Gestural Interfaces for Elderly Users: Help or Hindrance?

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1 Introduction

Recent years have seen the dissemination of gestural interface technology in mass consumer products, pioneered most notably by products such as the Apple iPhone or the Nintendo Wii videogame console. Since then, consumer electronics manufactures have included gesture control elements in a whole range of mobile electronic devices, such as laptops, cell phones, PDAs, remote controls, navigation systems and digital cameras. While these interfaces are generally considered to provide a very direct, natural and intuitive way of interacting with a device, it remains unclear whether they also meet the needs and capabilities of a user group that is growing more and more important: the elderly. Demographic, structural and societal changes in most industrialized countries lead to a dramatic change in the percentage of elderly among the population: for example in Germany, 30 years from now, more than one third of the total population will be aged 65 and above [1]. The normal aging process is typically accompanied with visual and auditory impairments, and a decline in working memory, selective attention, and motor control is observed [2]. The interaction with technology thus often confronts elderly people with particular problems, because devices are not designed to accommodate their special needs.

2 Suitable Gestures for Older Users

The aim of the present work is to evaluate to which degree especially elderly people are able to use gestural input technologies and how one can tailor these technologies to their needs. In addition, we assess whether they might even benefit from intuitive gesture input compared to traditional input modes such as function buttons and little joysticks which are typically used in mobile devices. The benefit for older users of direct input devices in general [3], and touch screens in particular [4], over indirect input devices such as the mouse, has already been demonstrated. However, there are also disadvantages related to touch screens, such as the lack of inherent feedback, the risk of inadvertent activation or difficulties with precision [5]. These might show to be especially problematic for

older users. Apart from changes in perception and cognition, age often brings about a decline in motor skills, which becomes manifested in longer movement times, difficulties with continuous movements, problems with the coordination of movements and enlarged variances in movement parameters [6]. In order to find out to which degree, if at all, gesture input is usable for the elderly, we compare younger and older users in their ability to replicate gestures on a handheld mobile device (iPod touch) with a custom build gesture registration tool. The gestures can be either finger gestures (registered by the multitouch screen) or tilt gestures (registered by the 3D accelerometer sensors) and vary by the number of fingers employed, the number of strokes that make up a gesture, and the available space to draw them (Figure 1).

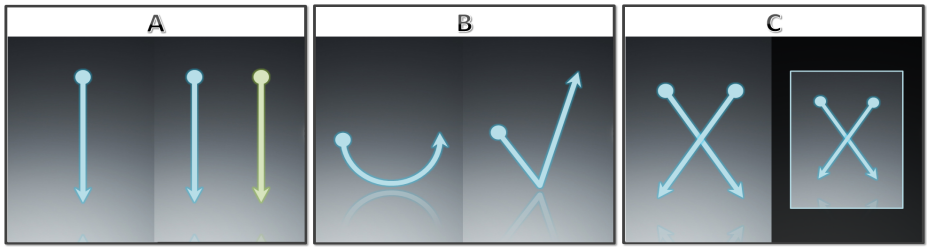

Fig. 1. Example finger gestures. Gestures are varied systematically according to A) fingers involved, B) number of strokes, C) available drawing surface

We hypothesize that with increasing complexity of the gestures and decreasing space to draw them, accuracy will deteriorate, especially so among older users. From the preliminary results, constraints on complexity, minimum space and form of gesture (finger vs. tilt) are derived for elderly users in order to delineate a gesture space suitable for older users. This research contributes to the development of technologies which are suited to the needs of the elderly, empowering them to make use of technology which can help them to ease their daily routine.

References

1. Statistisches Bundesamt. (2006). 11. Koordinierte Bevölkerungsvorausberechnung Variante 1-W1. Retrieved from: http://www.destatis.de
2. Fisk, A. D., Rogers, W. A., Charness, N., Czaja, S. J., & Sharit, J. (2004). Designing for older adults. Boca Raton, USA: CRC Press.
3. Charness, N., Holley, P., Feddon, J., & Jastrzembski, T. (2004). Light pen use and practice minimize age and hand performance differences in pointing tasks. Human Factors, 46(3), 373-384.
4. Murata, A., Iwase, H. (2005). Usability of touch-panel interfaces for older adults. Human Factors, 47(4), 767-776.
5. Rogers W. A., Fisk, A. D., McLaughlin, A. C., & Pak, R. (2005). Touch a screen or turn a knob: choosing the best device for the job. Human Factors, 47(2), 271-288.
6. Vercruyssen, M. (1997). Movement control and speed of behaviour. In A. D. Fisk W. A. Rogers (Eds.), Human Factors and the Older Adult (pp. 55-86). San Diego: Academic Press.