

TILT TO THE BEAT: A SONIFICATION SCHEME FOR THE SONIC TILT APP

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ABSTRACT

Sonification is a great tool, but it has still not been used to its fullest potential. [1] This is especially true for constrained sonification that only has access to mono audio output, and not stereo. A well-designed sonification app can be of great utility specially for the differently abled. In this manuscript, we present *Tilt to the Beat*, a sonification scheme for the spirit-level Sonic Tilt App [2]. The current sonification scheme of the Sonic Tilt app uses Shepard tones, and fluctuations in amplitude and roughness. However, the scheme lacks precision, and is unpleasant to the ear. We introduce our solution, that is pleasant, intuitive and precise. It is a simple scheme that rhythmically plays 4 beats, and uses the fluctuations in the melodic contour of the notes and the note duration to provide feedback to the user with regards to the tilt along the two axes.

1. INTRODUCTION

The Sonic Tilt app is meant to be used as a spirit-level app, conveying the pitch and the roll angle of the phone to the user. The app provides a visual interface as well as a corresponding sonification scheme. Due to the current sonification scheme being unintuitive and unpleasant, the Sonic-Tilt Competition 2023 (<https://sonification.uni-bremen.de/competition.html>) was conducted at ICAD2023. The requirements from the sonification scheme are such that it should be easy to learn and understand, super-precise, engaging and fun-to-use, and pleasant to listen to. The aim of the app is to be used for tasks like leveling a surface like a table, aligning a painting, taking a horizontal photograph etc.

We identified one key aspect of the sonification scheme to be the orthogonality between the two axes. The sonification of each axis should not interfere with that of the other. Due to this reason, it becomes essential for the scheme to be simple. This will also ensure that a new user can intuitively learn and understand how to use the app. Hence, we have kept as few components in the scheme, while conveying the most amount of information through it. For this, we have used a rhythmic beat of 4 notes, and caused fluctuations in the pitch and duration of those notes for conveying the pitch and the roll angles.

Care has also been taken to ensure that the scheme directs the user towards zero from both axes, and that the sound is the most pleasant at zero. For this, the possible pitch-roll values have been divided into concentric circle-like regions, and a short, positive or negative feedback is provided to the user in the form of a happy ding or a sad woop, based on whether they have gone from a farther region to a closer region and vice versa. Finally, a victory tune is played when the user reaches zero, providing clear and precise feedback for reaching the goal.

2. SONIFICATION SCHEME

The key elements of the Sonification Scheme have been elaborated upon in the following sub-sections.

2.1. Melodic Contour

The four notes form either a rising sequence or a falling sequence. The pitch interval between the notes tells the user how close they are to origin along this axis. As they head in the positive direction of the roll, the first three leading notes becomes higher pitched, and vice versa. At the origin, all four notes are the same.

2.2. Note Duration

The duration of the notes tells the user how close they are to origin along this axis. At the origin, all four notes happen very close to each other. The sequence itself always starts on the beat, i.e with relation to a global constant tempo. It is the sustain duration of the notes in the sequence which changes.

2.3. Concentric Regions

The tilt-space has been divided into concentric circles, and feedback is provided to the user once they go from one region to another. This is in the form of a positive "ding" sound, or a negative "woop" sound, depending on whether the user is going closer or further to the origin.

2.4. Victory Tune

In order to tell the user that they have levelled the surface by reaching the origin, a victory tune is played, which stops if the user is no longer at the origin.



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3. DISCUSSION

Tilt to the Beat uses a simple, yet effective approach to solving the problem of creating a sonification scheme for the Sonic Tilt App. It maintains orthogonality of the axes, providing intuitiveness. It's simplicity also makes it pleasant to listen to, despite the lack of anything particularly musical. It suffers from some precision issues near zero, but the victory tune ensures that the user can use it precisely.

4. REFERENCES

- [1] N. M. Ziemer, Tim Jadid, "Recommendations to develop, distribute, and market sonification apps."
- [2] A. et al., "Tiltification — an accessible app to popularize sonification."