Chapter 14
Optimal Resource Allocation Model for Pervasive Healthcare Using Genetic Algorithm

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ABSTRACT

Number of mobile devices, equipped with sophisticated services apart from communication, is increasing day by day. Today a vast set of high speed network infrastructure, both wired and wireless, exists. This work studies the mobility management model for healthcare services developed for the efficient utilization of the network infrastructure. The model assumes that the physicians (doctors) are highly mobile and are periodically changing their location to perform their daily work, which includes serving patients at different nodes (serving as health centre). The mobility information about these doctors dependents on their current location. A location-aware medical information system is developed to provide information about resources such as the location of a medical specialist and patient's records. In the author's previous work, a framework is developed to describe the relations between types of hospitals and specialists with the use of Hospital Information Systems (HIS). The model for pervasive healthcare is to manage the specialists' movements between the hospital nodes with the objective to serve the maximum number of patients in minimum amount of time. In this work, they carried out simulation experiments to evaluate the performance of the proposed model towards servicing the patients. It has been observed that the model performs better in servicing the patients in the service area.

INTRODUCTION

Governments all over the world are increasingly concerned about their ability or inability to meet their social obligations in the health sector. The situation is of concern in light of rapidly increasing costs for medical care, aging population, lack of government funds, and so on. Also the quality of medical services delivered to the end users are not up to the mark. The hospital management is seriously concerned about the lack of medical infrastructure and resources to provide satisfactory service (Ramani, 2004).

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Traditionally, hospitals are provided for the congregation of various medical professionals, nurses, medical technicians, diagnostic and therapeutic equipment that work together to bring the best possible quality of medical care to the patient. With the development of medical and communication technologies, the quality of healthcare delivered by hospital has improved a lot. Hospitals are struggling hard to contain costs without sacrificing the quality of care. Medical technology, though indispensable to patient care, is suppose to consider creating some of the greatest costs and risks that a hospital encounters. The purpose of service quality management between the hospitals is to establish a system that measures and manages patient care and provides an optimal medical service to the patients. An attention is to be given to the contents of the healthcare services management from the view of a patient. (Davis, 1996)

Life is priceless, so evaluation and management is important in medical services to enhance the quality of medical services (Mei-Ju, 2005). The common person is mobile and his health

travels with him. It is needed to support the person's health mobility requirements along with other needs. The current situation in the healthcare domain is affected by the exciting fields of medical and technological improvement and increasing patient's requirements. The utilization of health services is going to be a regular service available anywhere and anytime i.e. the healthcare services should be available pervasively (Loos, 2002).

With the development of new information and communication technologies, the environment is more congenial for the installation and diffusion of services, allowing a better exchange of information between the physicians and hospitals of a geographical sector. Communication between professionals is a key element for the quality of care (Clemmer, 1995). The strategy for the diagnosis and a patient's treatment is elaborated after exchange of data between cooperating doctors and hospitals. Networks particularly focus on the development of data exchanges between hospitals. The main objective of these healthcare networks is to ensure the rapid exchange of data between the participants of the system in a geographic sector. These exchanges facilitate the communication of the data which may be beneficial not only for the doctors but also for the patient (Beuscart, 1999).

Many national and regional healthcare plans have been floated in the past, in order to control the costs, the quality, and the availability of healthcare for all citizens. For instance, hospital management can focus on co-ordination of the primary medical processes, or on external networking with other hospitals for medical services. Healthcare usually consists of primary care (provided by general practitioners, dentists etc.) and hospital and special care provided by hospitals and medical specialists. Most medical specialists are not employees of a hospital, but work as private practitioners, making use of hospital facilities. The excessive pressure experienced by the hospitals can be transformed into 'functional specialization' thus to reduce costs and to improve the quality of specialized medical services. A more recent response of hospitals is to move into 'network management'. In this organizational type a hospital is seen as a piece of an elaborate network of medical care (Wulff, 1996). This can be used to improve the efficiency and effectiveness of hospital services. The communication processes are critical for improving the links between healthcare demands and providers (Smits, 1999).

Hospitals are facilities that provide both urgent and special medical care. The hospital staff may provide diagnosis and treatment for those persons who arrive at the facility and then release them back to the community. Some patients may need further treatment. Following the triage evaluation, treatment of the person's medical needs is administered to on an assessed priority of need basis (Tawney, 2005). The system should consider the connection between physicians (hospital doctors), specialists, when a patient consults a specialist