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A Study on Bidirectional Control Parameters using Audio Signals Based on an Adaptation of a Virtual Reality Space for User's Emotion Change

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Abstract

In this paper, we present a parametric study to optimize sound quality by vectorising the values that change during position change in virtual space. This research can be used for various applications by parameterizing the positions of front, back, left and right of user created in virtual space. Especially, when the emotional consideration is considered in order to realize the characteristics of the space movement in virtual reality, it is possible to express more realistic features. These researches have recently made it possible to faithfully improve the information about the user's location by providing the audio and the voice in the images that pursue the spatial feeling of the virtual space. The parameter used in this study is implemented by adding the spatial feeling of the extended above and below in the parameters of the left and right change in the existing stereo voice. In order to implement the parameters, we use a vector that gives a sense of distance and apply the up and down to the position to express the characteristics of the sound.

Keywords: Virtual space, vector, up-down spatial parameters

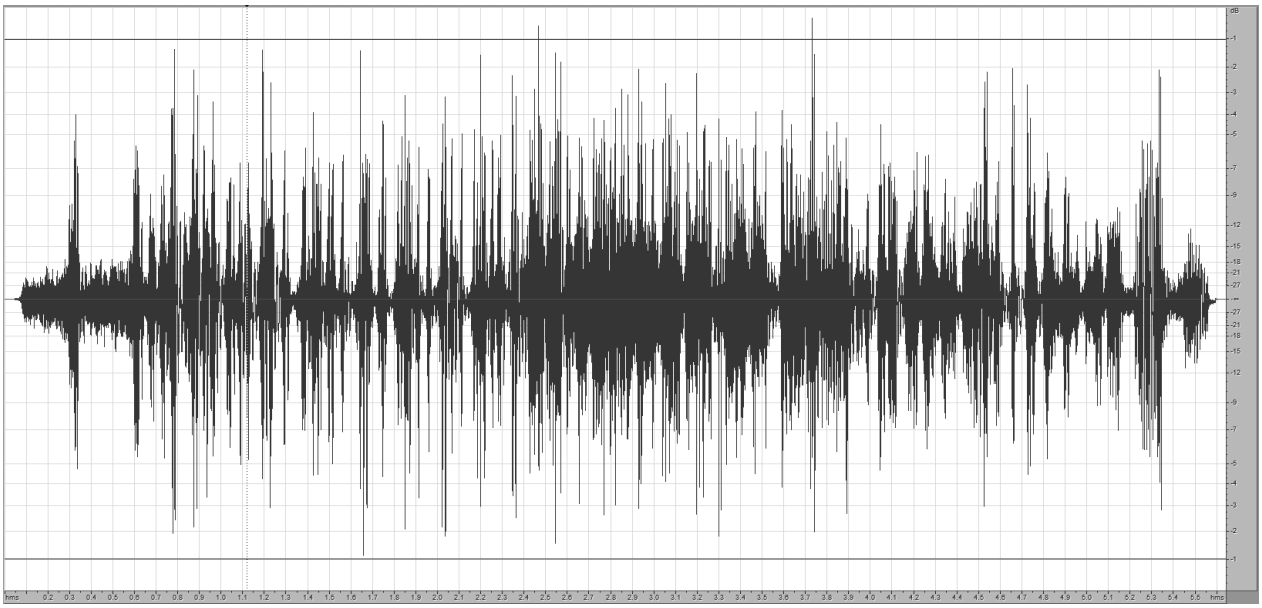
INTRODUCTION

As the quality of life increases with the development of society, various technologies are being developed. In recent years, research has been continuously conducted to communicate with machines using various technologies using the Internet. Although technology research is designed to be easy to use anywhere, it has a lot of research and development in a virtual environment in order to overcome these limitations because it has place and time constraints. This is a further development in the game sector, which shows infinite possibilities. It is true that they satisfy users' desires by eliminating the spatial constraints in the environment of virtual and making them active in various ways.

