

Chapter 20

Agent-Based Wellness Indicator

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ABSTRACT

An agent-based wellness indicator is an information visualization system designed to present wellness and decision-support information to individuals and their caregivers by elaborating the data provided by measuring devices utilizing the unique characteristics of software agents. The wellness indicator is constructed from an operational wellness model we developed. The model allows an automatic measuring system to calculate the wellness level for a number of indicators resulting in an overall wellness level. These results can be presented in a simple graphical format. The software has been evaluated by following the steps provided in the framework for testing a wellness visualization system. The evaluation is carried out by both general users and healthcare professionals. The results show positive feedback on various aspects of the indicator; and confirm that the wellness indicator can assist people to have a better understanding of their personal state of well-being and can support caregivers in delivering their services.

INTRODUCTION

Wellness is an important issue for both an individual and the public (Benedicenti & Soomlek, 2009; Soomlek & Benedicenti, Operational Wellness Model: A Wellness Model Designed for an Agent-Based Wellness Visualization System, 2010; Soomlek & Benedicenti, Creating a Framework for Testing Wellness Visualization Systems, 2011; Soomlek & Benedicenti, Repeatable Experimental Framework for Wellness Indi-

cator Testing/Evaluation: Environmental Setup, 2012). People perform various activities, e.g., exercise regularly, nutrition control, and physical examination, to achieve the best possible state of wellness. Wellness can be achieved individually while good health may require assistance from experts. In order to have a desired level of wellness, many efforts are required. Many people utilize a portable health monitoring device and a matching application available on a smart small form factor device, since they are easy to access or buy in the

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market. Portable health monitoring devices play an important role in assisting a person to measure and monitor certain parameters of wellness such as heart rate and blood sugar content. The measures are thus easy to obtain but difficult to interpret, and sometimes they require dedicated tools for recording and tracking purposes (Benedicenti & Soomlek, 2009). Knowing one's own wellness level is a key to maintaining or improving it. But a person must acquire specialized knowledge to interpret and contextualize most measures provided by a personal health device. Consulting with healthcare professionals does not require additional knowledge; unfortunately, there aren't enough healthcare workers compared to the number of people requiring wellness services at the time of writing (World Health Organization, 2008).

In order to improve the wellness level, it is important to understand our current conditions, our problems, risks, and what should we do to improve our state of wellbeing or which direction/approach we need to follow. There are many potential solutions to the presented problems such as training, attending a wellness improvement program, and consulting with the experts. Training allows people to have a better understanding in a certain topic; however, one training session is not enough for a person to understand everything relative to their wellness status and pursue to the right direction to improve their wellness level. In addition, training could be an expensive solution. In the United States, many companies provide worksite wellness programs to their employees with the hope of reducing healthcare costs (Hall, 2007). A comprehensive and effective wellness program could be expensive depending on what are included in the programs, i.e., approximately \$US100-450 per person per year or more (Hall, 2007), but it is still cheaper than paying for health insurance (Hall, 2007). Moreover, when participating in a wellness program, a person needs motivation and personal responsibility to follow the guide in the program and, then, to be success in the long run. Consulting with the experts is the ideal solution if we have enough number of healthcare profes-

sionals to give wellness services. That is one of the reasons why telehealth and telemedicine play an important role in solving the problem. Telehealth and telemedicine do bring health services and healthcare professionals to people at distance; which is convenient and increases accessibility to medical services. In addition, telehealth services are more cost effective than face-to-face services (Persaud, et al., 2005). For example, in Nova Scotia, a study shows the patient costs for telehealth is \$CAD17-70; which is cheaper than a face-to-face consultation, i.e., \$CAD240-1,048 (Persaud, et al., 2005). However, there is uncertainty in the effectiveness and risks in employing the approaches, because a study shows that remote monitoring does not fewer hospitalizations and emergency department visits, and increases the death rate in elderly patients (Takahashi, et al., 2012; Kaffash, 2012).

Therefore, an alternative mechanism, that can assist people attain a better understanding of their personal state of wellbeing and to track their wellness information, is needed. The existing solutions discussed above give knowledge, instructions/suggestions, or access to healthcare services from a distance respectively, but not the combination of all. This research presents an agent-based wellness indicator as an alternative solution to the issues just identified and a complement to the existing solutions presented above. The system employs the benefits of the existing resources already provided in a hospital and other electronic resources; therefore, it does not require a highly extensive cost to be included in the existing services. The wellness indicator is designed to give people a better understanding in their wellness conditions and fast access to the relevant information, potentially help them to improve the quality of their lives. By integrating a wellness indicator system with a hospital working system, potentially assist a person to gain access to their wellness information and history, communicate to a caregiver, and present their progress to their physicians.

The wellness visualization system we built presents wellness information to people in a

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