Presentation: A motion sensing mattress

Y.W. LIU, K.Y. WU, Y.L HSU. ***An integrated motion sensing mattress for elderly living assistance applications.*** *Gerontechnology 2012;11(2):255;* doi:10.4017/gt.2012.11.02.590.00 **Purpose** For elderly people living in homes or nursing homes, the bed is an indispensable part of their daily lives. Bed activity monitoring provides valuable information on the status of elderly people. Various sensors can implemented for this purpose, such as static charge sensitive bed[1], force sensors[2], air cushion[3], and textile-based sensors[4]. This paper presents the development of an integrated sensing mattress, 'SmartPad', for unobtrusive sensing of physical activities in the bed[5]. Working with a bedding manufacturer, this research aims to design a mattress with motion sensing for which the same material and fabrication process can be used by the bedding manufacturer, so that the mattress is comfortable, washable, inexpensive, and is closer to being a commercial product. **Method** SmartPad has a sandwich structure of two pieces of foam 6~10mm in thickness, on which conductive fiber is knitted in a special pattern in the 'sensing area', with pieces of conductive fabric in between. The average resistance of 10 tests of a 20cm×20cm sensing area decreases monotonically with applied pressure in the range of 500-3,500Pa, which is equivalent to pressure caused by the presence of an adult (*Figure 1*). The special elastic foam provided by the bedding manufacturer has passed the fatigue test of 30,000 pressure cycles. A possible layout is a mattress, with 3 horizontal sensing areas for detecting movements of the upper limbs, hip and lower limbs, and 3 vertical areas for detecting movements of the trunk (*Figure 2*). **Results & Discussion** Integrated with information systems, SmartPad was successfully implemented in nursing homes to facilitate real-time monitoring of on/off bed status, sleep posture, and body movements, using a 10Hz sampling rate of resistance. Service reminders and history reports were also provided[4]. Various living assistance applications are developed, such as detection of sitting posture changes in a wheelchair, a motion sensing carpet for monitoring purposes, and a 'touch and call' pad for elderly people with impaired motor skills who cannot handle the usual press buttons.

References

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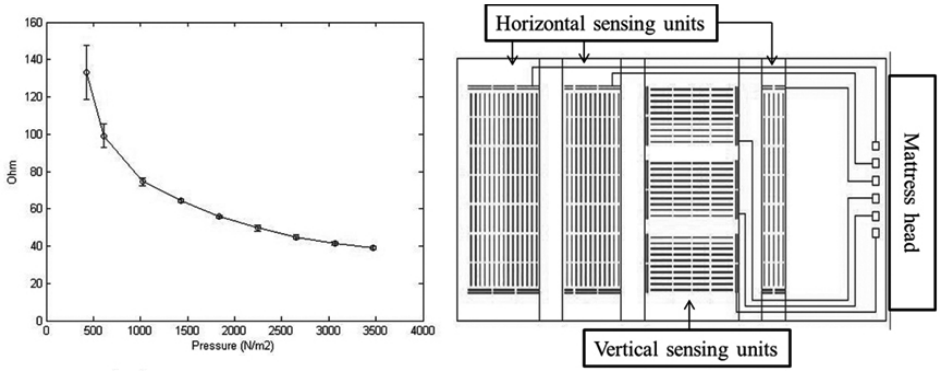

Figure 1. Applied pressure vs. resistance (left); Pressure sensing units on the SmartPad (right)