Chapter 19

VoiceWeb: Spoken Dialogue Interfaces and Usability

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ABSTRACT

This chapter presents the state-of-the-art in usability issues and methodologies for VoiceWeb interfaces. It undertakes a theoretical perspective to the usability methodology and provides a framework description for creating and testing usable content and applications for conversational interfaces. The methodologies and their uses are discussed as well as certain technical issues that are of specific importance for each type of system. Moreover, it discusses the hands-on approaches for applying usability methodologies in a spoken dialogue web application environment, including methodological and design issues, resource management, implementation using existing technologies for usability evaluation in several stages of the design and deployment. Finally, the challenging usability issues and parameters of the emerging advanced speech-enabled web interfaces are presented.

INTRODUCTION

Research in human-computer interaction aims at gaining an in depth understanding of the nature and principles governing the interactive communication between humans and machines, so that this understanding may be utilized in the development of universally usable and useful interfaces that address and adapt to user rather than system needs. In this line of thought enabling the use of various modalities like speech, gestures, haptics and graphical displays as input and output to such systems should enhance naturalness and ease of use.

At the same time, advances in web technologies over the past years have significantly increased the range of practical applications suited for such multimodal interaction. With high speed inter-
net availability providing access to demanding multimodal services to all homes, a lot of people can now benefit from real-time services ranging from voice banking to online socialising and e-commerce. While most high-level services are provided solely through web pages and the traditional mouse and keyboard interface, there are, nevertheless, providers who have begun deploying spoken dialogue interfaces to new or existing web applications, acknowledging the fact that spoken dialogue is now widely considered to comprise a significant aspect of multimodal human-machine interaction and a means to increased customer satisfaction and naturalness of information access.

As with all human-computer interfaces, spoken dialogue interfaces are built with the target user in mind. Thorough requirements analysis and efficient design methodology are imperative in their case as well, especially if one takes into account the capabilities and limitations of current speech understanding technologies that should be compensated for in order to reach industrial standards. Not all technologies involved in the development process are of the same maturity and/or standardisation, and there is only a limited number of platforms available for building such systems. Thus, given the range, variability and complexity of the actual business cases it is obvious that the enabling technologies may produce working systems of variable usefulness due to design and/or implementation limitations. In addition, the use of a transient medium such as speech as the main input and output mode substantially differentiates spoken dialogue interfaces from traditional graphical user interfaces (GUIs) and web interfaces. Therefore, even though core usability principles may in general apply, there are particular to the development of speech based web interfaces considerations, principles, guidelines and techniques that simply render the direct translation of a non-speech user interface into a speech-based interface infelicitous. Indeed spoken dialogue far more enhances naturalness in comparison to using forms and buttons on a traditional web interface. However, is the user satisfaction similarly improved? Does the performance of the resulting application meet the user requirements? How is usability ensured by design and verified by evaluation in a spoken dialogue web interface?

This chapter discusses the background of speech-based human-computer interaction and elaborates on the spoken dialog interfaces and the ways they differ from traditional web interfaces. It explores what usability is and how it is ensured for natural spoken dialogue interaction interface design and implementation. Finally, it presents key methodologies for usability testing of spoken dialogue web interfaces and discusses some of the challenges posed by the use of speech as the main modality in light of a speech-enabled complex application.

**INTERACTING VIA SPOKEN DIALOGUE**

The term usability has been used for many years to denote that an application or interface is user friendly, easy-to-use. It applies to most interfaces, including web interfaces and more importantly speech-based web interfaces, and it can be assessed on both full system level and individual modules and processes level. Therefore, in order to evaluate usability it is important to first understand the design requirements and the architecture of such interfaces. In the following sections we describe the main interaction frameworks that the architecture of most speech enabled applications falls into.

**Multimodal Interaction Framework**

A general framework (Larson et al., 2003) for the description and discussion of multimodal interaction on the web is developed by the World Wide Web Consortium (W3C). It describes the input and output modes that can be used in a relational abstractive architecture that includes all component types required for the interaction.
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