Information for research project

Call: Competition for financial support of basic research projects – 2022
Main scientific area: Technical sciences
Contract No: № КП-06-Н67/1
Initial date and duration of the project: **12.12.2022 for a period of 3 years**
Project title: Innovative methodology for integration of assistive technologies in speech therapy for children and adolescents
Research organization: Institute of Robotics, Bulgarian Academy of Sciences
Partner organizations: South-West University “Neofit Rilski” University of Library Studies and Information Technologies
Principle investigator: Anna Lekova, prof. PhD

Abstract of the research project

The lack of speech therapists and an appropriate structure for speech therapy in kindergartens and schools can be critical for children and adolescents with communication disorders (CD). The development of social robotics and augmented reality allows scientists to look for innovative technological solutions to assist speech therapists. Scientific research shows that robot-assisted therapy and virtual reality improve the skills of children with CD but their limited application is probably due to lack of methodological and ethical guidelines for use, an ergonomic model for programming, as well as lack of quantitative assessment of the efficacy of this type of therapy. Expectations of people for greater robot autonomy, as well as human-like speech recognition and reproduction, lead to the conclusion that Artificial Intelligence (AI) and cloud technologies are key assistive technologies. Therefore, we propose development of a Methodology for game scenarios design for speech therapy enhanced with assistive technologies, which will create innovative thinking in speech therapists on how to integrate socially assistive robots, augmented reality technologies and natural language processing into their practice for a complete perception and knowledge via action and experience.

The goal of the project is research and development of an innovative methodology for speech therapy assisted by social robots, augmented reality, cloud services and natural language processing, which will support: (1) children and adolescents with CD in the acquisition and practice of speech, language and social skills in an innovative environment and (2) speech therapists in designing structured game scenarios in the physical, digital and virtual worlds through an open platform for synergic integration of the assistive technologies.

The project will provide an opportunity for scientists to analyze the development of the assistive technologies and solutions for integration of more than one assistive technology in an open platform with an ergonomic model for use will be searched. Analyzing new social robots, new technologies for virtual and mixed reality, the potential of visual programming, as well as new methods for quantitative evaluation of attention, engagement and emotions of children and adolescents with CD via tracking of non-verbal social cues, are key studies and will enable the development of the innovative Methodology and Platform proposed in the project.

Another key innovation that will be analyzed is generation of human-like speech in the Platform. The rapid development of large language models with a generative pre-trained transformer (GPT) will allow development of the functionality of assistive robots to understand, generate and speak a text.

Efficacy of the proposed methodology for speech therapy is expected to be proved through the planned experimental studies and quantitative evaluation of the results, and based on the Methodology proposed at the end of the project - the possibility for speech therapists to independently combine assistive technologies and design game scenarios. An ethical framework for use of the Platform will be created, through which possible risks related to the use of AI, personal data and protection of the fundamental rights of individuals will be analysed.