Chapter 13
Modern Healthcare With Wearable Sensors and Wireless Technology

Anitha Mary
Karunya University, India

Jegan R.
https://orcid.org/0000-0001-6115-3455
Karunya Institute of Technology and Sciences, India

Suganthi Evangeline
Karunya Institute of Technology and Sciences, India

ABSTRACT

In today's world, people are most concerned about their health and safe living especially bed ridden people needing extensive care and assistance. A strict routine has to be followed by the patients after operation. Wearable sensors play an important role in monitoring physiological signals for the patient at home. With wireless technology, these physiological parameters can be monitored continuously. Also, the medical staffs and doctors are given immediate warning and causality services can be provided as early as possible. This chapter addresses the importance of wireless technology in healthcare sector.

1. PATIENT FALL MONITORING SYSTEM

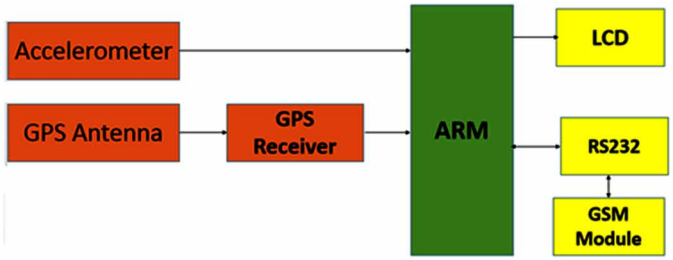
Elderly people are subjected to encounter fall frequently. It is the most significant cause of injury. These ultimately leads to the cause of many disabling fractures that could eventually leads to death and left with complications (NIS Senior Health 2013), such as infection or pneumonia. If proper treatment is not provided then it leads to the consequences of serious conditions. By reducing the delay in assisting and treatment such consequences can be minimized (Frank et.al., 2012). The unexpected human fall is detected by the 3-axis MEMS accelerometer. The principle behind this work is to detect the changes in

DOI: 10.4018/978-1-5225-6067-8.ch013

the human position and the motion using an analogue sensor, which tracks the acceleration change in three orthogonal directions. When the fall is detected, the exact fall location with the latitude and longitude values are provided to the end user using wireless technology such as Global Positioning System (GPS) (Lord et.al., 2006).

1.1 Methodology

Figure 1. Block diagram for patient fall monitoring system



The prototype developed shown in Figure 1 consists of a set of biomedical sensor attached to the body of the person whose health condition is to be monitored. In this work, three axis accelerometer are used to detect the fall of the person. These sensors are connected to LPC2148 Advanced RISC Machine (ARM) micro controller. The microcontroller receives the signals from the sensors and processes the data and checks for the condition of the person. If the condition is normal then the microcontroller keeps on repeating the same process of receiving the data from the sensors and monitoring the position of the person. Whenever the condition steps out the normal range it checks for two or more values, if still the same condition prevails microcontroller sends alert messages to the care takers and concerned health care professionals about the unusual health condition of the person. Once doctor receives message and immediate response can be provided to the affected person. The SMS is sent in response to the person in need of help through the GSM modem which receives message and medicine name is displayed on LCD connected to controller through port pins.

1.2 ARM LPC2148 Microcontroller

NXP Semiconductors (formerly Philips Semiconductors) designed a 32 bit microcontroller grouped under LPC series. It has the CPU with emulation and debugging support and also with In-circuit programming features which supports 32 kB to 512 kB high speed flash memory. The microcontroller used in the prototype is with 128 bit wide memory interface with pipelined architecture which enables faster code execution. There is an alternative instruction set to ARM 32 bit is Thumb 16 bit which is ideal for critical code size applications that reduces code by more than 30% with minimal performance penalty (NXP Semiconductors 2011).

Each microcontroller unit consists of the processor core which is the heart of the core, memories includes static RAM (SRAM) memory, flash memory. In some higher applications cache memory is also used for storage purposed. It also support serial communications interfaces ranging from a Universal Serial Bus (USB) 2.0 Full-speed device, multiple Universal Asynchronous Receiver and Transmitter (UART),