Neural Based CAD and CAP Agent System Framework for High Risk Patients in Ubiquitous Environment

Insung Jung[1], Myeong-Ho Lee[2], and Sanghoon Bae[3]

[1] Department of Industrial & Information Systems Engineering
Ajou University, Korea, 442-749
gabriel7@ajou.ac.kr
[2] Division of Internet Information, Semyung University,
579 Sinweol-Dong, Jechon, Chungbuk, Korea, 390-711
mhlee@semyung.ac.kr
[3] Department of Satellite Information Sciences, Pukyong National University,
599-1 Daeyeon 3 dong, Nam gu , Pusan, Korea, 608-737
sbae@pknu.ac.kr

Abstract. The objective of this paper is to describe the diagnosis, detection, and prediction of high risk patient status or level of risk, based on the hospital domain server with agent based intelligent home medical service system. We have proposed a Computer Aided Diagnosis and monitoring system framework for the high risk patient exploiting the ubiquitous artifacts available in the contemporary medical environment. The proposed framework monitors patients using bio signal devices while they are staying at their homes. Furthermore, the agent based learning process is used to make intelligent inferences and adaptive learning of these private data using Computer Aided Diagnosis system. It can monitor acute COPD using integrated home medical server. The services include prevention, emergency call center and ambulance service in a common platform of ubiquitous environment.

1 Introduction

Recently, the medical treatment technique has improved gradually allowing people to enjoy longer lives. As the studies show, more than 70% the senior citizens have got high risk disease such as hypertension, diabetes and acute respiratory diseases. H.S Lee *et al* [1] "if we can do emergency treatment to them, it is possible to prevent a sudden death." However, recent medical systems are quite lacking in terms of offering real time patient monitoring, early detection and diagnosis. Consequently many people are quite interested in ubiquitous system provisioning for hospital domain. There have been recent studies regarding the use of such u-Health systems. For example, Newandee D. has studied COPD severity classification using principal component and cluster analysis on HRV parameters using bio-signals [2]. Dr. K. Karoui discusses about the multilevel diagnosis framework systems which verify the remote diagnosis information based on four level testing [3]. D. Krenchel and J. P. Calabretto *et al* described about the well-organized storage of remote patient's profiling and quick searching facility based on online services [4, 5]. It can be applied in our project for efficient database handling and on-time automatic updating of the patient regular

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diagnosis reports. Most of the references have focused on single dimension of the medical facility while our approach integrates the complete solutions utilizing ubiquitous artifacts and online services. It provides just-in-time medical diagnosis and treatment to the home based high risk patients.

The objective of this paper is to combine the agent based decision support system with ubiquitous artifacts. It helps the doctors to acquire on-time diagnosis correctly and select appropriate treatment choices. An attempt is made to supervise the dynamic situation by using agent based ubiquitous artifacts and to find out the appropriate solution for emergency circumstances that provides correct diagnosis and appropriate treatment in time.

2 High Risk Patient System Service Scenario

Health monitoring and Computer Aided diagnosis will be useful for high risk patients for prevention of sudden death. As a specific example, the doctors at Ajou University define four clusters of patient level (regular, careful, serious and dangerous) using vital signal data. They just need to take some medicines and follow prescriptions at home. However, serious situation patients need to be given first aid and readily be in contact with their private doctor. When patient's level is dangerous, a phone call to emergency call center is automatically made and the vital data is sent. The agent computes the location for the nearest hospital to call an ambulance. As a result, we are setting up 3 kinds of health care modules which are called home care module, emergency call center module and an ambulance module.

Fig. 1. High risk patient system service scenario

The working is executed as the following. We acquire vital sign from the patient by electronic devices. Home network protocols such as IEEE 802.11b will be used for wireless communication between sensors and home medical server. Subsequently, the home healthcare server suggests an emergency treatment using MLP.

3 System Framework

Our framework of home healthcare system (Fig 2) consists of 4 systems and one knowledge database. The database supports sharing of hospital diagnosis knowledge to CAD system. The vital signal data processing system is used for data normalization, after detecting the vital data. These filtered signals will be used as input data to