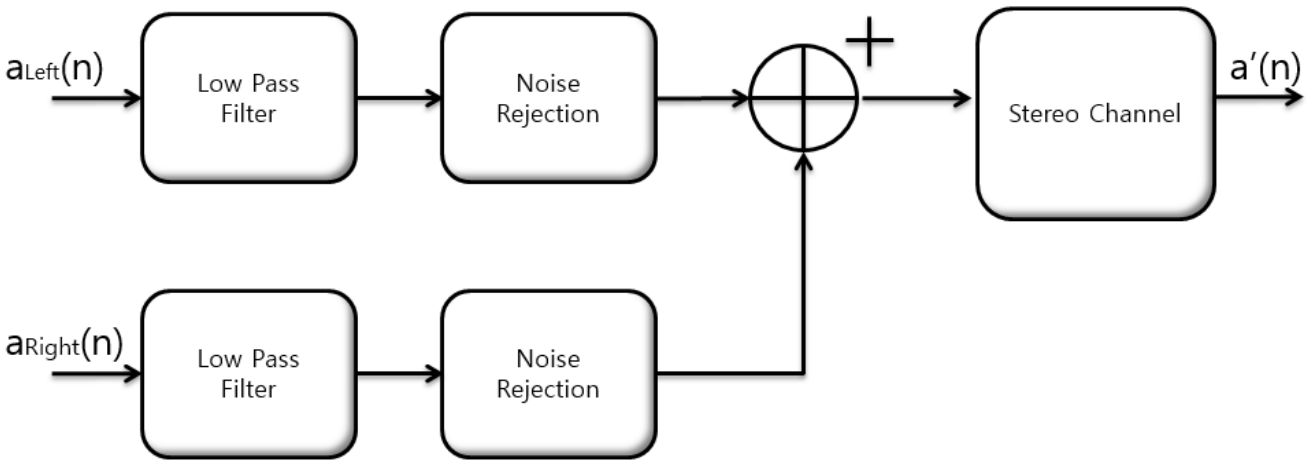
In recent years, the virtual environment has been making the environment more similar by applying the 3D effect, making the part about the fun and activity of the game more realistic. In the movie avatar created in the second half of 2000, it is the first time that real people enter, act and feel in the virtual space. In many countries, the game space and media using these virtual spaces are created and used in various places. I think it is important. In this trend, utilization of virtual space becomes more important, and emphasis on image accuracy is important. However, audio sound effect delivered through ears is very important factor. This is due to the fact that spatial changes caused by video position changes must be applied to the audio signal as well, resulting in a more realistic space. Therefore, in this paper, the characteristics of virtual space are analyzed and based on this, the research on the utilization of virtual space applying the sound effect according to the position change is carried out. In Chapter 2, we explain the characteristics of virtual space and the existing implementation method. In Chapter 3, we present specific research direction and experiments about the sound effects applied in virtual space. Finally, chapter 4, the conclusions of this study and the future research progress are concluded.

EXISTING METHODS

Generation of a sound source is typically modeled or configured by measuring the sound heard by the two ears. This feature is possible in the case of stereo, but when there are several sound sources appearing in a complex space, four are synthesized by being made different depending on the position of the sound source. This can be done with a multi-channel audio source configuration. However, in general, more detailed analysis is needed to give a change in the location of the sound source in the virtual space and the diversification in the strong space. In order to realize all of these features, it is difficult to express the characteristics of the virtual space, so the method of plugging the earphone into the ear is applied. Generally, to construct a sound source, we use a stereo that considers the characteristics of the ear as shown in Fig. 1.



(a) Audio waveform



(b) Block of diagram

Figure 1: A block of diagram of audio channel

PROPOSED METHOD

Within the virtual reality space, the musical effect is very important because it is the auditory element in addition to the visual change. However, in general, it is necessary to apply the effect to the change of the hearing by showing only the visual effect. These effects are important, so in this case it is important to set the sound pressure level according to location and space. In this paper, we propose this feature to recognize the difference of distance using frequency comparison method. Especially, by separating the frequencies in the distance with low frequency, medium frequency, and high frequency, we maximized the spatial feeling in virtual reality. Especially, since the frequency characteristics are considered, it is possible to variously change the characteristics of the sound and to make various spatial features by applying DB of characteristic parameters of spatial feeling. This study is focused on the characteristics of the celadon according to the change of the position of the sound, so it shows excellent concentration and immersion. In order to make such a feature, the position of the ear of the celadon by the position of the virtual space is modeled and used as coordinates. Since the position of the sound pressure varies depending on the position of the ear of the listener, the simulation is performed considering the position and the sound pressure.

