A-E-I-O-U - TILTIFICATION DEMO FOR ICAD2023

Katharina Groß-Vogt

Institute of Electronic Music and Acoustics (IEM)
University of Music and Performing Arts Graz
Austria
vogt@iem.at

Carmen Jenny Rieder

Institute of Electronic Music and Acoustics (IEM)
University of Music and Performing Arts Graz
Austria
rieder.carmen.jenny@gmail.com

ABSTRACT

This short paper describes a contribution to the Sonic Tilt Competition at ICAD 2023. The parameter mapping approach uses vowels as the base for an intuitive, prosody-based sonification. We realized the project as demo version in SuperCollider, and end with ideas for a better fine-tuning and implementation in pd Vanilla.

1. INTRODUCTION

Following the call for the Sonic Tilt Competition at ICAD 2023, we implemented a different sound design for the tiltification app as presented in [1, 2]. During a seminar in sonic interaction design at the IEM (Institute for Electronic Music and Aocustics in Graz) in winter term 2022/23, the authors discussed and explored a variety of different solutions for a new tiltification app. This paper presents one approach in the form of a demo version realized in SuperCollider.

Vowels have proven high potential in sonification, as they are psychoacoustic entities we are specialized to listen to. Furthermore, using vowels allows us to communicate about a sonification, both in the context of exploring new data [3] and for supporting a quick, language-free, explanation of a user interface.

Furthermore, different experiments have shown the power of using prosodic cues in sonification. For instance, Tuuri et al. [4] showed that runners understand prosodic cues (without explicit language), and the messages furthermore have a motivating effect.

We thus implemented vowels and prosodic pitch and amplitude envelops to create an intuitive sound mapping that is depicted in Fig. 1. Find a demo video at `https://phaidra.kug.ac.at/o:130570`.

2. MAPPING

The basic mapping of our approach is depicted in Fig. 1, that shows the x- and y-axis corresponding to roll and pitch of a mobile phone.

Timbre and vowels

When tilted extremely at either side of these axes, we use the vowels “o”, “i”, “oo”, and, respectively, “e”. In the center, we use the vowel “ah”. The x-axes, blending “o->ah->oo” employs a bass voice, the y-axis, “’i->ah->e” a soprano voice. The vowels used stem from the SuperCollider Vowel class [5], and we use

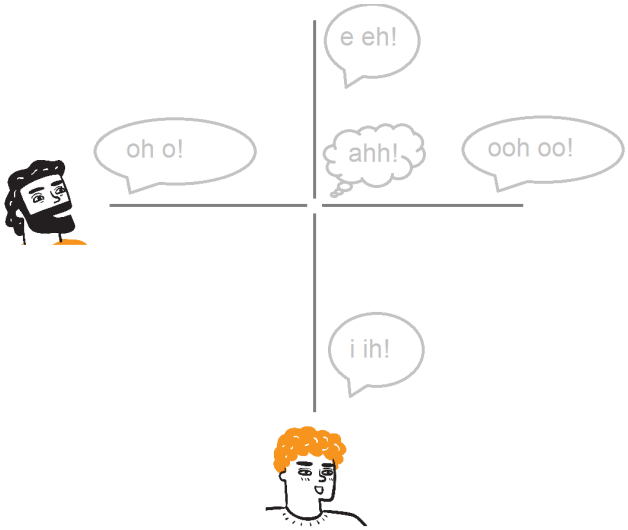

Figure 1: Basic mapping of the a-e-i-o-u sound design. The two axes (corresponding to roll and pitch of a mobile phone) are depicted as x- and y-axes. Singer sketches for the two voices used (bass, soprano) are taken from: `https://www.freepik.com/free-vector/best-friends-are-singing-playing-guitar_13571681.htm`

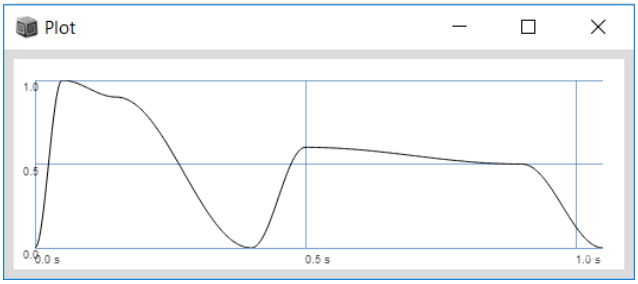

Figure 2: Amplitude envelope used for the prosodic “oh o!”-gestalt.

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one fundamental frequency for each voice. While mixing several harmonies created a better soundquality, the recognizability of the vowels suffered too much.

Rhythm and envelope

Furthermore we use a rhythmic effect, following the prosodic gestalt of "oh o!", an interjection, that equally works with "ih i'!', "ooh oo!", and "e eh!", to show that something is wrong but nothing serious. The basic envelope is shown in Fig. 2. The rhythm prolongs as a function towards the center, where it becomes an affirmative "ahh!" in the center area with a one-bump-envelope.

Amplitude mapping and silencing

We use an amplitude mapping to soften the bass or soprano voice when moving away from the respective axis. As the fundamentals of the voices are at different frequencies, these are compensated to appear equally loud.

Furthermore, to convey the exact center position, we use silence. The amplitude drops rapidly when close to the exact balanced/middle point. This mapping would afford the tiltification app to be played at defined amplitude or even calibrated depending on the environment's noise. Despite these drawbacks, the demo version showed that this mapping is clear and silence is evidently least annoying. It feels rewarding to find the absolute zero amplitude at the middle.

We think that the presented mapping is very intuitive and works across language barriers. The only information for users needed would be an a-e-i-o-u -map as in Fig. 1 that could be shown on the mobile phone's screen.

3. OUTLOOK

We know that our demo implementation is only a first mockup design, but it was not within the scope of this project to do more fine-tuning, especially not in SuperCollider. In case you approve of our general concept, we would further suggest the following improvements:

- The affirmative "aah" is at the moment a mixture of bass and soprano voice. This results in a blurring of the vowel perception, therefore only one voice should be used in the center, giving again timbral information on which axis is less close from the balance/ middle point.
- At the moment, the "Eh" and "ih" vowels of the soprano voice are not very clear. We plan to adapt the vowels in order to make them better recognizable. The dynamic treatment of formants levels in the attack phase of the sound seems most promising to reach this goal.
- In general, the sound quality of the voices could be approved adding a harmonic spectrum, treating the transient phase of the attack of the sound specifically- dynamically changing the formant filters-, and, perhaps, adding a slight singer's vibrato.

Realizing this app in pd, we are happy to be surrounded by some of the leading pd developpers at the IEM. The code is surely codeable within pd Vanilla, based on formant tables, and not too demanding for the CPU on the mobile phone.

4. REFERENCES

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Figure 3: Inscription left by Emperor Frederik III in Graz/ Austria. © Land Steiermark/Binder

5. APPENDIX : A-E-I-O-U

Excuse for a short historic excursus. In 1452 Emperor Frederik III was crowned Holy Roman Emperor. He chose our hometown, Graz, as residential city and left at many places there a mysterious inscription "AEIOU", for instance see Fig. 3 . [1]. Inspired by this, we chose this name for our tilitification app proposal.

[1] Only recently, the meaning of these inscpriptions has been discovered to be "Beloved by the elect, feared by the unrighteous" [6]