Sensor Technologies for AL Systems
Integrated Health Monitoring and Emergency Call System

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Abstract. Most developed countries are facing an ageing population, leading to an increasing demand on both health care and social welfare systems. There is a general agreement that these increasing needs can not be met by increasing the provision of hospital care or other forms of institutional care. Therefore, home care is an obvious alternative to meet the future needs of the elderly people. In this way, new home sensor networks need to be developed. The presented position statement establishes the basis for future integrated health monitoring and Emergency call system based on vital signs sensors.

Keywords: Assisted Living Systems, Sensor Technology, Health Monitoring, Emergency call system.

1 Position Statement

Most developed countries are facing an ageing population, leading to an increasing demand on both health care and social welfare systems. There is a general agreement that these increasing needs can not be met by increasing the provision of hospital care or other forms of institutional care. Therefore, home care is an obvious alternative to meet the future needs of the elderly people.

A study made in Jönköping in Sweden showed that around 35 % of heart failure sufferers are unnecessarily admitted to hospital. Bondmass et al. (2000) monitored physiological parameters and weight in 60 patients receiving care in their homes for heart failure. The results from this study showed a marked reduction in readmissions to hospital, compared to the situation before the intervention. Each admission costs about 1100 EUR including hospital care, ambulance transport and preparation of the patient for transport. A reduction in hospital admissions could thus mean substantial savings in terms of societal costs. Savings will be made both in hospital care costs and in costs for social services, as well as in time spent in planning, replanning, and overtime work by care personnel.

There is some evidence supporting the idea that regular monitoring (digital or otherwise) in the home can improve quality of life for the patient.

At the same time, we have to face the increasing amount of *healthy* elderly people, without a serious medical history, living on their own that want to maintain an active and independent life in their preferred environment. But this group of people is also a high risk population with particular health needs and where any home accident can lead to a serious problem. Therefore, there is also the need of having an emergency call and health monitoring system based on a home sensor network, which should be able to detect sudden falls, other home accidents and to monitor health by establishing a common disease prevention program.

To define risk incidents the system should rely on detecting vital signs changes. This way the system would be transparent without requiring any special skill from the user. From a medical point of view, it's well-known that vital signs (temperature, pulse and blood pressure) are strongly altered after an accident. For example, if somebody falls down breaks a bone and loses their consciousness, due to the need of sending more blood to the brain, the body temperature and pulse are increased quickly. Through proper monitoring of those constants, it is possible to detect what has happened and call to notify the event. With this system it is also possible to improve the health care system by monitoring vital constants in order to prevent and attend the common illnesses quickly and avoid unnecessary hospital admissions.

Some issues must be faced for a system like this:

Medical-welfare and service provider level

− guidelines and selection criteria for prescribing vital signs monitoring
− organisation and guidelines for, and documentation of, actions taken when rising temperature is detected
− analysis and diagnosis of the causes behind the rising temperature
− follow-up and assessment of results
− simulation and description of probable result without monitoring and intervention
− feed-back for evaluation and revision of guidelines and organisation

Simultaneously, a psychological group and elderly people service providers must work together to establish a user-friendly sensor which will not be rejected by the person.

Technological level

This level tries to develop the sensor network to send data to the decision centre. The network is divided in four parts:

a) **Sensor**: Elements that measure some physical variables and pass the information to the sensor node. In order to reduce the size of these sensors and the cost of the whole system, they will be designed as battery-less.

b) **Sensor nodes**: Elements that gather sensor information, process it and send it to the base station directly or through other sensor nodes using RF links.

c) **Base station**: This element collects the information from sensor nodes and sends it to the decision maker.

d) **Decision maker**: This is a computer located at home or at the service provider. It has the necessary software installed to implement the correct procedure and notify the proper entity, depending on each case. It will use the patterns taken from the medical-welfare level.

It is important in the sensor network design to stress the comments given by the medical-welfare level. It must be a low cost product, so families could afford it. Thus, standard components will be used.

References

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