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Speech processing in assistive technologies

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Speech processing, a subdomain of multimedia processing, has become an advanced part of computer science. For many decades scientists have analyzed speech signals, experimented with their recognition, conversion or synthetic generation, and they often gained outstanding results. Quite recently, researchers have started to use advanced speech processing in an assistive context, aiming to support people with disabilities or assist medical diagnosis and treatment. The number of people with various disabilities, in which speech processing techniques can be helpful, is enormous. According to data from 2015, globally, 1.33 billion individuals are estimated to exhibit hearing impairment of various levels, 940 million are visually impaired to some extent, 216 million people are affected by major depressive disorder and 25 million are affected by autism. The number of patients with diagnosed Alzheimer's disease increased from 21 million in 1990 to 46 million in 2015, which is one of consequences of aging in society. These numbers show the growing need for research in the area of assistive technologies, including the ones that incorporate speech processing. The talk will present an overview of the existing approaches to implementing speech processing algorithms in assistive technologies, and give representative examples of assistive solutions helping in various disorders, starting with dyslexia ending up with neoplasm. It will start with briefly characterizing the main subdomains of speech processing, such as voice modification, text to speech conversion, visual speech synthesis, automatic speech recognition and speech analysis and classification. Next, the most representative examples of applying those techniques in diagnosis and therapy of various disorders will be described. Also examples of speech processing-based applications assisting in everyday life of people with various disabilities will be presented. The talk will be concluded with a summary, presenting the most probable future trends in applying speech processing techniques in assistive technologies.

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