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A New Sunrise for Speech Therapy: SoundRise Application

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***Abstract*— SoundRise is a web-based application designed to support individuals with communication difficulties, especially children. By analyzing vocal characteristics and providing real-time visual feedback via an animated sun, the application supports users in improving vocal control, intonation, and articulation, facilitating independent practice between speech therapy sessions.**

***Index Terms*—** speech therapy, web-app, timbre analysis

I. INTRODUCTION

SoundRise is a web-based application developed in React JS, using the Web Audio API, designed to assist people with communication difficulties, especially children. The interface features a stylized sun representing the user's voice which is animated based on the tonal and timbral characteristics of the user's voice. The application analyzes these vocal features and provides corresponding real-time visual feedback. SoundRise is designed as a support tool in speech therapy to help people improve vocal control, intonation, and articulation independently. Many individuals with hearing impairments or developmental speech delays, children in particular, struggle to perceive and control their voices, thus to modulate intonation, and to articulate and produce sounds correctly. For this reason, immediate and clear feedback on vocal performance is necessary.

II. METHOD

SoundRise provides multimodal feedback on vocal performance, combining visual and auditory cues to create an external representation of the user's voice, through the extraction of tonal characteristics and vowel formants from the vocal input. The visual feedback, represented by an animated sun, helps users construct a mental model of their voice control, making abstract vocal concepts tangible and easier to manipulate. By visualizing their vocal output, users can understand how different adjustments to pitch, volume, and timbre influence the sound they produce, fostering a deeper understanding of vocal dynamics and allowing users to experiment and refine their skills. Furthermore, the application is intended to be useful during a speech therapy treatment, in particular between one session to the next, to give the patient the opportunity to practice independently and to progress faster and gain more confidence. For this reason, SoundRise is a web application accessible from any device connected to the Internet, thus allowing users to practice whenever they want.

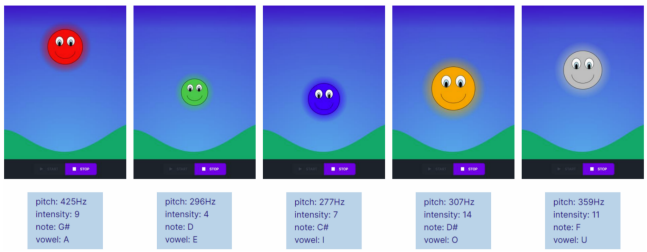

Figure 1: SoundRise GUI showing the behaviour of the sun in relation to the voice parameters.

III. DISSEMINATION

Preliminary tests with SoundRise have been conducted at a local music school and also during Science4All,[1] a University outreach event of European relevance, that reached over 20000 visitors. The results achieved showed good performance, especially in the usability aspect, although they highlight a need for improvement in vowel recognition.

IV. FUTURE DEVELOPMENTS

Future developments primarily focus on vocal timbre analysis. Accordingly, we can summarize future developments as follows:

1. enhance vowel recognition by focusing on vocal timbre analysis, extending to adult age groups and supporting wider timbral variations across adult gendered voices, using machine learning systems for recognition and adaptation of formant values;
2. develop a backend that can be used by the speech therapist who follows patients, for monitoring and analysis of individual progress over time for personalized exercises, and for the enhancement of features for recording and reviewing practice sessions;
3. improvement of accessibility support for different languages.

[1] https://science4all.it/