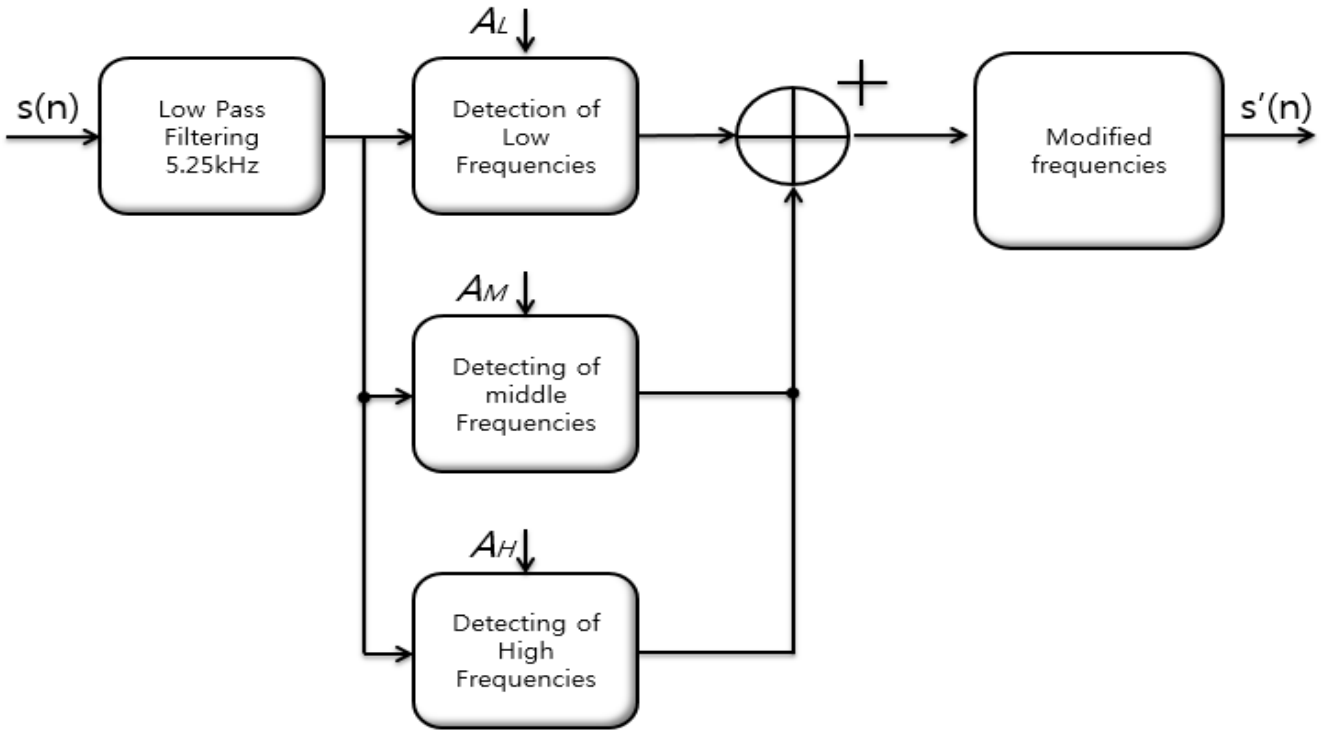


Figure 2: Block diagram for proposed frequency separation and synthesis

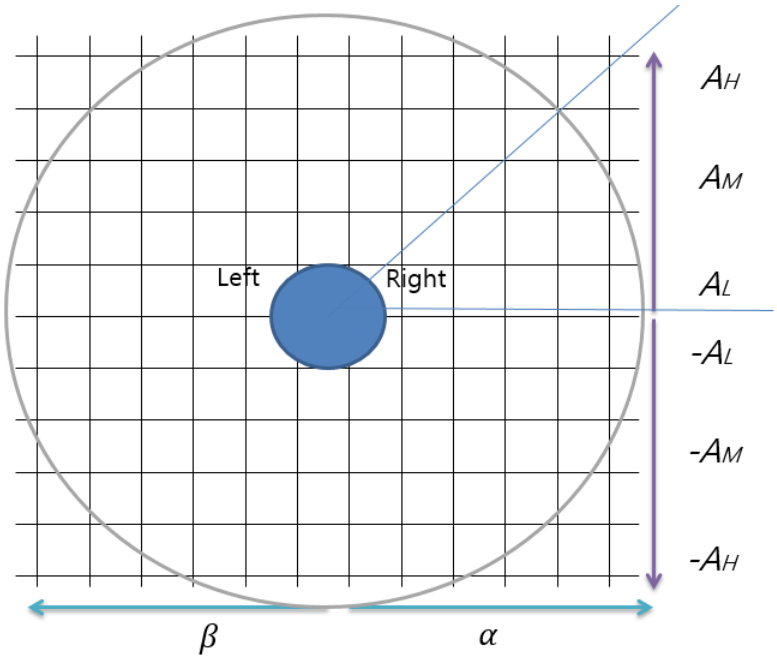


Figure 3: Consideration of sound pressure characteristics in virtual space

In Figure 2, the input sound passes through a filter and analyzes the characteristics of the position coordinates in the filter. By adjusting the sound pressure magnitude for each low, mid, and high frequency, It can be composed of spatial sound with characteristics of various space movements. If the person moving in the virtual space moves the head 45 degrees to the right from the right side, the position of the sound source is shifted 45 degrees to the left and 45 degrees to the right, so that the sound source of low, mid, Because. Therefore, these features should be further modified and used. Figure 3 shows low, mid, and high frequencies that change as the position of the sound changes.

