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WIRELESS SENSOR NETWORK BASED SMART HOME FOR ELDER CARE

A thesis presented in partial fulfilment of the requirement for the degree of

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Abstract

The proportion of elderly people in any population is growing rapidly creating the need to increase geriatric care and this trend isn't going to change in the near future. In New Zealand, the median age of the population is projected to rise from 36.6 in 2010 to 43.1 in 2050. This will put tremendous strain on national resources and the cost of elder care is only going to escalate. More and more elderly people are choosing to stay alone, independently, rather than in a retirement village or old people's home. Such people, often frail and infirm, do however require constant monitoring so that medical help can be provided immediately in times of dire needs.

Considerable research efforts have been focused towards in-home monitoring of elderly people, often using wireless personal area networks. As wireless sensing technology continues to evolve, it is playing an important role in improving the quality of life for elderly people and their families. Wireless sensors based smart home monitoring system provides a safe, sound and secure living environment for the elderly people. A wireless sensors based smart home consists of number of wireless sensors that provide information. The information from the sensors can be used for monitoring elderly people by detecting their abnormal patterns in their daily activities and picking up any unforeseen abnormal condition when occurs.

The thesis is focused on research and developmental issues of an intelligent wireless sensors based smart home and determination of person's daily activities based on the usage of different appliances. The daily pattern can then be compared to determine the early signs of behavioural pattern change of elderly, which can potentially allow for early medical intervention. While several sensors are readily available off the shelf, making them "intelligent" in the context of a specific application (such as monitoring of the elderly) is always a challenging task. We have developed a framework, dealing with the design intricacies and implementation issues of novel sensors, targeted to achieve a Digital Home specifically for the elderly. This smart home monitoring may circumvent institutionalizing the older persons and can help them live at home in safety and independence.

The design methodology is on the impediments in designing, implementing and testing a wireless sensor network based smart home for monitoring the elderly and to propose an optimal solution to circumvent the impediments. The smart home is based on a few smart and

intelligent sensors, which are developed, fabricated and configured around a wireless ad-hoc network. The system will generate early warning message to care giver, when an unforeseen abnormal condition occurs. It will also, analyse gathered data to determine resident behaviour using optimal number of intelligent sensors. In general terms intelligent sensors, i.e., sensing devices having intelligent aspects, can be considered as an extension of conventional sensors with advanced learning and adaptation capabilities.

The developed monitoring system is used to recognize activities of daily living and life style of elderly person living alone. Even though the monitoring system uses a limited number of sensors, it determines the daily behaviour of the person. The system was installed in residential environments with ease. Moreover, the proposed sensing system presents an alternative to sensors that are perceived by most people as invasive such as cameras and microphones, making the sensors are almost invisible to the user thereby increasing the acceptance level to use the system in a household environment.

The results obtained from this research demonstrate the feasibility to build a system based on wireless sensors, to identify, and possible to distinguish between normal and abnormal situation of an elderly person living alone in a home.

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