UNIVERSITÉ
CÔTE D'AZUR
ACADEMY OF EXCELLENCE
NETWORKS, INFORMATION,
AND DIGITAL SOCIETY

Extensible model for describing User Profiles

Ankica Barišić (Ankica.Barisic@univ-cotedazur.fr)

Supervised by:
Marco Winckler (Marco.Winckler@univ-cotedazur.fr)
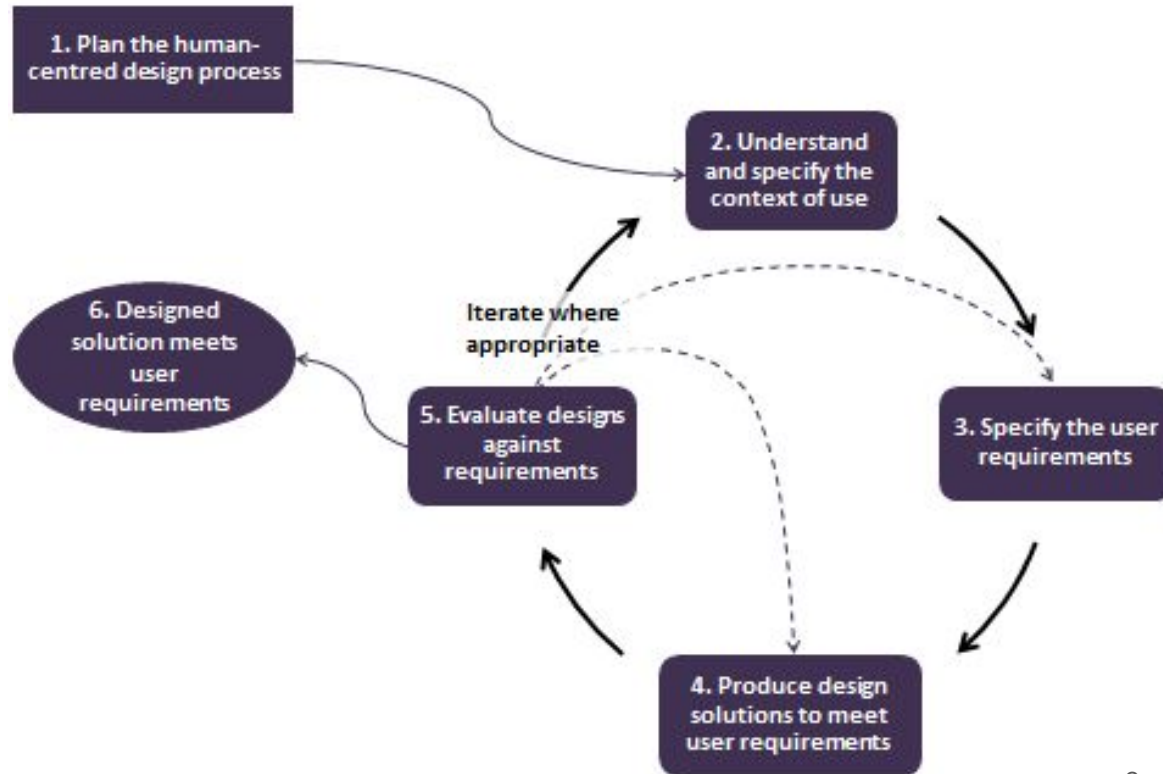
Overview

1. Why user profile matters?

2. Existing techniques

3. Problems

4. Research questions

5. Planning of activities

6. Preliminary findings (State of the Art)

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User Centered Design

ISO 13407 User Centered Design
ISO 9241-210:2019 - Ergonomics
of human-system interaction
- Part 210: Human-centred
  design for interactive systems.
- Usability:
  - Effectiveness
  - Efficiency
  - Satisfaction
- User Experience/UX:
  - Dimensions describing
    users' perception and
    feelings

1. Plan the human-centred design process

2. Understand and specify the context of use

Iterate where appropriate

6. Designed solution meets user requirements

5. Evaluate designs against requirements

3. Specify the user requirements

4. Produce design solutions to meet user requirements

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User Group

describe the characteristics of target users of an interactive system

- Process for identifying and selecting users
  - define the characteristics of the user population, i.e. user groups
  - work with a representative sample of the user group

- Methods for describing user groups
  - User roles, personas, user profiling
- Methods for assessing user groups
  - Interviews, questionnaires, focus groups …

User profiling

A collection of users characteristics that can be used to identify user groups

Ex.: Personal characteristics:
- Age, sex, education, job type, socio-economic status, role in organization.
- Lifestyle, personality, emotions and attitudes (e.g. toward using a technology).
- Skills.
- Physical abilities and constraints, e.g. poor eyesight, color blindness, etc.