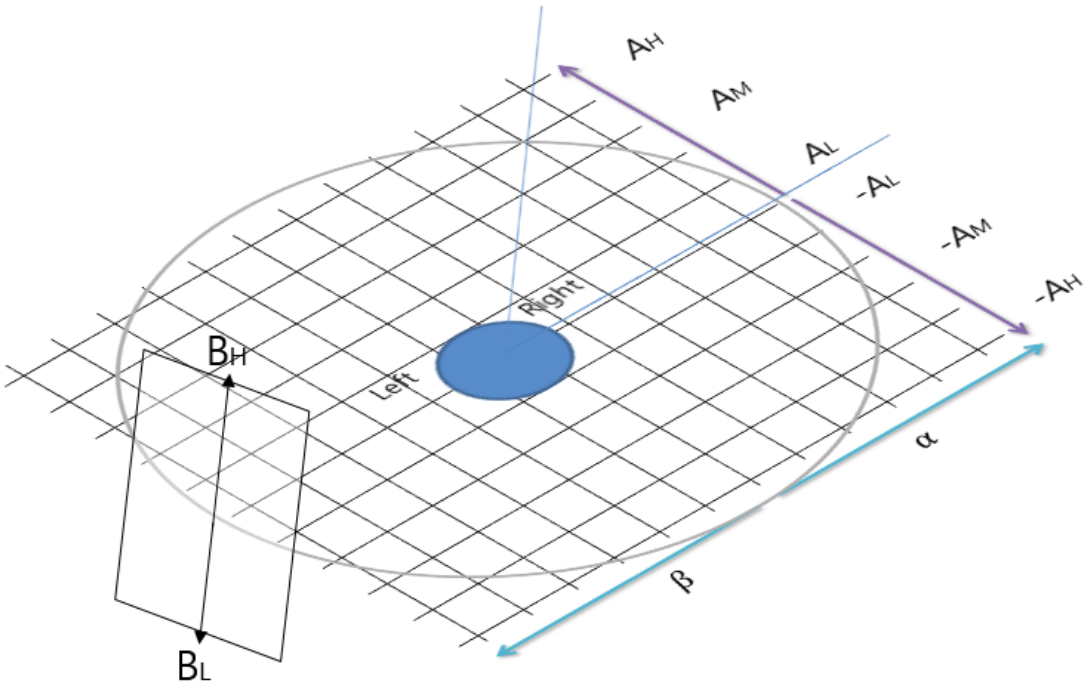
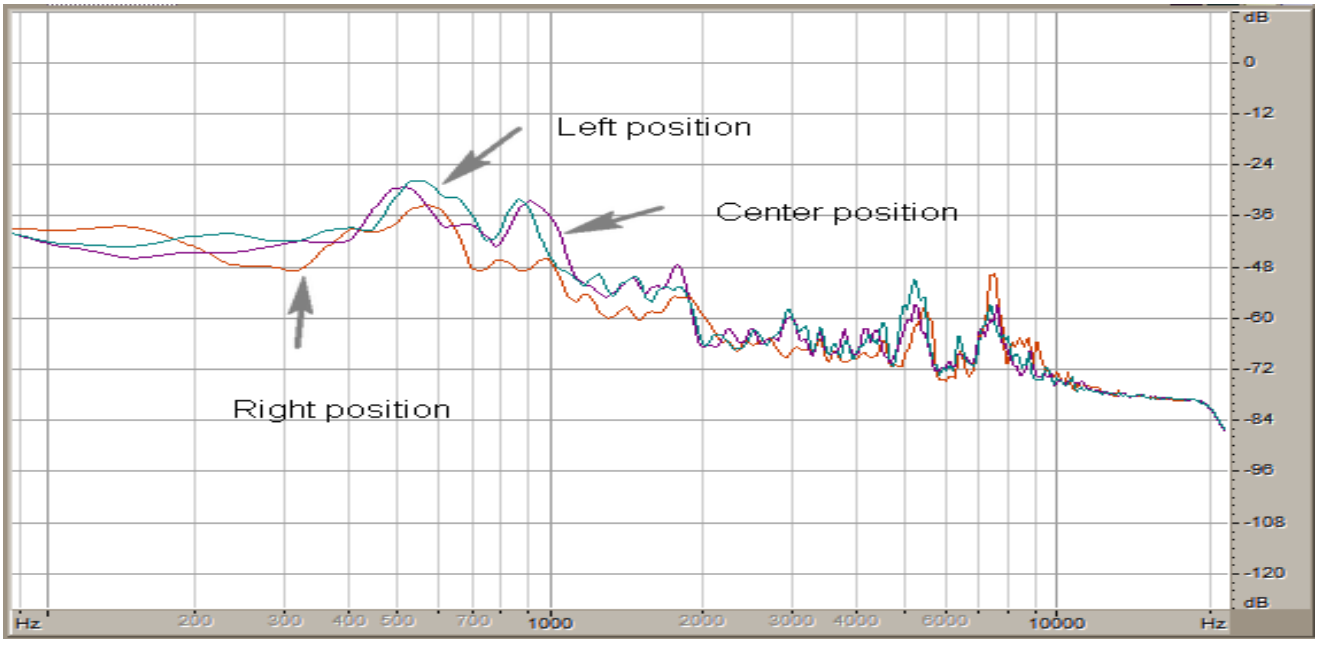
