Chapter XXVIII
Multimodal Warehouse Project

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ABSTRACT

In this chapter, we present the Multimodal Warehouse Project, which aimed at applying multimodal interaction to a warehouse picking process. We provide an overview of the warehouse picking procedure as well as the overall architecture of the multimodal picking application and technologies applied to design the application. Furthermore, we describe the execution of user tests of the picking application at a warehouse and present the results of these tests. In this way, the authors hope to provide the reader with a better understanding of how multimodal systems can be built and the opportunities as well as the challenges of applying multimodal technology to real-world application scenarios.

INTRODUCTION

Multimodal interaction is described in the chapter “Multimodal and Federated Interaction” of this book as “… the use of more than one modality in a single interface.” In a pilot project, SAP Research applied multimodality to a warehouse picking process, where mobile workers collect goods into deliveries. The goal was to apply mobile technology combined with multimodal interaction in order to improve the user efficiency and accuracy (Raiyani & Kumar, 2006).

In this chapter, we will present the multimodal warehouse application and the pilot project we did at a distribution center for video games. The reader will get an insight into a possible architectural approach for building a mobile multimodal system. She will also see some of the advantages as well as difficulties of applying multimodal user interface (UI) technology in real life.
THE PICKING PROCESS

As goods make their way from a manufacturer to a customer, they are “staged” at warehouses along the way. When goods arrive at a warehouse, they are stored in their designated shelves. Thereafter, they are assembled into deliveries based on customer orders. A warehouse worker picks the items from the shelves according to a customer order. The worker reads the printed order form, selects the relevant items, and places them into a tote or a box. Once all the items have been picked, they are packed together and shipped to the customer. The entire process is illustrated in Figure 1.

THE MULTIMODAL WAREHOUSE APPLICATION

The warehouse system consists of two main parts: a multimodal user interface running on a handheld device (an Intermec 700 PDA), and a customer order application running on the server. The PDA is connected to the server over a wireless LAN. The setup is depicted in Figure 2. The communication between the multimodal user interface and the customer order application is handled over a wireless connection. The server may access order data from a data source. Both the multimodal user interface, as well as the customer order application, are described below in detail.

The Multimodal User Interface

The multimodal user interface runs inside a multimodal Web browser, which provides standard Web browser functionality such as HTML rendering and JavaScript handling. Besides that, it offers voice recognition and text-to-speech services. These technologies are provided by IBM voice technology (ViaVoice).

The multimodal Web browser also supports the XHTML + VoiceXML (X+V) standard (Axelsson, Cross, Ferrans, McCobb, Raman, & Wilson, 2004), which combines technologies...