Task related characteristics:
- Goals and motivation.
- Tasks.
- Usage (heavy vs. light, frequency, indirect or remote).
- Training and experience (from novice to expert).

Geographic and social characteristics:
- Location: regions, countries, continents, market areas.
- Cultures and other circumstances.
- Social connections and societies.

…

User Roles

A collection of attributes that characterize certain user population and their intentional interaction with the system

- User/Task Matrix (who is doing what, and how often)?

Users	Getting comfortable with software	Basic software use	Advanced software use	Training the patients	Customizing the software
Patients	X	X			
Patient families	X	X	X		
Novice clinicians		X	X	X	
Expert clinicians		X	X	X	X

Personas

Technique based on data gathered through user research
- Mapping user archetypes (profiles) that represent a few important classes of users' goals and needs. Could be fictional or based on real data

Current practice: no uniform way for describing users

- lack of formalization
- difficult to compare user groups from different studies
- hard to integrate and reuse knowledge about users

- Important Problems
  - Every user is an unique individual (variation in the population)
  - In some cases, users tasks and responsibilities might be more important than individuals preferences but not always…
  - Stereotyped views of users is a dangerous and yet necessary tradeoff

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Objective

Acquire knowledge about different user modeling techniques in order to provide extensible, technology independent, computer-readable User Profile model.

RQ1 - **To specify computable user models**

RQ2 - **To accommodate large variety of attributes describing users**

RQ3 - **To create platform for share knowledge about users**

On going Activities

1. **State of Art (literature review)
   -> preliminary findings**

Next Activities

2. Proposing metamodel for describing users
   - based on existing metamodels & ontologies

3. Test model with real life case studies describing models

4. Integrating diverse metamodels

Scope of the state of the art

- Sources of papers: Google Scholar

- Keywords used:
  - User Profile, User Profiling, User Group, User Model, User Modelling, Persona
  - Survey, Literature Review, Ontology

- Period of obtained papers: 2005->2022

- Number of papers analysed: 23
  - Surveys/Literature reviews: 14
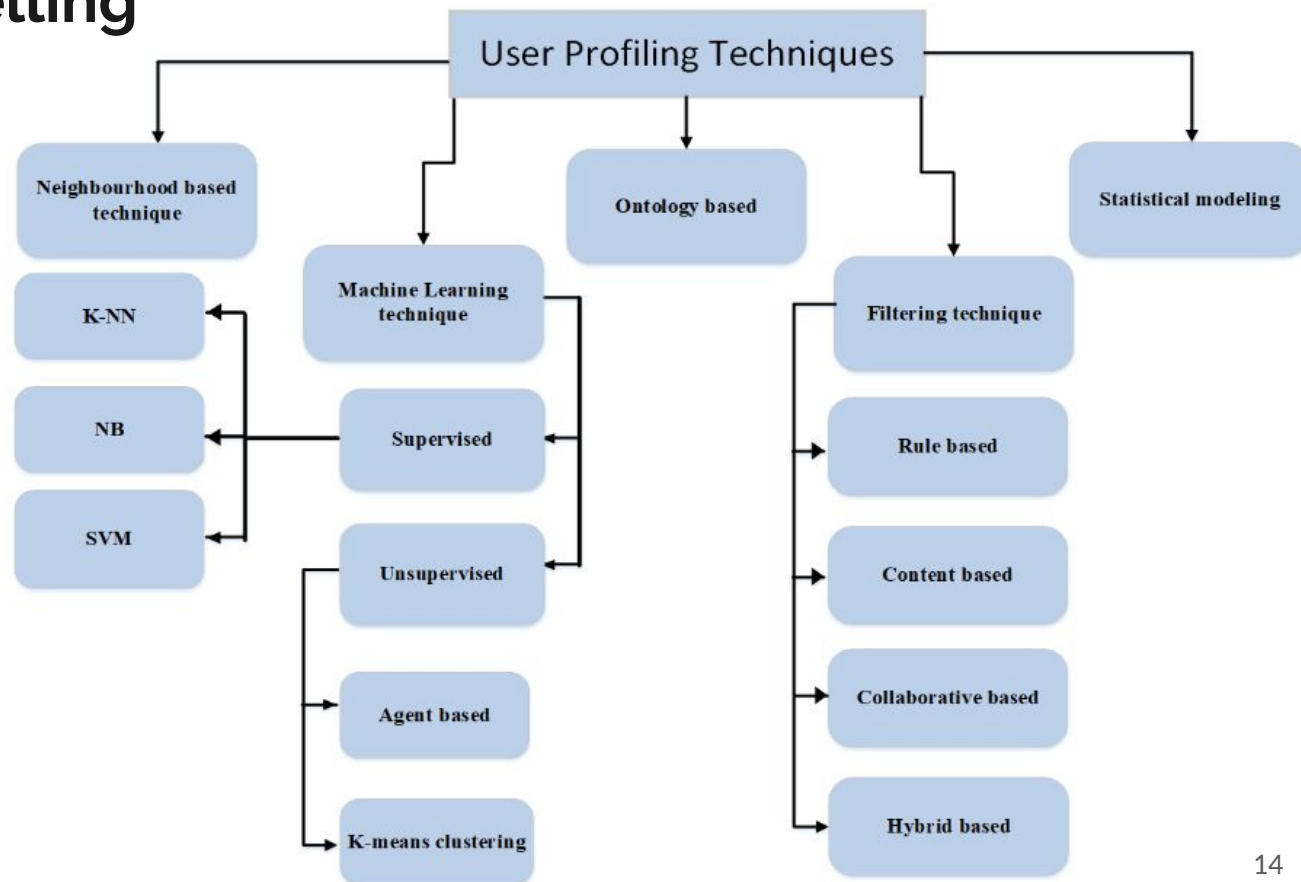 - Ontologies: 9

