locations, and
    - Waiting for the computer to execute a command.

- CPM-GOMS
  - Exploit parallelism in working

- NGOMSL, GLEAN…

Characteristics

- Serial processing (initially)
- Extensively used in HCI
- Expert performance
- Errorless performance

Formal Grammars

- Modelling language
- Operations -> Terminal symbols
- Interaction -> Set of rules
- Knowledge -> Sentence

Variations

- Task Action Language (TAL)
  - Minimizing size of grammar
- Task Action Grammar (TAG)
  - Consistency
  - Simple tasks

Characteristics

- Model competence, not performance
- Can model knowledge and learning
- Difficult to define a unique set of *simple tasks*

Cognitive Architectures

- Introduced in 1972 Carnegie Symposium
- Unified theories of Cognition
- Virtual human

Variations

- SOAR
  - Rule based system
  - Impasse and Chunking
- ACT-R
  - Hybrid architecture
  - Spreading activation
- EPIC
  - Perceptual and Motor processing
- CORE
  - Constraint satisfaction problem

Characteristics

- Can model any performance (Theoretically)
- Extensively used to model psychological experiments
- Need detailed knowledge of psychology
- Yet to be used to model complex interactions
  - Parameter tuning

Mixed Approaches

Simplicity of GOMS

+

Details of Cognitive Architectures

Variations

- Programmable User Model (PUM)
- ACT-R Simple……

Characteristics

Lost

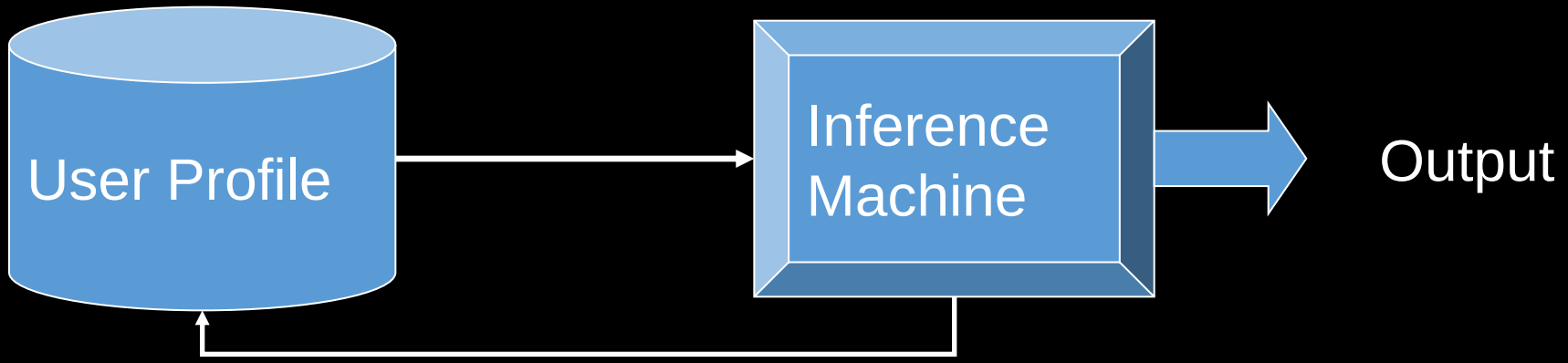
Simplicity of GOMS

+

Lost

Details of Cognitive Architectures

Application specific models



- Online recommender system
- eLearning system
- Web link prediction

ISO Standards

ISO-FDIS 9241-129

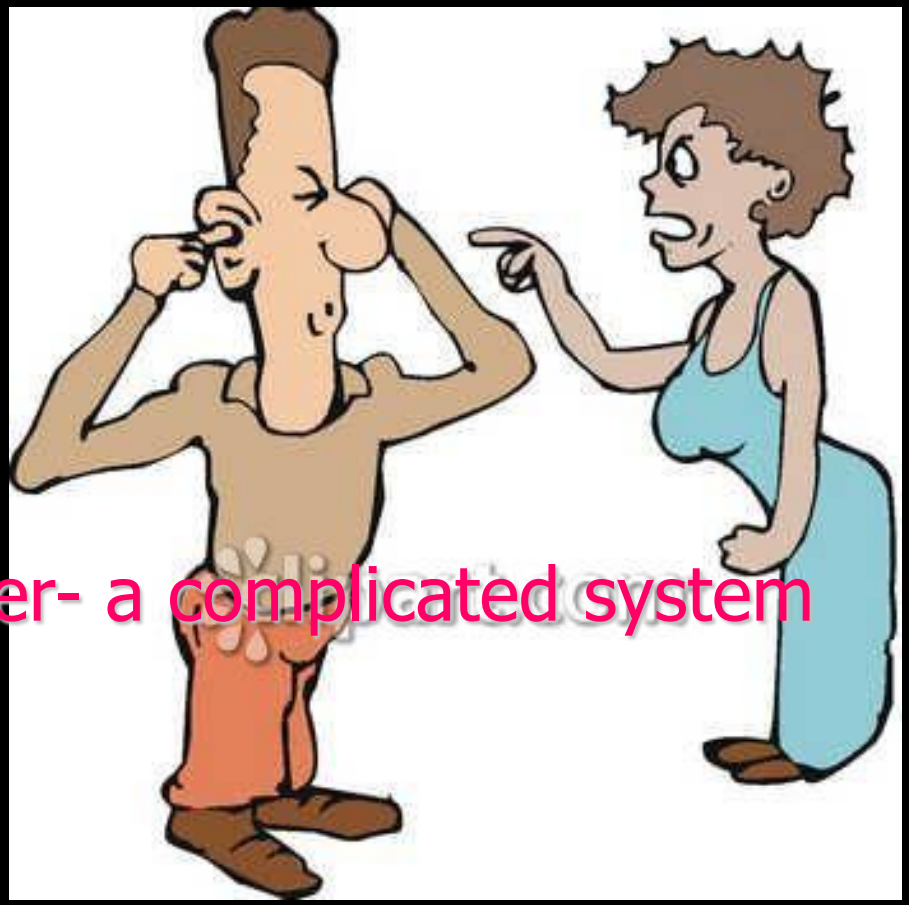
- Software Individualization
- Management of user profile
  - Consistency
  - Storage
  - Activation
  - And so on…

ISO_IEC_24756

- Common Access Profile
  - Type
  - Name
  - Qualifier (required/optional/excluded)
  - Description
  - Linkages

Existing problems

Existing problems



Existing problems

Existing problems

Existing problems

Open questions

- Optimum fidelity
  - Level of details
- What to model
  - Performance, Knowledge, Competence..
- When to model
  - User trial
  - More experiments…

Take away points

- Concept of user modelling
- Different kinds of user models
  - Their advantages and disadvantages
- Open research challenges in user modelling