Chapter 1
Overview:
Important Issues for Researchers and Practitioners Using Computer Synthesized Speech as an Assistive Aid

John W. Mullennix
University of Pittsburgh at Johnstown, USA

Steven E. Stern
University of Pittsburgh at Johnstown, USA

ABSTRACT

A brief overview of the current research topics and future directions of research in the area encompassing CSS as used in augmentative and alternative communication for people with speech impairments. Issues that are especially important for practitioners who work with people with speech impairments are mentioned. This overview presents an integrated vision of research where practitioners need to be apprised of the latest research and technological developments and where researchers need to solicit feedback from practitioners in order to pursue fruitful future directions for research.

INTRODUCTION

Stephen Hawking is the most famous theoretical physicist of our generation. He is best known for books such as *A Brief History of Time*, *The Universe in a Nutshell*, and *On the Shoulders of Giants*, as well as hundreds of publications on topics related to theoretical cosmology, quantum gravity, and black holes. It is common knowledge that Dr. Hawking has suffered for over 40 years from amyotrophic lateral sclerosis (ALS), a disease of the nerve cells in the brain and spinal cord that control voluntary muscle movement. As a result of this disorder, Dr. Hawking lost the ability to speak many years ago. As he describes it:

*The tracheotomy operation removed my ability to speak altogether. For a time, the only way I could communicate was to spell out words letter by letter, by raising my eyebrows when someone pointed to the right letter on a spelling card. It is pretty difficult to carry on a conversation like that, let alone write a scientific paper.* (Hawking, 2009)

Eventually, Dr. Hawking was put into contact with developers working on early versions of speech...
synthesizers for use by people with speech impairments. Dr. Hawking describes the apparatus he adopted for use:

... David Mason, of Cambridge Adaptive Communication, fitted a small portable computer and a speech synthesizer to my wheelchair. This system allowed me to communicate much better than I could before. I can manage up to 15 words a minute. I can either speak what I have written, or save it to disk. I can then print it out, or call it back and speak it sentence by sentence. Using this system, I have written a book, and dozens of scientific papers. I have also given many scientific and popular talks. They have all been well received. I think that is in a large part due to the quality of the speech synthesizer... (Hawking, 2009)

Dr. Hawking started out using a system controlled with a hand switch that allowed him to choose words by moving a cursor through menus on a computer. Later modifications involved infrared beam switches that respond to head and eye movements. For many years, Dr. Hawking was satisfied with the “voice” provided by his Speech Plus™ synthesizer. However, a few years ago Dr. Hawking had a change of heart and decided to upgrade his speech synthesizer to one marketed by Neospeech™ that outputs a more realistic and natural sounding voice (www.neospeech.com/NewsDetail.aspx?id=50).

The story of Stephen Hawking is a heartwarming and uplifting story for many reasons, one of which, of course, is the triumph of human will and spirit over difficult circumstances. For those of us who research and develop speaking aids or who work with clients using speaking aids, however, his story offers great encouragement because it illustrates how a severe speech impairment can be dealt with through computer technology. Dr. Hawking has faced the same obstacles and issues that numerous persons with speech impairments have encountered when they have decided to adopt a computer-based speaking aid. Dr. Hawking has firsthand knowledge of some of the limitations of this technology and he has participated in the same decision processes that many people with speech impairments go through when they decide whether to update their speaking device or not. So in many respects, his story stands as a good example illustrating some of the major issues surrounding the use of computer-based speaking aids.

Stephen Hawking is not alone. There are many people around the world who suffer from disorders that result in various degrees of speech impairment. Some disorders are present from birth, such as cerebral palsy or disorders tied to intellectual disability, such as fetal alcohol syndrome or Down’s syndrome. There are neurological disorders that do not show themselves until later in adulthood that have a severe impact on speech, such as ALS or Parkinson’s disease. There are articulatory disorders like dysarthria where speech is impeded by poor or absent control of speech articulation. And there are other situations where speech loss is acquired through a sudden and unexpected event such as stroke or accidents involving traumatic brain injury (TBI). When considering the circumstances surrounding a speech impairment, each of these situations comes with its own special set of circumstances and its own set of unique challenges that must be dealt with. Researchers such as those in the present volume who work on computer synthesized speech (CSS) systems or those who investigate the use of CSS in alternative and augmentative communication (AAC) systems realize only too well that “one size does not fit all.” This is one of the major themes addressed in the present volume by researchers who are concerned with how CSS is used in different populations with different speaking needs.

THE TECHNOLOGY

There exists a cornucopia of acronyms related to technologies designed to help people communicate and speak. The most general term is AAC, which is defined by the American Speech and Hearing
Related Content

Are Speech-Generating Devices Viable AAC Options for Adults with Intellectual Disabilities?

Question Answering and Generation

Computational Intelligence Using Type-2 Fuzzy Logic Framework

Some Issues on Capturing the Meaning of Negated Statements
Eduardo Blanco and Dan Moldovan (2012). *Cross-Disciplinary Advances in Applied Natural Language Processing: Issues and Approaches*  (pp. 103-113). www.igi-global.com/chapter/some-issues-capturing-meaning-negated/64583?camid=4v1a