

# 使用 HRTF 之耳機聽覺虛擬環境功能實現

## Using HRTF to Realize the Function of Earphone Auditory Virtual Environment

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### 摘要

由於視障人士僅能透過聽覺及觸覺來感知環境的狀況，所以為了讓視障人士能感知三維空間的環境資訊，即須將空間資訊轉換成聽覺資訊。本論文即在物理聽覺的基礎上，依據虛擬聽覺系統的實現原理，在 MATLAB 平台上，利用 Kinect 深度攝影機取得三維空間資訊，再利用開源的頭部相關傳輸函數(Head Related Transfer Functions, HRTF)資料庫建立虛擬聽覺環境 (Auditory Virtual Environments, AVE)，使得環境的三維空間資訊轉化為空間聽覺的三維資訊，讓視障人士能通過耳機，進行障礙物的方向及距離的識別，進而避開障礙，協助其達成行動自主的目的。

關鍵字：頭部相關傳輸函數、虛擬聽覺環境、Kinect 深度影像處理、視障

### Abstract

Since the visually impaired people can only perceive the environment through the sense of hearing and touch. For the visually impaired people to perceive the environmental information in the three-dimensional space, the spatial information must be converted into distinguishable auditory information. In this paper, based on the human auditory system and the principle of virtual auditory system, we realize an auditory virtual environments (AVE) system built on the MATLAB platform which can convert 3D spatial information to useful auditory information to help visually impaired people to avoid obstacles. A Kinect depth camera is used to obtain spatial information, and then the open source Head Related Transfer Functions (HRTF) database is adopted to establish our AVE. In the proposed AVE, visually impaired people can perceive the direction and distance of obstacles in the physical environment through earphones.

Keywords: HRTF, virtual auditory environment, Kinect depth image processing, visually impaired.