Project No

E! 114156

Breaking Barriers: 360 Educational Adaptive Platform For Children With Special Needs

Funding Programme

Eurostars

Project Start Date

01.10.2020

Project End Date

28.02.2022

Coordinator

Smile & Learn

Partners

SESTEK

Objectives

“Breaking Barriers,” as the name suggests, is an e-learning project that facilitates a gateway to eliminate the burdens of accessing education for kids with special educational needs (SEN).
The platform provides a personalized learning experience for kids with SEN through its 360-degree content and tailor-made AI tools.
The delivered platform is equipped with a state-of-the-art recommendation engine that uses Artificial intelligence to recommend learning paths based on children’s needs, a learning analytics system with advanced features to track and adapt the learning experience, and speech processing tools to enable interactivity and accessibility.

SESTEK’s Ambition to be a Part of This Project

- New interaction features developed by SESTEK: speech recognition, voice activity detection, and text-to-speech with a focus on “Breaking Barriers” in accessibility through innovative solutions.
- Recognizing the substantial demand for an education platform, customizing speech processing technologies for diverse SEN learners.
- Development of a 360-degree adaptive educational mobile platform for SEN children aged 3-12 years, leveraging user experience.

Project Rationale

- Children tend to spend a long time on low platforms for education with low-value content.
- Children with visual impairments, motor disabilities, intellectual impairments autism spectrum disorders (ASD) necessitate special education.
- Personalization of education by taking into consideration age and special needs. Resources (time and knowledge) are limited for such an educational system to proceed at home or school.
- Technology offers significant opportunities for children with special educational needs. Current applications fall short of providing a personalized educational experience.

Scope

During the project's implementation, SESTEK adapted speech processing models to align with the unique characteristics of children's speech, while its partner, Smile & Learn, developed the interfaces and educational content for mobile applications across different operating systems (IOS and Android).
Feedback obtained from students, teachers, and parents participating in the pilot tests conducted by Smile & Learn in schools in Spain was communicated to SESTEK. Subsequently, enhancements were implemented in the modules based on this valuable input.
The project targeted four groups of Special Educational Needs (SEN) learners: those with visual impairments (ages 3-14), motor impairments (ages 3-21), intellectual impairments (ages 3-21), and Autism Spectrum Disorder (ASD) (ages 3-45).
Upon completion of the project, the modules were made available in Turkish, English, and Spanish.

Novelties for SESTEK

Speech Recognition for Children's Voices: Recognizing the unique characteristics of children's voices, which differ from those of adults due to factors such as a shorter vocal tract, shorter vocal cords, higher base and formant frequencies, and variable speech speed and pronunciation.
Voice Activity Detection is tailored to interpret nonverbal confirmation/ disapproval expressions from children with motor disabilities.
Adapting the language model to accommodate children's voices, thereby expanding its user base and enhancing the diversity of models and databases.

Sestek’s Role & Achievements

- Customization and adaptation of speech recognition, voice activity detection, and speech synthesis modules were carried out to meet the specific project requirements, ensuring accessibility for human-machine interaction across all major operating systems (Windows, iOS, and Android).

- Classification studies were conducted to assess the voice activity detection performance in the speech of children with motor disorders. Additionally, the impact of non-human voices on speech recognition was observed through experiments involving different datasets and six distinct Voice Activity Detection (VAD) models, achieving an impressive 99% accuracy.

- The project successfully attained a 96.76% success rate in speech recognition. The method was chosen explicitly with the target audience in mind, catering to children with speech disorders.

- A data augmentation approach was implemented to optimize the speech recognition module for children's speech patterns—this involved frequency adjustments and utilizing an artificial neural network-based method to generate synthetic children's voices.

- The project involved the construction and integration of speech recognition (SR), text-to-speech (TTS), and voice activity detection (VAD) modules, creating a comprehensive and cohesive system.

Smile&Learn User Interface