Preliminary findings

- There are many definitions of what to put in a User Model description

- Classification of techniques for modeling users

- Research field encourage use of ontology for describing users

- Existing Ontologies for representing users

Definitions for User Model

- It is a (data) structure used to capture certain characteristics about an individual
- a **user profile** is the actual representation in a given **user model**

- **Static** - Once the main data is gathered they are not changed again.
- **Dynamic** - Can be updated and take the current user data into account.
- **Stereotype-based** - Based on demographic statistics.
  - Users are classified into common stereotypes to which system adapts.
  - Personal attributes might not match the stereotype.
  - Allow predictions about a user even if there is little information about.
- **Highly adaptive** - Represent one particular user.
  - Allow a very high adaptivity of the system.
  - This kind of model needs to gather a lot of information first.
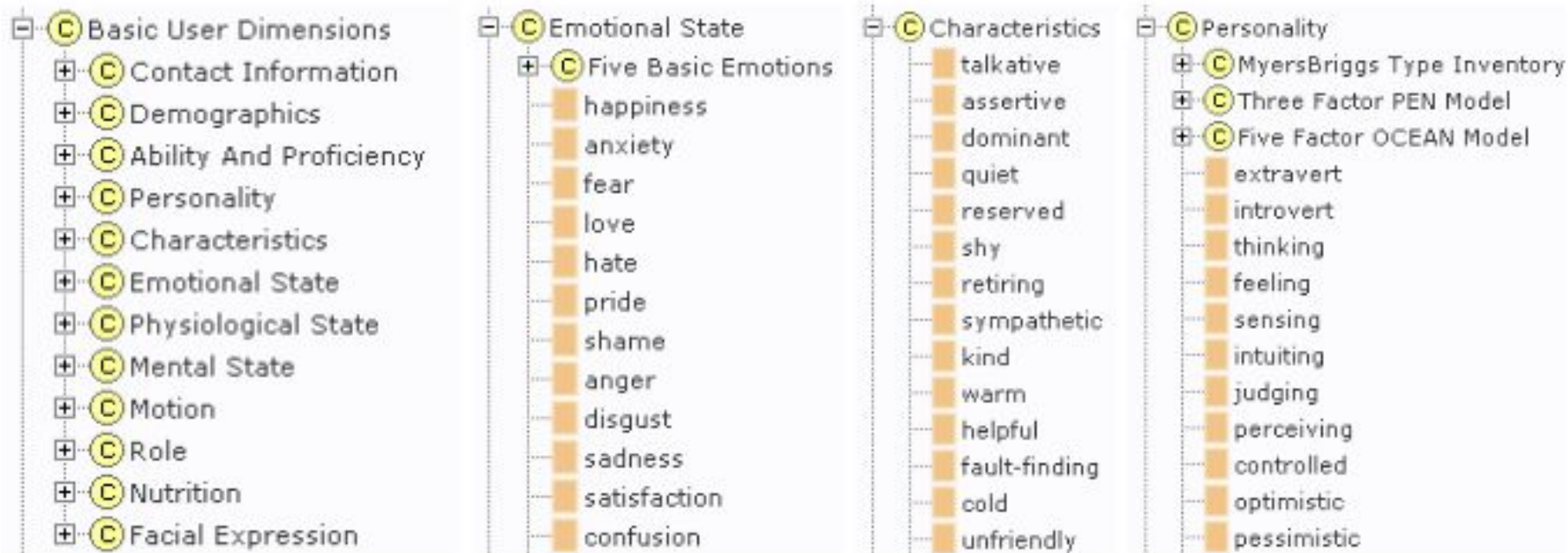
User profile modelling

