Appendix: Project Abstract

Using Sound Cue to Improve Time Perception Accuracy in Data Sonification

This project is set my capstone project, and my goal is to verify whether a certain approach which helps users to gain a higher time perception accuracy is actually effective.

Abstract

Formal research showed that people’s perception of time is significantly less accurate compare to perception of pitch while listening to a sonified data chart. In this work, I propose adding a repeating sound cue to the data signification. Such sound cue serve as a reference to people’s perception over time while listening to a sonified data chart, similar to grids serve as a reference to people’s perception over space in visual modality. Also, I will use within subject experiments to test if this design approach could improve people’s perception of time while hearing a sonified data chart.

Method:

In this research, each participant will be shown 7 data chart, four are a set of visualized chart and sonified chart for the same data set(A), one is a visualized data chart(B), and two are sonified data chart(C).

Researcher will provide participant with A, for each set the participant could spend up to 5 minutes to probe the sonified data chart to have a basic familiarity with the data sonification. Afterwards researcher will present B, and ask participants to duplicate it on a dotted paper. After that, based on the experiment design, participant may hear C-1 with the sound cue and C-2 without the sound cue, or the opposite. And participants will be asked to draw down what they hear on a dotted paper.

In the data sonification, we use pitch to represent Y-Axis, and time to represent X-Axis. And the pitch we use is from 1000 Hz to 7000 Hz, which is a relatively safe area for pitches. Participants could adjust the volume on the test machine as they see fit. The data chart we are using in the test includes a sine curve Y = Sin(X), a flat line (Y = 0.5), and a straight line (Y = x). And other similar data chart created from simple math formulas.

Risk Assessment

It is known that certain noise exposure will be harmful to health, causing potential hearing loss, focus waving, bad mood and even weaker immune system. In our research, we only use safe sound frequence from 1000 Hz to 7000 Hz, in less than 50 dB which is lower than daily talking loudness. Also, we limited each exposure session for less than 2 minutes, and between each session there will be a 3 minutes rest time. The overall exposure time is about 10 minutes, which is considerably safe.

Also, we would verbally remind participants to tell the investigator if they feel uncomfortable because of the sound played during the experiment, and investigator will stop the experiment immediately.

Reference:

1. Government guideline of hearing protecting in working environment <http://labor.alaska.gov/lss/pads/noise.htm>
2. Another government guideline (United State Department of Labor, Occupational Safety and Health Administration) of hearing protecting in working environment <https://www.osha.gov/SLTC/noisehearingconservation/healtheffects.html>
3. Wikipedia regarding health risk caused by noise <https://en.wikipedia.org/wiki/Health_effects_from_noise>