User Modelling Issues

- User modelling research can be much more than just customize the interface to user's needs
- The field has resulted in significant amounts of theoretical work, as well as practical experience, in developing UM-based applications in traditional areas of human-computer interaction and tutoring systems
- further, it promises to have an enormous impact on recent developments in areas like information filtering, e-commerce, adaptive presentation techniques, and interface agents.
- Several issued may be raised about virtually any instance of user modelling research:
  1. Purposes of the User Model
  2. Content of the User Model
  3. Methods for exploiting the User Model
  4. Input data for User Model construction
  5. Methods for constructing the User Model
  6. Empirical Foundations

Purposes of the User Model

In what was is the system's adaptation to the User intended to be beneficial to the User?

- Help U to find information
  remind of previous visited Web pages, recommend web pages, select information of interest, adapt navigation style
- Tailor information presentation to U
  take into account working memory, tailor explanations to beliefs and goals, adapt document layout, choose appropriate diagrams
- Adapt the interface to U
  offer shortcuts, adapt interfaces on the basis of U's familiarity, tailored hypermedia that reflect past access, offer a suitable next move
- Choose suitable instructional exercises or interventions
  choose test exercises taking into account student's proficiencies, adapt help to user knowledge, give examples based on past experiences
- Support collaboration
  CSCW (computer supported cooperative work)

Content of the User Model

What sort of information about the User is represented?

- U's knowledge and beliefs
  factual beliefs on domain or system, proneness to and causes of errors, dialogue-relevant (mutual) beliefs
- U's preferences, interests, attitudes, goals
  preferences concerning possible solutions to a problem, attitudes towards the system/the domain, interests in a particular subject, cooperativity, sincerity, credulity
- U's proficiency
  mastery of tasks, level of expertise, problem solving ability, familiarity with situations
- U's non cognitive abilities
  visual perception abilities, motor abilities
- Personal characteristics
  location, job title, medical records, level of education, age, personality types
- History of the interaction with the system
  aspects of U's keyboard use, using WWW navigation history, history of dialogue acts, U's execution of a specific task

Methods for exploiting the User Model

According to what principles or inference techniques does the System decide how to adapt its behaviour on the basis of the information in the user model?

- decision-theoretic methods
  evaluation of possible solutions on the basis of U's preferences, models for predicting user's actions
- logic based techniques
  abduction, deduction, logic programming, modal logics
- probabilistic (Bayesian) methods
  probabilistic inference on the basis of past performances
- machine learning techniques
  agent modelling, neural networks
- specific qualitative rules and procedures (application specific)

Input data for User Model construction

On the basis of what types of evidence does the system construct its user model?

- explicitly stated preferences, goals, etc.
  critiques of proposed solutions, interests in particular topics dealt with by a text, high-level visualization preferences
- explicitly elicited information about personal characteristics
  job title, level of education, hobbies, etc.
- self-assessment
- specific actions of the user
  history of dialogue acts (e.g. hypermedia pages the user has visited) performance of a specific task, common misspelling and corrections, user choices within particular environments
- responses to test or practice items
  game-like ability tests, tutoring systems, training systems, observing students actions or utterances that imply possession of a particular belief at a given time

Methods for constructing the User Model

According to what principles or inference techniques does the System arrive at the hypotheses about the User which are stored in the user model?

- decision-theoretic methods
  various principled methods for eliciting and interpreting information
- logic based techniques
  inference techniques within a logic framework (e.g. modal logic, other non-monotonic logics etc.)
- probabilistic (Bayesian) methods
  computing probabilities that some information is known, probabilistic inference about unobservable aspects of a user properties, etc.
- machine learning techniques
  e.g. neural networks
- stereotype based techniques
  ascription of properties/interests associated with types of users
- specific qualitative rules and procedures (application specific)

Empirical Foundations

What sorts of empirical data give us reasons to believe that the System's methods are valid and useful?

- knowledge acquisition from domain experts
  judgments of experts, think-aloud methods to acquire knowledge etc.
- empirical studies conducted prior to system design
  study of human behaviour and how this is modified by internal (e.g. personality) or external (e.g. working environment) factors
- experiences with real use of the system
  usability tests
- informal responses by early users
  prototypes and usability tests
- empirical evaluation of the system
  comparative evaluations of two systems, simulating situations, etc.