
A Framework for Modelling Goals in Personal Lifelong Informatics

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Abstract

Goals and goal-setting play an important role in personal informatics because they link the data within personal informatics systems to core problems in people's lives. This paper presents a framework for personal informatics based on a user model representing user goals. We are creating a domain specific ontology for setting lifelong wellbeing goals, and a generic ontology of attributes associated with goals based on goal-setting theory. User control is the key to this framework as it enables users to set meaningful goals in relation to their individual abilities and create application models that link information stored in personal digital devices to a particular goal. We envisage that this novel approach will facilitate lifelong personal goal management for individual user.

Keywords

Goal, Goal-setting theory, Personal informatics, Applications supporting Well-being

ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.

General Terms

Documentation, Standardization

Introduction

Goals are considered an important means of self-regulation and monitoring [7]. They are also critical for the behaviour changes needed for many improvements in people's lives [2]. Effective goal-setting can motivate people to maintain their healthy lifestyle and wellbeing and facilitate behaviour changes.

Maintaining lifelong goals such as wellbeing is a continuous and difficult process embedded in user's daily routine [6]. So these should be supported by relevant cognitive factors (e.g. knowledge, skill, self-efficacy).

Commercial personal informatics tools for goal-setting (e.g. Health Month¹, StickK²) and persuasive systems [3, 4, 8] support different theory-driven goal-management strategies for behaviour change. Some have support for linking personal digital devices to relevant goals. Yet users still face challenges in identifying realistic lifelong goals that are likely to help them achieve their desired behaviour changes.

To address these issues, we are developing a framework for personal informatics systems based on a *user model* that holds models for goals derived from a *domain specific ontology* for wellbeing and a generic ontology of attributes associated with goals, based on goal-setting theory. We call this ontology the "Generic ontology" in rest of this paper.

A *user model* is the repository of personal information that has the potential to drive personalisation and learning. Coupled with a user interface, it can also support self-reflection and monitoring. In turn, this can improve lifelong goal management in several ways. It may

help users to link personal digital devices (e.g. activity sensors) to relevant goals. It may enable them to focus on the "most important" goals, revise current goals in the given context, and set new goals. It can provide personalised assistance based on information about users' skills in planning, monitoring and self-regulation associated with wellbeing goals.

Our proposed framework aims to support these functionalities. It builds upon the Personis lifelong user modelling framework [1] which was designed to support effective user control over self-monitoring and privacy.

In next section, we summarise some key ideas from goal-setting theories relating to our generic ontology. Then we review the related work and discuss our proposed theoretical model.

Goal and Goal-Setting Theory

Goal-setting theories presents some core concepts related to the goals [9]. According to these theories, goals can be assigned, participatory or self-set. We only consider here the self-set goals.

Since our generic ontology is based on the goal-setting theory, we briefly point out the attributes and moderators we need to consider. Goal-setting theory [9] established that *proximal, specific, difficult yet attainable goals* result in higher task performance compared to "no goals" or "easy goals". So the attributes of proximity, specificity, difficulty and attainability are included in the ontology.

The generic ontology also includes moderators such as commitment to goal attainment and positive feedback, as these can further increase motivation and performance. Commitment, in turn, is influenced by importance of each goal and self-efficacy in relation to it.

¹www.healthmonth.com

²www.stickK.com

Related Work

In recent years, a number of health and wellbeing applications have been developed that encourage people to adopt a healthy lifestyle. Some work has explored various aspects of goal-setting in personal health informatics frameworks [10, 5]. While these systems enhance awareness and motivation, they do not allow users to link their personal information to the related lifelong goals. The “Ubifit” system [3] supports theory driven self-set goals with feedback through a glanceable mobile display. We have similar aims as our proposed user controlled framework enables users to set their goals and task strategies. Ubifit, however, does not consider users to revise and set priorities over goals.

Theoretical Model

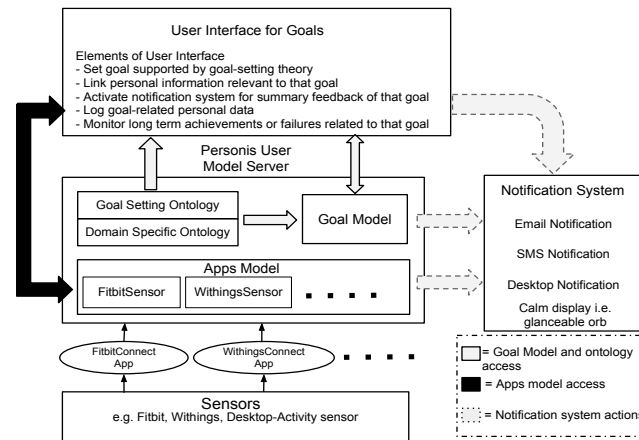


Figure 1: Framework for Modelling Goals.

We have extended the underlying Personis framework to support the representation of goals, including hierarchies of subgoals and mechanisms to link evidence to goals.

The goal hierarchy follows from a domain specific ontology. For example, if users set a goal for increasing their activity levels by walking 10,000 steps a day, the goal will be stored in a hierarchy for the “Activities” category and the “Walking” subcategory. The generic ontology helps users to identify the attributes of an effective goal. For example, the above goal target is *specific* and *proximal*. This also offers a set of cognitive factors such as commitment, self-efficacy that users might choose to monitor over long term.

Figure 1 shows the core elements of our user modelling framework for goals. At the top is the user interface which enables users to define goals and link them to the flow of information from sensors. This interface also helps users to set notifications for a particular goal. Moreover, this provides support for logging and editing personal data and monitoring long term goals.

In the middle left, we can see the new elements added to the Personis framework: an ontology database with a generic ontology for goal attributes and domain specific ontology for goals, goal models set by the user and models of the external systems or devices. For example, referring to the 10,000 steps walking goal, a user with a Fitbit sensor³ might decide to link the Fitbit sensor (at the bottom) data to this goal. He might install a Fitbit plugin “FitbitConnect App” (left-most oval at the bottom) and build a model for the Fitbit inside the “apps model” to hold the step-counts from his Fitbit sensor.

In the middle right in Figure 1 are the notification systems that users can choose. A notifier may be a passive display, such as emerging low cost displays which are unobtrusive and subtle indicators of simple status, a form of

³www.fitbit.com

glanceable display [3] to help users maintain awareness of information about an important current health goal. Or it may be an email or twitter notification or a form of alert which captures the user's attention.

Conclusion

The contribution of this paper is to introduce an approach to support people in achieving their lifelong health and wellness goal. It is based on a user modelling infrastructure that supports goal-setting based on a generic ontology of goal attributes and a domain specific framework, both in terms of the technical underlying framework and user interfaces for controlling the storage and use of personal data from the personal digital devices and applications. To achieve user-controlled goal-setting, this framework will provide interfaces for managing goals and reflection: defining goals; monitoring the information associated with each goal; reviewing goals. It must also provide interfaces for linking each sensor into the infrastructure and linking it to the relevant goals. And critically, to help the user tackle these tasks, it will provide a user modelling system to assist in the challenging tasks of thinking about goal-setting, revision and self-reflection and monitoring over the long term data about health and wellness.

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