MyHealthEducator: Personalization in the Age of Health 2.0

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Abstract. Most Europeans use the Internet for searching health information [1] and many of them use the Web 2.0 to access health information and services, share knowledge and socialize. There is an emerging trend towards the developing of personalized Health 2.0 applications which could dramatically change how the health consumers use the Web. This paper provides an overview of personalization in the Health 2.0 domain and it presents the ongoing project MyHealthEducator, which is an early example of personalization in the Age of Health 2.0. MyHealthEducator aims to study the feasibility of using Recommender Technologies for delivering personalized and adaptive recommendations of web health information based on the user's Personal Health Records and content from their community (e.g. user's comments).
Key words: eHealth, Personalization, Health 2.0, Health Education

1 Introduction

Personalization is not new in eHealth, especially in health education[2, 3]. It has been traditionally based on explicit feedback (e.g. questionnaires) for delivering tailored educational resources aiming at modifying a health behavior (e.g. stop smoking). In general, these stand-alone systems are static and designed for a specific disease, taking into account a closed set of parameters and resources controlled by healthcare professionals. This approach is not aimed at the current context of the Web 2.0, where many different types of health resources are appearing. For example, health consumers are creating content (e.g. blogs, v-logs, comments) and socializing through Social Networks (e.g. Facebook, Tudiabetes.com). They are also managing their health records by using web-based Personal Health Records (PHRs) such as Google Health.

The Web 2.0 provides many opportunities for personalized health applications, especially due to the increased availability of information about the users. For example, approximately half of teenagers' profiles in MySpace contain private health information (e.g. drug abuse, sexuality, etc.) [4]. This type of information is being used in the project Riskbot [5] for delivering personalized health promotion messages. Tags [6] and ratings [7] have been also used in personalized health education. In addition, there are already personalized applications based on the data available in Google's and Microsoft's PHRs. Bourgeois et al. [8] used Indivo PHR [9] for delivering tailored messages about influenza vaccination.

2 MyHealthEducator

MyHealthEducator approach consists of a service for recommending personalized health information adapted to the changing needs of the patients and not designed for a specific disease. Its main characteristic is the adaptability to the changes, both in the educational resources and in the user's data. We are aiming to achieve this adaptability with Semantic Modeling techniques to create dynamic models of the users and educational resources. The knowledge about the health user's status, preferences, and demographic information will be modeled as the changing user's context (e.g. diagnosed diseases) and gathered mainly from their PHRs. MyHealthEducator, figure 1, comprises 3 main components: 1) the User-models Repository which contains the information about the users 2) the Health-Repository with the metadata about the educational resources and 3) the Recommender Engine. The system is integrated with external com-

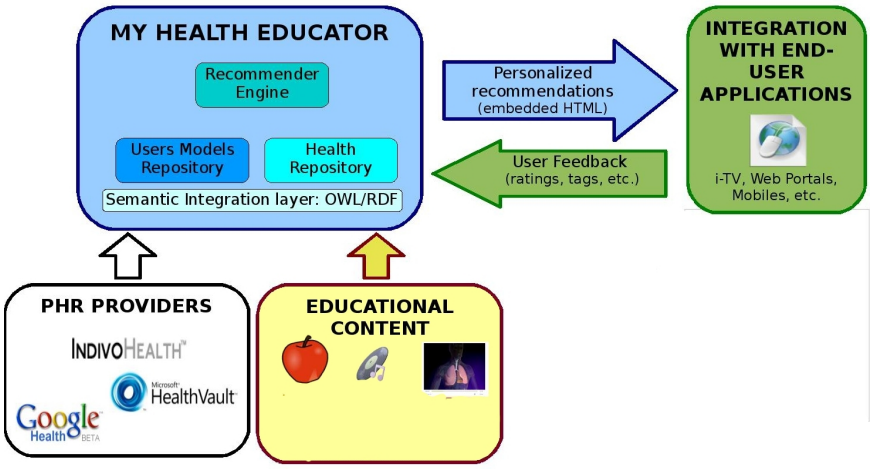

Fig. 1. Overview of MyHealthEducator

ponents, such as the PHRs, repositories of health educational resources and the user interface. The user interface will vary depending on the platform where it is integrated. Currently, it is being designed to be integrated as a web-based gadget in our telemedicine platform MyHealthService [10].

2.1 User-models Repository and Health Repository

The **User-models Repository** contains the information about the users. The health information will be gathered from the PHRs. After the users grant access to their PHRs, the system can access the user's data using the PHR's secure APIs. The health information will be modeled as context, which could vary and

be different between the users. The non-health related information about the users is also modeled and stored in a Personal Record containing information such as the user's preferences, which will be gathered using implicit feedback (e.g. user's interaction with the system) and explicit feedback (e.g. favorited content provider). The models will be based on Semantic Technologies, such as Semantic Networks or Concept Profiles. Instead of extracting list keywords to build the user models the system captures linked concepts and terms, decreasing the polysemy problem. We are looking into the usage of the Unified Medical Language System (UMLS) Semantic Networks, which are widely used in the health domain and have been ported to OWL.

The **Health Repository** contains the metadata about the web-based educational resources. Similar to the User-models the available information about the resources (e.g. descriptions, comments) will be analyzed to extract relevant keywords and concepts in order to build a semantic model of the resources. The information created by the community of users (e.g. ratings, comments) will be also used to enrich the resource's model. One of the main challenges to address will be the diversity of the users' vocabulary and the use of acronyms.

2.2 Recommender Engine

The recommender engine will be a hybrid Recommender System based on: 1) the analysis of the semantic structure of the models about the users and the educational resources, 2) collaborative techniques. A pre-filtered list of educational resources is generated by analyzing the semantic similarity between the users and resources models. Finally, the list is sorted using collaborative techniques.

2.3 Status and future work

MyHealthEducator is currently under development based on our previous studies about the Patient Generated Content, such as educational resources [11] and comments [12]. The first prototype, which is expected by the end of 2009, will be a recommender system of health videos from YouTube based on the analysis of the User Generated Content and the PHRs. The evaluation of this prototype will be focused on the evaluation of different recommendation algorithms based on the analysis of data collected from the system usage and users' feedback (e.g. surveys).

3 Conclusions

The increased availability of structured and un-structured data about health consumers and content has opened a new conduit for research opportunities towards the development of personalized Health 2.0 applications, where PHRs are becoming platforms with ecosystems of personalized health applications. The impact of these applications can ultimately lead to a paradigm shift of patient-centered healthcare systems. Many challenges are also appearing; including new

ethical dilemmas related to web-mining sensitive information or technical questions regarding to the interoperability and integration. Some of these challenges are being addressed in the ongoing project MyHealthEducator. This project will increase the knowledge about the usage of Web Technologies for health personalization.

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