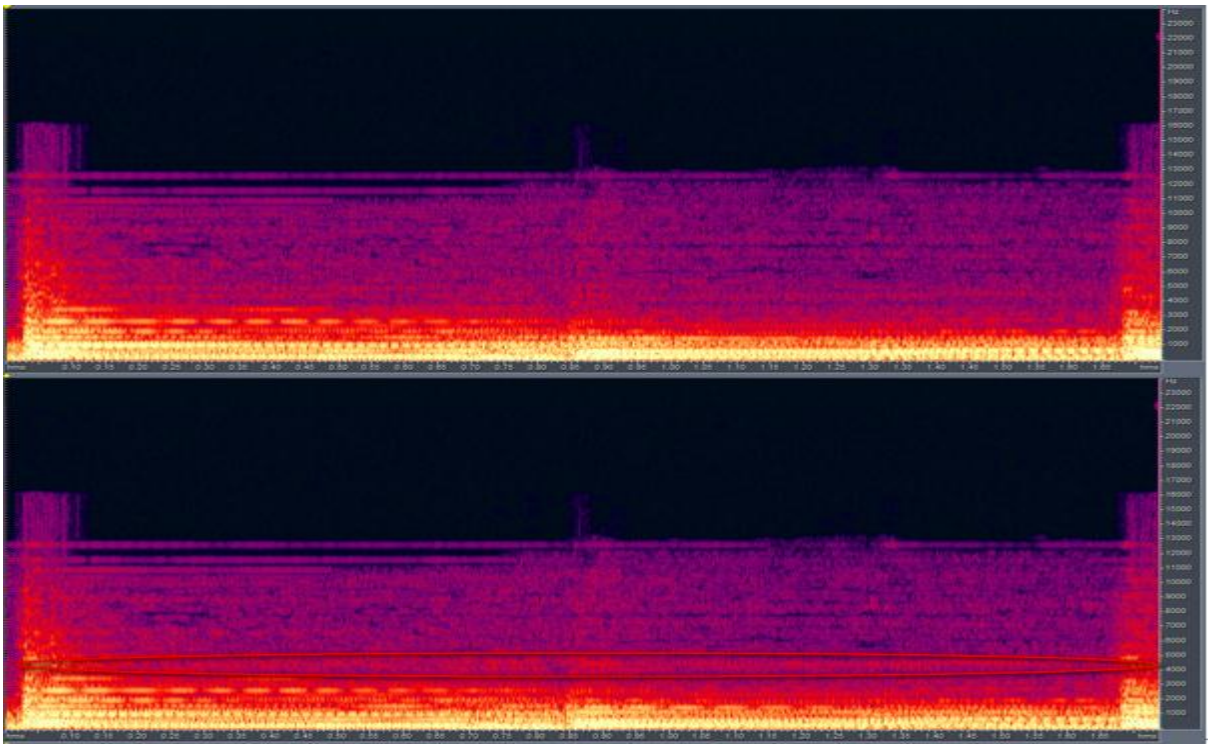


