A Persona-based Modeling for Contextual Requirements

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Introduction

“A persona is a fictional character that represents a group of users of a given system and renders the product development more effective and accommodative to diversity” [Cooper, 2004].

...and can add a human-centred facet to RE practice
A Persona Example

Mary Collins (Persona 1)

Attributes
- Live alone in a small house;
- Does not have a houserkeeper, only diarist every 15 days;
- Does other household chores;
- Fell at home once, but did not fracture any bone;
- Has osteoporosis type 2 at an early stage;
- Has diabetes, high blood pressure and heart problems;
- She is diurnal but wakes up twice at night to go to the bathroom;
- Has 2 children who lives in their homes;
- Don't have Wi-Fi at home.

Goals
- To avoid frustrating experiences with technologies;
- To not to worry with her children;
- To feel safe by not falling down at home;
- To have quality of life.

Age: 70 years
Profession: Retired
Goal models (GM) provide the goals for which the system should be designed and a set of ways to reach those goals in prescriptive and pragmatic manners [Guimarães et al., 2015].

Contextual Goal Model (CGM) makes explicit presentation of the relationship between a goals and their achievement strategies and the context: “a partial state of the world in which the system operates and is relevant to its goals.” [Ali et al., 2010].
A Goal Model Example

Figure: CGM’s Emergency Response in AAL (adapted from [Guimarães et al., 2015])
Motivation

Goals and capabilities are core and also shared constituents for both goal modelling and personas making the integration of power between both techniques easier and natural!
Problem

- In traditional GORE, people roles, responsibilities and permissions need to be normalized to fit in a general model.
- However, in reality people play different roles in different ways!
- And a case by case basis would add infeasible overhead to the engineers by personalizing the requirements [Sutcliffe et al., 2005].
How can we empower GORE modelling practice with personalization and human-centred design facets? In addition, how to devise a goal achievement sensitive to their actual set of personas?
We formalize the description of the persona attributes into contextual facts as follows:

1. $i$ is the id of the persona in the population of interest.
2. $A_i \in \{A_1, A_2, ..., A_n\}$, where $A$ is a set of attributes as nominal categorical variables of $i$.
3. Each attribute $A_i$ may have a corresponding contextual fact $F_j$, where $i \leq j$.
4. $i = \bigcup_{n=1}^{j} F_n$, the persona $i$ is characterized as the union of $F_j$ contextual facts.
The Personas Contexts

- Context as a predicate formula of and/or combinations of statements and facts [Ali et al., 2010].
- Contextual facts in our work map only those relevant and verifiable persona information.
Structuring the Contextual Facts into Contexts

Figure: Excerpt of the Health Context Structure.
Definition (Persona Context Set)

Let the mapping function \( C: i \xrightarrow{C_j} \{T, F\} \) which returns true or false for the facts of persona \( i \) applied to context \( C_j \). If \( C_j(i) = T \), it means that \( C_j \in \Omega \), where \( \Omega \) is the set of contexts triggered by persona \( i \).
A Context Set Example

Based on the Persona Mary Collins attributes and goals, Mary’s context set follows:

- **Facts**: \((F1, F5, F6, F14, F19)\)
- **Health Context (Ch)**: \((F1 & F5 & F6)\)
- **Home Assistance (Cha)**: \((F14)\)
- **Technology Aversion (Ct)**: \((F19)\)

Therefore, Mary’s Context Set = \{Ch, Cha, Ct\}
The Relationship Between Actors and Persona Goals

Persona: P1
Persona: P2
Persona: P3

C1
C2
C3

Persona Goal
Persona Goal
Persona Goal

Actor
Actor Goal
Achievability of a Persona Goal Satisfaction

Definition (Persona Goal Satisfaction)

Let the context set $\Omega$ triggered by persona $i$, the actor goal $\Gamma$, which the persona goal is link dependent, and the target system CGM. The persona goal satisfaction property $\Phi_i$ is achieved when $(\Omega, \Gamma, \text{CGM}) \models \Phi_i$.
Goal Achievement Check

- Persona goal satisfaction via the goal achievement check algorithm (further details on the paper).
- CGM goals achievability facing personas context sets.
- Enables richer adaptation decisions for:
  - Achievability analysis in explicitly modelled user context
  - The effect of the user context on a goal fulfillment criteria
Goal Achievement Check

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The achievability of a goal is a selection and enactment of a suitable alternative to reach a goal under a certain or multiple persona contexts criteria.
Feasibility Study on MPERS

- 19 distinctive facts for the considered personas.
- Eight distinctive contexts: five for the patients and three for the medical doctor.
- Four modelled personas: 3 patients and 1 doctor
Table: GQM devised plan

<table>
<thead>
<tr>
<th>Goal: Analysis of the achievability of the goals</th>
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<tbody>
<tr>
<td><strong>Question</strong></td>
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Rodrigues et al. A Persona-based Modeling for Contextual Requirements
Results

- Q1 - Is the algorithm efficient to come up with an execution plan?
  - Algorithm’s complexity for the goal achievement check is linear on time (further details on the paper).

- Q2 - Does the algorithm allow testing and explaining persona-based goal achievability?
  - Only Mary did not have the MPERS goals achieved!
  - Mary has technology aversion to some degree since she fears having frustrating experiences with technology.
Q3. Are the plans provided by the algorithm correct?

Figure: Achievable Plans for the provided personas contexts.
Personas-based structuring and impact analysis on goals achievement
Alignment between personas intentions and capabilities as context information in a goal oriented perspective.
Feasibility studies performed on MPERS.
In the future:
  - Analyse in the presence and perspective of multiple actors
  - Analyse the impact of the personas on NFR analysis
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