- a process of building a computational model using the extracted features that can predict user needs or preferences

[Eke2019]

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General user modelling ontology (GUMO)

Basic User Dimensions
- Contact Information
- Demographics
- Ability And Proficiency
- Personality
- Characteristics
- Emotional State
- Physiological State
- Mental State
- Motion
- Role
- Nutrition
- Facial Expression

Emotional State
- Five Basic Emotions
- happiness
- anxiety
- fear
- love
- hate
- pride
- shame
- anger
- disgust
- sadness
- satisfaction
- confusion

Characteristics
- talkative
- assertive
- dominant
- quiet
- reserved
- shy
- retiring
- sympathetic
- kind
- warm
- helpful
- fault-finding
- cold
- unfriendly

Personality
- MyersBriggs Type Inventory
- Three Factor PEN Model
- Five Factor OCEAN Model
- extravert
- introvert
- thinking
- feeling
- sensing
- intuiting
- judging
- perceiving
- controlled
- optimistic
- pessimistic

[Heckmann2005]

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User profile ontology

Class name	Class description
Person	Basic User Information like name, date of birth, e-mail
Characteristic	General user characteristics, like eye color, height, weight, etc.
Ability	User abilities and disabilities, both mental and physical
Living Conditions	Information relevant to the user's place of residence and house type
Contact	Other persons, with whom the person is related, including relatives, friends, co-workers.
Preference	User preferences, for example "loves cats", "likes blue color" or "dislikes classical music"
Interest	User hobby or work-related interests. For example, "interested in sports", "interested in cooking"
Activity	User activities, hobby or work related. For example, "collects stamps"
Education	User education issues, including for example university diplomas and languages

[Golemati2007]

Holistic persona ontology

| Persona/ User	Factual	Personality	Intelligent	Knowledge	Cognitive process	Comments
Case 2: Digital TV extras						
Operator	Demographics Duties	Conscientious, Disagreeable, High-Strung	Linguistic: sufficient Logic: sufficient	Procedural	Apply	Follows procedure during broadcast
Manager	Demographics Duties	Extraverted, Conscientious, Agreeable, Relaxed	Linguistic: good Logic: good	Meta-cognitive	Create	Decides by summarised reports
Professional Viewer	Demographics (minimum information)	High-Strung (In the morning)	Linguistic: sufficient	Factual	Understand	Reads news headlines, weather, Program Guide
Elderly viewer	Demographics (minimum information)	Relaxed	Linguistic: sufficient Musical ability: high	Factual	Understand	Reads news, listens to music
Case 4: Application to disseminate tools						
Farmer (user)	Demographics, Duties	Relaxed, Agreeable, Patient,	Linguistic: sufficient Logic: sufficient	Procedural	Apply	Makes time to investigate solution to the issues
Researcher	Demographics, Research interests	Conscientious, Agreeable, Relaxed	Linguistic: high Logic: high	Meta-cognitive	Create	Works hard to find solutions to a problem
Case 5: Financial Information Management Systems (FIMS)						
Accountant	Field of specialty, number of years in profession	Conscientious, Introverted	Linguistic: average Logic: good	Procedural	Apply, Analyse, Evaluate	Must keep track of accounts; has time to learn FIMS
General Manager	Faculty, number of years at the university	Openness, Conscientious, Extraverted	Linguistic: good Logic: high	Meta-cognitive	Apply, Analyse, Evaluate, Create	In charge of financial matters; makes time to learn FIMS

[Anvari2013] 17

Conclusions so far from the state of the art

- Strengths :
  - Static properties are broadly analysed
  - There are examples illustrating user modelling process with ontology
  - Requirement engineering phase is well covered
- Weakness
  - Existing ontologies are static (not addressing how the property change with the time/new data retrieval)
  - Focus mostly on Knowledge Management Systems
  - Ontologies are not publicly available (operational and usable)
  - No examples how to support testing and operational part of system development