Figure 4: Consideration of spatial sound pressure characteristics considering horizontal axis and vertical axis in virtual space

These characteristics are obtained by using the distance from the slope of the sound source, applying the A_L, A_M, and A_H, which apply the sound pressure characteristics, as the log value by applying the weights.



(a) Results of FFT



(b) Results of spectrogram

Figure 4: Result after compensation for position shift of sound image

As shown in Fig. 4, the characteristics appear when the sound source changes from the center position to the center position from the left position to the center position. This is because the feature according to the position change is separated according to the low frequency, the medium frequency, and the high frequency, and the gain according to the change in the position of the sound pressure is additionally applied. Because the adaptation according to the anthropogenic changes in the frequency separation is needed, the error of the rapidly varying frequency is minimized by applying the linear slope to the boundary frequency. Figure 4 (b) shows the results for the 4 kHz band. It can be seen that due to the change of the sound image, the part about 4 kHz becomes higher in the sound pressure.

CONCLUSION

In this study, we can compensate the position of the audio signal that can be provided in virtual space, so that it can be applied variously according to the position change of the sound image. Especially, the change of audio in virtual space appears constantly, but applying this research algorithm enables us to feel more realistic audio effect by making audio according to spatial variation estimation. To achieve this effect, low frequency, mid frequency, and high frequency are separated and various changes are implemented according to the virtual space by changing the frequency characteristics and weight according to the change of the sound source. In this paper, we apply slope and distance features so that we can follow the changes of the necessary sound in space as closely as possible. In the future, by comparing the characteristics of the sound pressure along the tilt and the distance with the predicted value, it is possible to provide a more realistic sound effect. Since this study makes the unnaturalness of the audio that can be felt in the virtual space more realistic, it is designed so that it can be applied without needing to produce audio considering spatial constraints or characteristics.

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