Service Composition in GreenOlive Intelligent Living Platform

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Abstract. Rapidly increasing chronic disease population demands living services that improve people’s wellness by lifestyle interventions. However, existing work requires substantial programming efforts, and there lacks sufficient system support for case managers to select living services and compose care solutions. GreenOlive platform is proposed to facilitate: (i) developers to implement living services by providing foundational information services; and (ii) case managers to create collaborative care solutions by outcome-driven service composition. This paper reports on our framework of information services, illustrates rapid living service development and discusses outcome-driven service composition.

1. Introduction

The effectiveness of lifestyle intervention such as diet and exercise planning has been verified in many countries by multi-year studies [1-2]. However, currently living services are often provided by different vendors and designed based on their specific requirements. It’s critical but challenging to choose appropriate services based on the outcome of users’ wellness condition. We propose to use the GreenOlive [3] platform to facilitate the development of turn-key collaborative care solutions through common information services, including data collection, transformation, real-time event processing, and data analytic services. The proposed method intends to help case managers select and compose services with the aim of maximizing health outcome.

2. Methods and Results

Our framework (Fig.1) consists of three layers: (i) information service provisioning layer; (ii) living service development layer, and (iii) care solution layer. In (i), we adopt a message-driven, loosely coupled programming model to orchestrate information services that handle different stages of data processing, and enables dynamic adaption on the fly. In (ii), developers can select a set of information services and configure them as a composed service. In (iii), our framework provides systematic support for case managers to create collaborative care solutions by service composition. First, the platform adopts international standard such as HL7 CDA [4] for service descriptions, and provides the communication and monitoring mechanism to enable data exchange and measure service effectiveness. Furthermore, compatibility among agonistic and antagonistic services is evaluated to achieve desired positive effects and reduce adverse effects when applied to the same user concurrently. It is computed based on service history, but can be overwritten by case managers.
The deployment of living services involves the following two parts:

(Part 1) **Living service providers specify service description:** Typically, the service description includes: (1) user demographic information, (2) clinical/wellness guideline, (3) expected outcome, (4) service compatibility, (5) service statistic (e.g., personal preference, effectiveness, and adherence). For (4) and (5), the system monitors the usage and outcome of living services and updates these statistics in the background.

(Part 2) **Case managers invoke outcome-driven living service selection and composition:** Our system provides a set of matchmaking mechanisms to support interactive service selection. First, the system provides a filtering mechanism that can search services by specified criteria. Second, the system provides a ranking mechanism to sort the services based on user constraints or preferences. Third, vendors can create their own versions of ranking approaches for service selection using the open API.

In automated outcome-driven service composition, the system first assesses patient-specific wellness status by aggregating disease risks considered, and excludes service combinations that entail antagonistic interactions. Then, the system evaluates the remaining combinations and predicts the new wellness status after employment based on service history.

3. Discussion, Conclusion and Future Work

Lacking open API to enable value added services has become the bottleneck of the development of current “one-fits-all” living services. We advocate an open platform that adopts the Internet service framework for living service delivery. Challenges include prediction of living services effectiveness and personalized weighing procedure for health status. In summary, our approach helps combat the operating assumption in previous research that living services have to be pre-structured, and users have to adapt themselves to the services. We propose a system to facilitate service selection and composition without stereotyping based on medical diagnosis-based classes (or other broad criteria). Future work includes scalability study and dynamicity support.

References