

应用

控制声像距离的二维FIR滤波器设计

汤永清, 方勇, 黄青华

上海大学 通信与信息工程学院; 丽水学院计算机与信息学院, 浙江

摘要:

声像距离控制是实现三维视听系统的关键技术之一。现有的音频环绕声技术产生的声像距离固定, 且扬声器环形结构不利于与视听系统融合。针对上述问题, 本文提出一种利用线型扬声器阵列通过二维FIR滤波器控制声像距离的方法。首先根据声波的传播特点, 通过调整声源到波前的时间延迟, 改变波前半径产生了虚拟声像。将时间延迟作为二维FIR滤波器的群延迟, 使滤波器具有线性相位。考虑到宽带信号, 设计具有楔形过渡带的滤波器幅频响应, 使在期望宽度内形成波束。最后给出了滤波器实现步骤以及仿真结果。实验表明利用二维FIR滤波器在线型扬声器阵列中实现了声像距离的控制, 输出稳定的波束。该方法改变了声像的距离, 增强了沉浸感, 线型扬声器更容易与视听系统相结合。

关键词: 声像距离; 二维FIR滤波器; 线型扬声器阵列; 楔形过渡带; 波束形成

Design of Two-Dimensional FIR Filter for Distance Control of Sound Image

TANG Yong-Qing, FANG Yong, HUANG Qing-Hua

School of Communication and Information Engineering, Shanghai University; School of Computer and Information Engineering, Lishui University, Lishui Zhejiang

Abstract:

Controlling Sound image's distance is one of key techniques on three dimensional audio visual systems. In view of fixed sound image of existed surrounding system and circle structure of loudspeakers' layout, we proposed a method to control sound image's distance using two-dimensional filter in linear loudspeakers array. According to the principle of sound's propagation, firstly, time delay which is corresponding to wave front at directions of radiation is adjusted to change radius of wave front.. The change of wave front's radius denotes as the change of sound image's position, namely virtual sound image. The time delay acts as the group delay of two dimensional FIR filter which has linear phase. In consideration of wideband characteristic of signal, the amplitude-frequency characteristics which have wedge-shaped transition are designed in two dimensional FIR filter and beams are formed in desired beam width. The approach to designing two dimensional filter and simulations are provided in the end of paper. Results demonstrated that the change of sound image is realized in linear loudspeakers array by designing two-dimensional FIR filter. Method we proposed can control distance of sound image and promote immersive feeling, and the linear structure composed of loudspeakers is easier to incorporate into audio visual system than surrounding system.

Keywords: sound image's distance two-dimensional FIR filter linear loudspeakers array wedge-shaped transition beamforming

收稿日期 2010-10-28 修回日期 2011-01-06 网络版发布日期 2011-04-25

DOI:

基金项目:

国家自然科学基金(61001160); 上海市自然科学基金(08ZR1408300); 上海市重点学科(S30108)和上海市科委重点实验室项目(08DZ2231100)联合资助

通讯作者:

作者简介:

作者Email:

参考文献:

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(1034KB)
- ▶ [HTML全文]
- ▶ 参考文献[PDF]
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ 声像距离; 二维FIR滤波器; 线型扬声器阵列; 楔形过渡带; 波束形成

本文作者相关文章

- ▶ 汤永清
- ▶ 方勇
- ▶ 黄青华

PubMed

- ▶ Article by Tang, Y. Q.
- ▶ Article by Fang, Y.
- ▶ Article by Huang, Q. H.

反馈人	<input type="text"/>	邮箱地址	<input type="text"/>
反馈标题	<input type="text"/>	验证码	<input type="text" value="7940"/>