

three diminsional sound reproduction in Vehicles based on data mining techniques

Maosheng Zhang, Ruimin Hu, Lin JIang

computer school, wuhan university
Bayi road, Wuhan, China

Abstract. The abstract should summarize the contents of the paper and should contain at least 70 and at most 150 words. It should be written using the *abstract* environment.

Keywords: Vehicles, sound, data mining, reproduction

1 Introduction

Sound systems for vehicle have been well researched by scientists and engineers. Akitoshi Yamada developed a sound reproduction system for vehicle using only a pair of loudspeakers in 1982[1]. The system comprised a transfer function, a delay circuit, and a reverberation circuit. With the help of these components, a surrounding sound system was implemented. Honda Motor designed a sound reproducing apparatus for vehicle in 1990[2]. The apparatus takes advantage of a acoustic duct and a loudspeaker placing in the duct. In 2003, Takeshi reproduced a requiered sound image for the specified seat with a sound system consisting of two loudspeakers for Vehicles[3]. In addition, sound systems using more than two loudspeakers are developed to generate surrounding ambiance acoustic effects[4][5]. FORD Motor Company invented a multichannel sound reproduction system for vehicles and applied for a patent in 2017[5]. The embodiments mentioned in this papent composed of several loudspeakers, including a low-frequency loudspeaker or sub-woofer, placing in pilars, door frames and vehicle roof. A sound entertainment system for determined positions in a vehicle is proposed by David in 2007. This system provides ultrasonic waves and cancels the unwanted noise[6].

The sound reproduciton system for entertainment in vehicle are well researched. Lots of patents are applied by vehicle companies[7][8][6][9]. However,

the sound immersive and surrounding perception is satisfactory The most there popular 3-D sound reproduction algorithms include Wave Field Synthesis(WFS), Ambisonics and Amplitude panning. WFS aims to reproduce the whole sound field and thus the real sound immersion was reproduced. However, WFS method is not practicle since there are too many loudspeakers requiered in WFS system. Ambisonics system

2 tree regression

3 three dimensional sound reproduction algorithm in Vehicles

4 experiment

5 conclusion

References

1. A. Yamada, "Sound reproduction system for motor vehicle," *Journal of the Acoustical Society of America*, vol. 72, no. 3, pp. 1101–1101, 1982.
2. K. Terai, S. Saiki, K. Murata, K. Satoh, Y. Kumura, Y. Nakama, M. Ogawa, and S. Obata, "Sound reproducing apparatus for use in vehicle," *Journal of the Acoustical Society of America*, vol. 88, no. 5, pp. 2518–2518, 1990.
3. T. Enya, Y. Sato, and I. Aichi, "Sound output apparatus for an automotive vehicle," 2003.
4. D. L. Clark and J. W. Steuber, "Vehicle audio system," *Journal of the Acoustical Society of America*, vol. 104, no. 6, p. 3155, 1998.
5. M. C. A. S. N. M. Orellana, Fernando Mar (Benito Juarez, "Loudspeaker arrangement in a vehicle," Patent 9725047, August, 2017. [Online]. Available: <http://www.freepatentsonline.com/9725047.html>
6. D. S., B. E., D. VallWendell, and C. Johnson, "Audio reception control arrangement and method for a vehicle," *Journal of the Acoustical Society of America*, vol. 155, no. 6, pp. 3151–3156, 2007.
7. J. G. G Simon, "Method and apparatus for control of personal digital media devices using a vehicle audio system," Patent 10/870,424, August, 2005. [Online]. Available: <https://academic.microsoft.com/#/detail/1600054936>
8. M. Vu, B. Boblett, N. Penke, K. Hsieh, and J. Nuxoll, "Vehicle audio system interface," Patent 13/671660, August, 2014. [Online]. Available: <http://www.freepatentsonline.com/y2014/0096003.html>
9. J. S. Gibson, "Vehicle human machine interface with auto-customization," Patent 14/672698, August, 2015. [Online]. Available: <http://www.freepatentsonline.com/y2015/0277735.html>