RVISS - Realtime Visualization Software for Vehicle Sound Color

Toshihiro Wakita, Human Interface Lab.

1. Introduction

With the growing improvement of vehicle quietness in recent years, discussions are frequently held on the sound color in addition to the analysis and evaluation of vehicle sound. This laboratory developed a "Method of Visualizing Sound Color", which is a general-purpose method of analyzing and evaluating vehicle sound. This method was applied to various types of sounds and its effectiveness demonstrated. We have presently developed real time visualization software for sound color using a personal computer.

2. Analytical Method

Conventionally, 1/3 octave analysis, FFT frequency analysis, wavelet analysis, etc. were used to analyze sounds. These methods, howerver, failed to fully reflect people's hearing characteristics, and the analytical results did not always match the sense of hearing. In this connection, we developed a model of the human auditory system as shown in **Fig. 1** to analyze the sound. This method assures the consistency of the results of the analysis (**Fig. 2**) and the sense of hearing in regard to the sound continuity (intermittence), frequency resolution, and size of scale.

3. Developed Software

Based on the method shown in Fig. 1, we developed software to gather, analyze and indicate sounds in real time (**Fig. 3**). Hilbert transformation and other high-speed operating algorithms were applied to expedite the processing. This software operates on Windows98/2000 and Linux. Since it enables real time operation, sound analysis and evaluation can be conducted at vehicle and parts production sites. The software can also be used to determine mechanical conditions or for carrying out inspection by sound.

4. Conclusion

We have developed software for analyzing sound in real time by using a hearing model. We intend to apply this software to actual problems.

References

1) Wakita, T., et al. : Objective Rating of Rumble in Vehicle Passenger Compartment during Acceleration", SAE Tech. Pap. Ser., No. 891155, (1989)
2) Wakita, T. : "Visualization of Vehicle Sound Quality Using Human Hearing Model", SAE Tech, Pap. Ser., No. 940604, (1994)
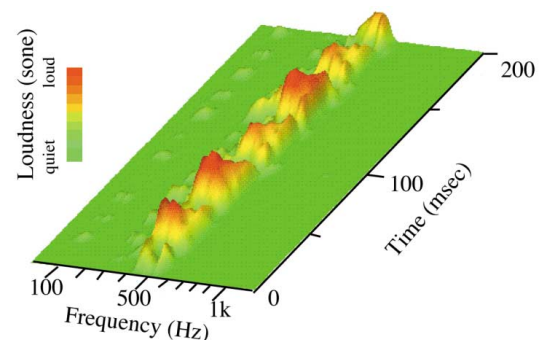
(Report received on May 17, 2000)

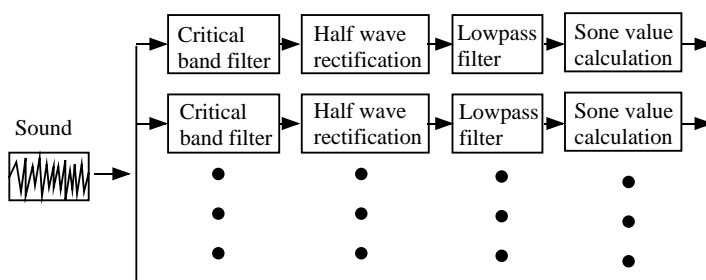**Fig. 2**　Analysis exmple of RVISS (car exhaust sound).

Fig. 1　Analysis method of RVISS.

Fig. 3　Realtime visualization system for vehicle sound color.