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Dicriminability of high-resolution audio with regard to the quantization accuracy'

Masanobu MIURA

Kunitachi College of Music, Japan

ABSTRACT

The high-resolution audio has been popular for commercially-sold music delivery services. The high-resolution audio is characterized in both the over 20Hz components and high-quantization accuracy. This presentation focuses on the quantization accuracy in terms of the discriminability of the difference on quantization accuracy. In particular, here employs 24 bits and 16 bits format's audio as experimental stimuli, where the ones of 16 bits are created by conducting downbit-processing for commercially sold 24 bits audio. Three methods of downbit-processing are employed. 10 university students were asked to listen to the audio and to answer the format, as 24 or 16. The stimuli are simultaneously presented to listeners through headphones. Then the listeners were asked to answer the sound image localization. This method is newly employed here. The method has an advantage that listeners are possible to compare the sound simultaneously and to answer the sound image locations, which is thought as easier to rate than to the conventional listening experiment, just presenting each by each. The experimental result shows significant difference on the discrimination on the difference of audio format. The factor why people are possible to discriminate will be discussed on the conference venue.

Keywords: High-resolution Audio, Discriminability, 24bit, 16bit

1. INTRODUCTION

The high-resolution audio has been popular for industrial music commerce. The high-resolution audio has finer resolution on either or both time and amplitude. Here focuses on the resolution from the quantization. The discriminability of the resolution on quantization is discussed here. On the conventional method ABX method, subjects are asked to rate two distinct sounds that are presented each by each. In case of using lowbit and highbit sound sources, in particular 16 and 24 bit, subjects feel usually the difficulty of the difference between them, since the difference of resolution of the sound is perceived as weaker than the consistent context of the music. To cope with the problem, we proposed a method to use sound localization using headphone presentation, where the 16 or 24 bit sound on consistent context is presented either left or right channel. The listeners are asked to rate the sound image localization. If the sound image is localized neither left nor right side, the subjects are assumed that he/she can perceive the difference of 24 and 16 bit. On this report, we examine the possibility of the sound image localization when using 16 and 24 bit audio on each ear side for consistent music context.

2. DOWNBIT PROCESSING

The stimuli of the sound image localization are the modified sound sources of original commercially sold music. The music of the original sound source is a performance of wind orchestra, played by the Japanese professional wind-orchestral band. Original music's format is 48000Hz with 24bit. Three types of downbit processing are conducted for the original music. The three methods consist of three rounding from 24 bit to 16 bit by 1) up, 2) down, or 3) nearest step on 16 bit. Figs.1-3 shows each of the processings.

3. LISTENING EXPERIMENT

A listening experiment is conducted where four types of wind orchestra music are employed. On each of the stimuli, left or right channel is either 16 or 24 bit, labelled as (16-16, 16-24, 24-16,24-24). Length of each stimuli is approximately 30 seconds. Ten students (L_1 to L_{10}) belonging to engineering university participated in this test. They were asked to rate the consistency of sound image localization on the conductive two music. Results are shown on figure 2, where the correct answer rate is 44.38%,

being higher significantly (p<.05, chi-square test).

