Chapter 2.11
Intelligent Agents Framework for RFID Hospitals

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ABSTRACT

When dealing with human lives, the need to utilize and apply the latest technology to help in saving and maintaining patients' lives is quite important and requires accurate, near-real-time data acquisition and evaluation. At the same time, the delivery of a patient's medical data needs to be as fast and as secure as possible. One possible way to achieve this is to use a wireless framework based on radio-frequency identification (RFID). This framework can integrate wireless networks for fast data acquisition and transmission while maintaining the privacy issue. This chapter discusses the development of an agent framework in which RFID can be used for patient data collection. The chapter presents a framework for the knowledge acquisition of patient and doctor profiling in a hospital. The acquisition of profile data is assisted by a profiling agent that is responsible for processing the raw data obtained through RFID and a database of doctors and patients.

INTRODUCTION

The use and deployment of radio-frequency identification (RFID) is a relatively new area and it has been shown to be a promising technology (Glover & Bhatt, 2006; Lahiri, 2005; Shepard, 2004). This technology has the capability to penetrate and add value to nearly every field, lowering costs while improving service to individuals and businesses. Although many organizations are developing and testing the deployment of RFIDs, the real value of RFID implementation is achieved in conjunction with the use of intelligent systems and intelligent agents. The real issue is how intelligent-agent technologies can be integrated with RFID to be used to achieve the best outcome in business and services areas.

In this research, a new method for integrating intelligent-agent technologies with RFIDs in managing patients' healthcare data in a hospital environment is given. Knowledge acquisition and

profiling of patients and doctors in a hospital are assisted by a profiling agent that is responsible for processing the raw data obtained through RFID data that are stored in a hospital database. There are several perspectives for profiling that could be used in a healthcare and hospital environment.

An intelligent agent can assist in profiling patients based on their illness and ongoing diagnostics as reported by the RFIDs. There are certain data and knowledge about each patient in the hospital. This knowledge could be the description of what the patient's symptoms are, monitoring status, and why the patient was admitted to the hospital. Using this information, an evolving profile of each patient can be built.

This data and knowledge can assist in deciding what kind of care he or she requires, the effects of ongoing care, and how to best care for this patient using available resources (doctors, nurses, beds, etc.). The intelligent agent will build a profile of each patient. Along with a profile of each patient, a profile for each doctor can also be developed. Then the patient and doctor profiles can be correlated to find the best doctor to suit the patient.

The patient-doctor profiling can be useful in several situations:

- Providing personalized services to a particular patient, for example, by identifying the services that a patient requires and hence speeding his or her recovery progress in or even out of the hospital.
- Disambiguating a patient's diagnostic based on the patient profile and matching this profile to the available doctor's profile. This may help in matching doctors with the suitable specialization to a patient.
- Providing speedy, reliable reentry of patients into the hospital by having the patients allocated to visit the relevant doctors.
- Presenting information in a way suitable to the doctor's needs, for example, presenting the information about the patients on a continuous basis for the doctors.
- Providing tailored and appropriate care to assist in cost reduction.

Personalization, user modeling, and profiling have been used for many e-commerce applications by IBM, ATG Dynamo, BroadVision, Amazon, and Garden. However, the use of such systems in hospital and personal care and profiling has not been reported. It should be noted that the definitions of personalization, user modeling, and profiling that these companies discuss are not quite the same as our intended meanings.

Many user models try to predict the user's preference in a narrow and specific domain. This works well as long as that domain remains relatively static and as such the results may be limited.

One of the main aims of profiling and user modeling is to provide users with correct and timely responses for their needs. This entails an evolving profile to ensure that as the dynamics of the user and real world change, the profile and user model reflects these changes.

A patient's visit to the hospital can simply be classified as a regular visit, an emergency visit, or an ad hoc appointment (on a need basis). In each of these situations, the needs of the patients are different. During a regular visit, the patient visits the hospital at a regular interval and usually a doctor is assigned to that patient. The patient's profile can assist the patient in a situation where the assigned doctor suddenly becomes unavailable. In this situation, the profile of the patient can be matched with the available doctors with suitable specializations for the needs of the patient. The patient-doctor assignment here is a kind of timetabling problem as we know the profile of the patient and doctors as well as the available doctors. Timetabling of doctors is out of the scope of this research study.

However, in an emergency visit, there is no assigned doctor for such a patient. The doctor in the emergency section of the hospital will provide information about a patient after examination,