Chapter 19

USER MULTITASKING
WITH MOBILE MULTIMODAL SYSTEMS

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Abstract
Users of mobile systems often simultaneously perform some other task, and multimodality tends to give them greater opportunities to do so. One goal in the design of mobile multimodal systems should therefore be the support of effective user multitasking. Previous research in several areas has made many contributions that are relevant to this goal, but some key issues require further work. Using the example of voice dialling with a mobile phone, we discuss task analyses of two voice dialling methods, showing how such analyses can help to identify possible obstacles to the simultaneous performance of voice dialling and other tasks. Detailed observations of users doing multitasking, supplemented with survey results, confirm that these analyses capture important aspects of the multitasking problem; but also that users’ decisions and behaviour are strongly influenced by factors not covered by the task analyses, such as previous experience and beliefs about social acceptability. Conclusions are drawn concerning the implications of this research for design methods and for future research in support of user multitasking.

Keywords: Multimodal systems; Mobile computing; Multitasking; Task analysis; Eye tracking.
1. The Challenge of Multitasking

Mobile interactive systems - for example, handheld and wearable computers, as well as motor vehicle driver interfaces - raise a usability challenge that is encountered to a lesser degree in stationary systems: Users often try to use such a system while simultaneously performing one or more other tasks that are related to their current environment. For example, while performing a system-related task such as retrieving information from the web, checking email, or using a navigation system, the mobile user may want to perform an environment-related task such as shopping, conversing, or walking down a street. Whether the user switches back and forth between the two tasks or performs both of them concurrently without interruption, we can speak of user multitasking.

When a mobile system is also multimodal, the possibilities for user multitasking may be especially appealing: The ability to choose among different input and output modalities for the system-related task may make it easier for a user to perform an environment-related task simultaneously.

This chapter examines the implications of user multitasking for the design of mobile multimodal systems: How can we design such systems so as to ensure that users can successfully engage in the sorts of multitasking that they want to engage in?

1.1 Relevant Research Traditions

A number of research areas have yielded concepts, theories, and empirical results that are relevant to these questions - although, as we will see, some key issues are not yet well understood.

1.1.1 Motor vehicle driver interfaces. An area that has yielded much of the most directly relevant research concerns driver distraction in connection with in-car systems for drivers. Many empirical studies have examined the ways in which the use of such systems can impair driving performance, see, e.g., (Green, 2003). Some research has yielded explicit models of the relationships between driving and the use of in-car interfaces, see, e.g., (Wierwille, 1993) and (Salvucci, 2001). One way of viewing the goal of the present chapter is as that of extending this type of research to other types of mobile multimodal system, for which the practical consequences of unsuccessful multitasking are not as dramatic - although they can seriously degrade overall usability.

1.1.2 Industrial and engineering psychology. In the broader field of industrial and engineering psychology, which subsumes the area just mentioned, designing for multitasking has been the topic of much research in-