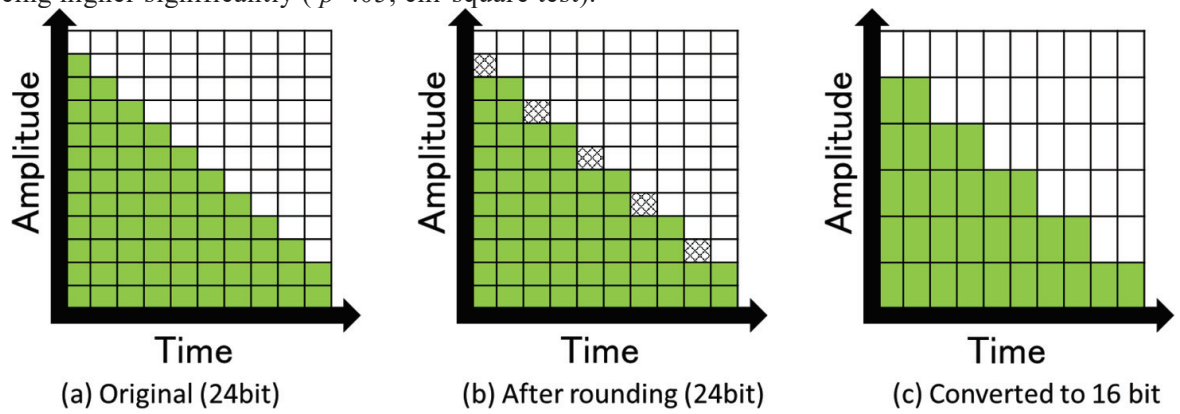


Fig.1 Rounding to upper step

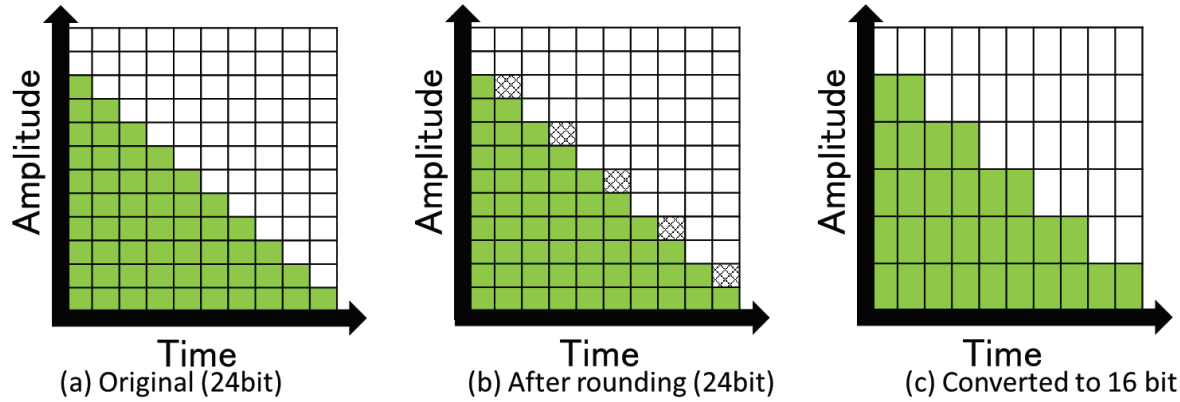


Fig.2 Rounding to lower step

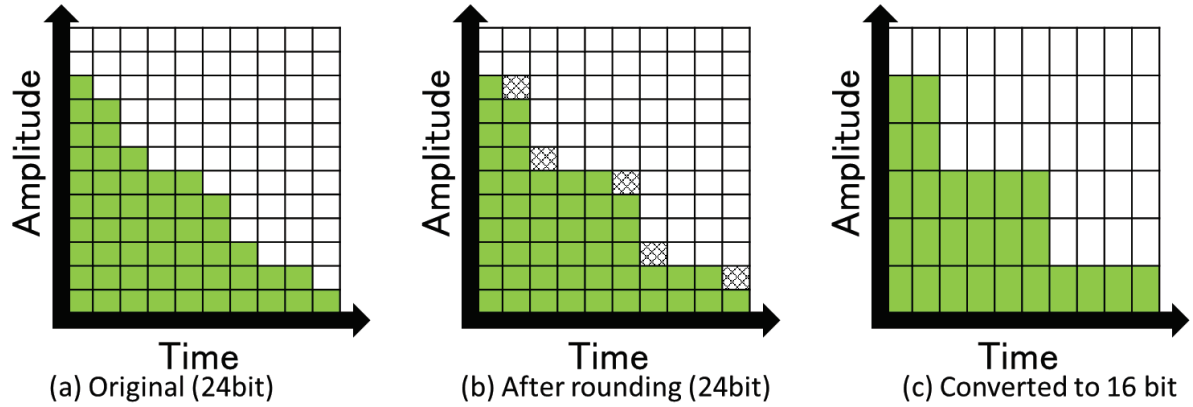
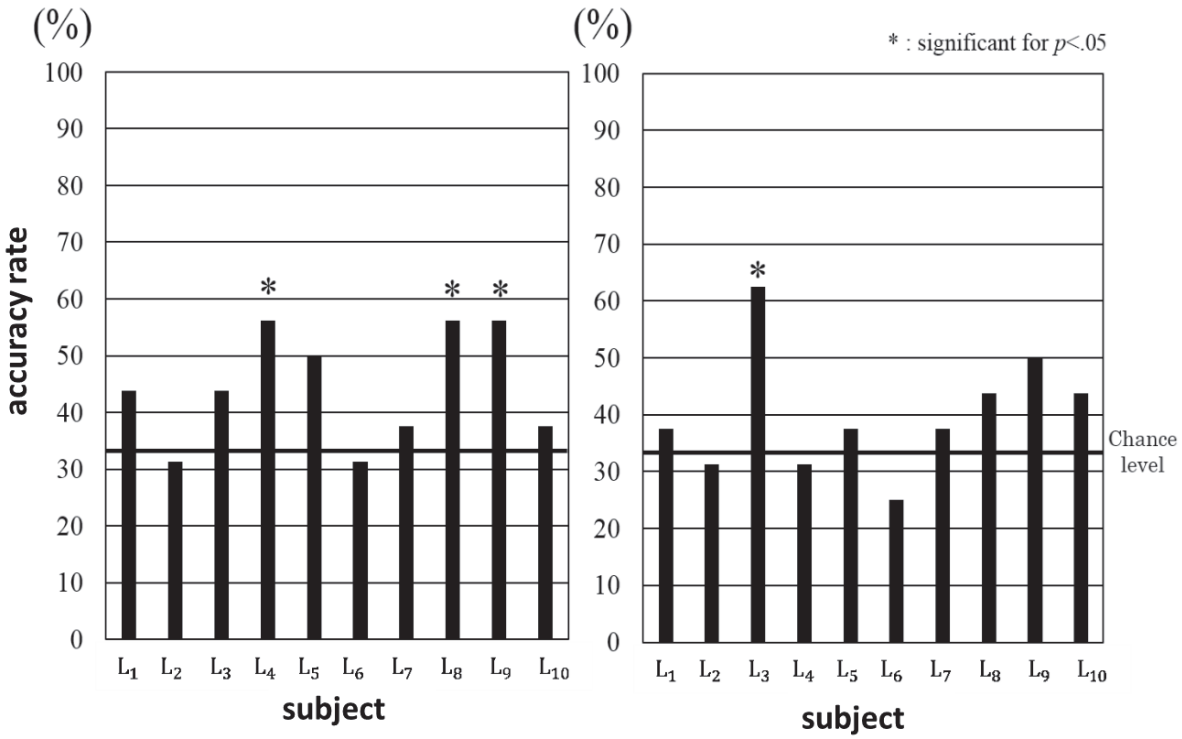


Fig.3 Rounding to nearest step

b)



(a) Result for the rounding 2). (b) Result for the rounding 3).

Fig.4 Results of the listening experiment.

4. DISCUSSION

As my colleagues reported that when using the rounding 1) and when using amateur musician's students[1], the average of correct answer ratio raises to 46.8% and five out of the ten musical students are significantly possible to answer correctly the sound image localization. Along with the results mentioned above, the possibility that people can discriminate the difference of sounds between 24 and 16 bit by listening experiments. I believe the result may be the new approach to discriminate two distinct sounds.

5. CONCLUSIONS

Here a new methodology using the sound-image localization to discriminate the difference of 24 bit and 16 bit sounds is presented. A possibility that people can discriminate the 24 and 16 bit sounds is introduced.

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REFERENCES

1. Akio Suguro, Masanobu Miura, "Quality discrimination on high-resolution audio with difference of quantization accuracy by sound-image localization", 2018 AES International Conference on Spatial Reproduction (2018).