

Accessibility heuristics utilizing learnability characteristics of synthesized speech applications

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Abstract

Most existing models for marketing of assistive technology concentrate on the development and improvement of product design and accessibility [10]. Instead, the Alt-Learning Project will concentrate on improving the delivery of assistive technology by providing information and tools concerning the learnability of screen readers used as an assistive technology. The Alt-Learning Project will integrate actual users of assistive technology within all aspects of the research methodology.

Introduction

Riemer-Reiss and Wacker [6] reported that over seventy-five percent of assistive technology is rejected within the first two years of use. Scherer [7, 10] attributed this high rejection rate not to problems with the technologies working as designed, but rather due to problems with the delivery of the products. Assistive technologies have the potential of helping and enabling people with disabilities, but often result in opposite outcomes of limiting, isolating, or making people feel more dependent on others.

The goal of the Accessible Learning Through Text-to-Speech Project (Alt-Learning Project) is to support the increased effectiveness and use of technology by people with disabilities by the identification of usability, accessibility, and learnability problems of users of text-to-speech applications. The study will result in a set of accessibility heuristics that are to be used by professionals responsible for the delivery of assistive technology while performing assessments, instruction, or other supportive services to people with disabilities.

Learnability

Learnability is a construct of language acquisition that measures a person's ability to acquire and use language skills [2]. Learnability theory encompasses areas of linguistics, developmental psychology, and educational theory. Measurement of a person's level of learnability is based on educational theories that describe learning as an active process involving social communication and the ability to utilize knowledge beyond the immediate moment or situation.

Learnability theories differentiate between the usability of a product and its learnability [5]. Key constructs of learnability include the ease of use of a product, gender

preferences, and the cognition needed by the user. The usability of a product relates to the enjoyment derived by the user and leads to the effectiveness of the product's use.

Paymans, Lindenberg, and Neerincx [5] found that a product can be found to be easy to use but at the same time not easy to learn. Even though a user understands the content of material or can perform an independent activity, they still may be unable to reapply the skills or knowledge from one activity to new activities later on.

Computer literacy

Computer-literacy is defined within two areas of performance, reading comprehension and navigation [3, 8, 9]. In order to access, understand, and effectively use information stored on a computer or on the Internet a user must be able to both access and comprehend electronic text and navigate a computer environment. While, computer-literacy may be difficult for users with normal learning capabilities, users of screen readers have been found to have additional learnability problems.

Understanding and comprehending human speech is dependent on two cognitive processes; the ability of somebody to understand individual words and their ability to comprehend the meaning of spoken phrases [4, 9]. Cahn [1] termed the quality of synthesized speech to render words that are understood as intelligibility and the quality of producing comprehensible phrases as comprehension. The listener's affect is the level in which they are able to learn how to interpret meaning of content or emotion from an orally produced sequence of words. Over longer periods of reading the persistency of the listener's affect must be sustained [9]. Information must be stored and retrieved from long-term memory, processed by working memory, and then restored to long-term memory.

Application designers use graphical interfaces to facilitate navigation, organize information, or to explain of content [3]. To make use of graphical images on computer systems, a computer user must be able to travel between screens, understand needed information to make navigational decisions, and ultimately retrieve and process the information desired to complete the original task. People with visual impairments have difficulty accessing computers because the graphical representations are incompatible with assistive technologies or because of the inability of the user to understand the graphical concepts.

Current status of the Alt-Learning Project

The problem that will be addressed in the Alt-Learning Project is the inability to perform accessibility usability evaluations of products that include applications of text-to-speech [9, 10]. Previous attempts of developing evaluative methods or instructional strategies that are effective for all users of assistive technology as a homogeneous population have not been successful. Users of screen reader applications are one of the fastest growing populations of users of assistive technology and include people with vision impairments, learning disabilities, language deficiencies, and physical and mobility impairments.

The Alt-Learning Project will use online focus groups to explore the problems of learnability of screen readers used as an assistive technology. The website is at www.wattenberg.biz/Alt_Learning_Project.htm. Findings of the study will include a list

of accessibility heuristics to be used by professionals responsible for the delivery of assistive technology. The heuristics will be used to develop instructional strategies or the matching of a technology with a person with a disability. Professional disciplines that may benefit from the Alt-Learning Project include, K-12 educators, community college and adult educators, rehabilitation counselors, speech pathologists, and other technical support specialists [7].

The Alt-Learning Project will include both users of screen readers and professionals responsible for the delivery of assistive technology. An online focus group will allow for the collection of data from participants as they would normally utilize their screen reader applications. In the final focus group, the researcher will present a set of accessibility heuristics derived from the previous focus groups. The group will discuss the validity of the proposed heuristics in terms of their trustworthiness, believability, and usefulness.

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