User profile ontology

- Enable sharing of understanding among the users and reuse of the domain knowledge
- Can map profile information that has different schemas into a unified system
- Enable profile transformation into a unified format

[Eke2019]
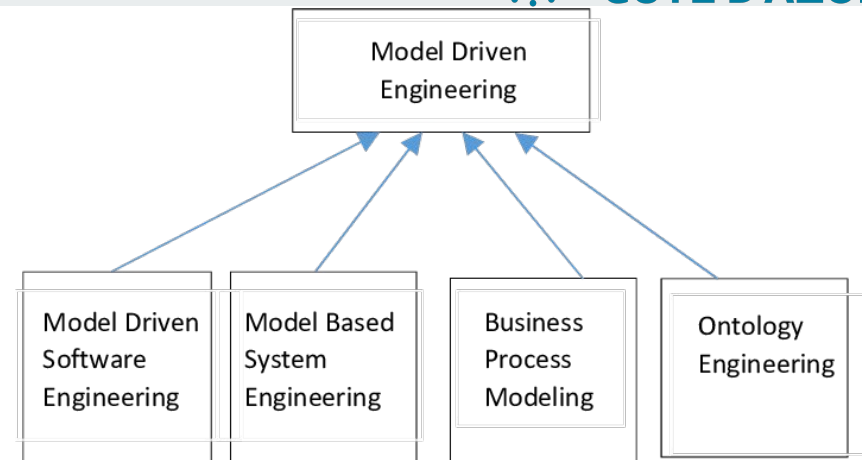
- Language independent
- General purpose profile
- Dynamic profile
- Distributed profile
- Secure user profile
- Location prediction
- Fake profile detection

Model-Driven Engineering (MDE)

Combines domain-specific modelling languages with model analyzers, transformers, and generators

- **Metamodels** define elements, relationships, views, and constraints
- **Model interpreters** leverage domain-specific models for analysis, generation, and transformation

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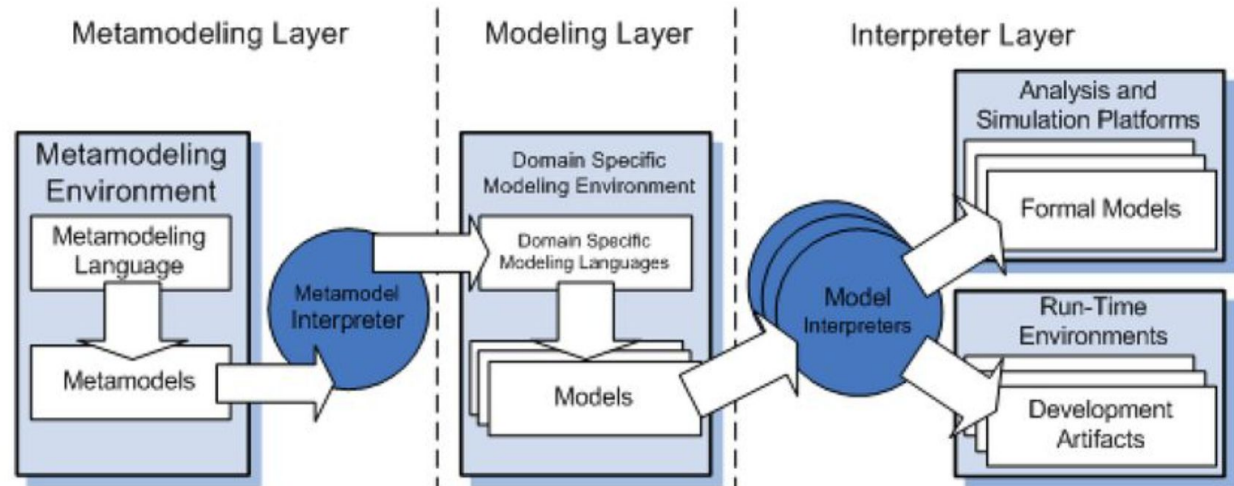
Insights for the next steps of the research

- Rely on Knowledge Graphs (RDF) for describing user models
    - Allows to apply reasoning techniques and find relationship between data
    - Standards, easy to operationalize, easy to disseminate (via linked data/End Points)

- Create a federate models/Ontologies for combining models
    - For that we can use existing End Points that contains data completing characteristics of user groups

- Case study for testing our hypothesis:
    - ADAVEC project (Authority transfer in autonomous vehicles)

On going Activities

1. State of Art (literature review)
    -> preliminary findings

Next Activities

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4. Integrating diverse metamodels

Thank you for your attention!

Questions?

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