Chapter 8
An Agent-Based Modeling System for Wellness

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ABSTRACT
This chapter introduces an agent-based wellness visualization system. The visualization system integrates and analyzes health information collected from existing portable health monitoring devices, users, and other existing health information resources (e.g., hospital’s databases). It can be used as a single wellness indicator for an individual and a one-station examination for health care professionals. The single wellness indicator provides a simplified view of health information of an individual. Thus, the individual will have a better understanding in personal wellness and will be encouraged to be aware of both personal and public’s health. The one-station examination assists healthcare professional to have rapid evaluation and boosts healthcare services. Initial result indicates that the proof of concept of the research will provide direct benefits to the public, research communities, and enterprises.

INTRODUCTION
Health is a major public issue: a healthy life is desired by everyone. Unfortunately, we do not have a sufficient number of doctors, nurses, and medical practitioners compared to the size of human population at the present (Core Health Indicators, 2007). Therefore, we need mechanisms that assist health care professionals to work faster with efficiency to serve the public needs. One possible solution is to integrate health information on one single station, providing correlations and patterns of clinical data of a patient, and then identify anomalous situation. This would make it faster for medical professionals to access, interpret, and analyse the clinical data. In turn, this leads to better care and services for more people.

Another potential solution is to offer triage training, disease protection and prevention training, and health monitoring devices directly to the public. Triage addresses the seriousness of a condition or injury for people in an emergency but it does not
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protect people from diseases and chronic health conditions. Disease protection and prevention training gives people a better understanding of the factors affecting the onset of a disease and of how to reduce the risk of contracting diseases; however, it is hard for people to do so when their health conditions are unknown. Portable health monitoring devices provide primitive health information, e.g. heart rate; blood pressure; and blood sugar content. The information is meaningful, useful, and interpretable by health care professionals; but the information is not readily understandable for people without training or specific knowledge. To let people be on the watch for their own health conditions, health information should be displayed in a way that is easy to understand with simple explanations and suggestions for general users.

The research described in this chapter aims to develop an agent-based visualization system that provides a comprehensive display of primitive health information for both health care professionals and non-professional users. The visualization system will show primitive health information, relevant information, history, wellness indicator, profile, and significant change of patient condition or anomaly for rapid evaluation by medical practitioners. The system will also provide a simple explanation and a set of suggestions that are understandable for general users. The objectives of the research are described in the following section. The research plan is given in Section III. The description of analysis and approaches is provided in section IV. The architecture of the system is introduced in section V. The system design, results, conclusions and future work are provided in section VI, VII and VIII respectively.

OBJECTIVES

The agent-based visualization system cannot replace any health care professional. It cannot diagnose a symptom. Instead, it assists the health care professionals to work faster with high efficiency and encourages an individual to be aware of his/her own health. The objective of this research is to develop an agent-based visualization system that can:

1. Help an individual to follow up and maintain his/her own health; and can assist a health care professional to provide better services to each patient.
2. Be used as a one-station examination for health care professionals and a single wellness indicator for patients.
3. Aggregate and integrate primitive health information collected from users.
4. Analyze correlations among parameters and display all relevant information in a comprehensive way to users.
5. Analyze patterns from primitive health information collected from a user and can identify anomaly from the patterns.
6. Has expandability and modularity characteristics.

RESEARCH PROGRESS AND PLAN

This section explains the research plan and main contributions by the team members. This research involves four main tasks spanning over three years. Details about each task are as follows:

Task 1: Literature Reviews and Data Collection

The first task allows the research team to gain knowledge from existing methods and technologies; and be able to conduct the research in the right direction. This task is accomplished by searching through existing research papers, books, products, and other existing resources. All relevant information are gathered and studied by the team members. This task can be performed in parallel with the other tasks because we may need more information and knowledge when we perform the other tasks. As a result, this task is still ongoing.