Experience-Based Noise Evaluation System Using VR Technology

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ABSTRACT

The evaluation of noise is very important for planning and designing of various construction works in urban area. There have been presented a number of evaluation methods for noise simulation. Based on the frame of reference used, those methods can be classified into two categories: 1) Methods based on the geometrical acoustic theory and 2) Methods based on acoustic wave theory. Both methods have advantages and disadvantages. For the methods based on the geometrical acoustic theory, the CPU time is very short but the numerical accuracy is low comparing with the methods based on the acoustic wave theory. On the other hand, the method based on the acoustic wave theory gives accurate solutions but the simulation becomes a large scale simulation.

In the conventional studies, the computed noise level is described by the visualization using computer graphic such as iso-surface. Although the visualization is a powerful tool to understand the distribution of noise, it is difficult to recognize the noise level intuitively.

This paper presents noise evaluation systems based on acoustic wave theory using virtual reality technology. The system exposes to users the computed noise level with both the auditory information using sound source signal and the visual information using CG image. The CIP method using AMR and FEM are employed for the descretization of wave equation. The ambisonics based on the spherical surface function expansion is employed to realize the stereoscopic sound field using computational results and sound source data. We performed the observation to obtain the sound source data for the auralization [1]. The present system is shown to be a useful tool for planning and designing tool for various construction works in urban area, and also for consensus building for designers and the local residents.

REFERENCES

[1] K. Kashiyama, T. Yoshimachi, R. Okamura, H. Nakamura, A. Ishida, M. Tanigawa and M. Shimura, “A road traffic noise evaluation system using virtual reality technology”, Proceedings of the 15th International Conference on Construction Application of Virtual Reality 2015, paper No. 81, 2015.