

# System And Method For Binaural Spatial Processing Of Audio Signals

Tech ID: 30276 / UC Case 2017-069-0

## BACKGROUND

Audio signal processing is the intentional modification of sound signals to create an auditory effect for a listener to alter the perception of the temporal, spatial, pitch and/or volume aspects of the received sound. Audio signal processing can be performed in analog and/or digital domains by audio signal processing systems. For example, analog processing techniques can use circuitry to modify the electrical signals associated with the sound, whereas digital processing techniques can include algorithms to modify the digital representation, e.g., binary code, corresponding to the electrical signals associated with the sound.

Binaural sound recordings are produced by a stereo recording of two microphones inside the ears of a human or a mannequin head. Such recordings include most cues for sound spatialization detected by humans, and thus, they are able to realistically transmit the localization of the recorded sounds, and in effect provide a three dimensional experience of the soundscape for the listener.

## TECHNOLOGY DESCRIPTION

Researchers from UC San Diego have developed devices, systems and methods for binaural spatial audio processing based on a set of measured pairs of head-related transfer functions (HRTFs) for each of a listener's two ears to synthesize a binaural sound that seems to come from a particular point in space. Applications of the disclosed devices, systems and methods include digital audio reproduction, recording, and multimedia applications including virtual reality and augmented reality experiences.

More specifically, this technology, utilizes methods for binaural audio signal processing. The invention is an algorithm for three dimensional (3-D) processing of sounds for localizing a fictitious sound source for a listener using headphones. The novel aspect of this technology is the way databases of single-distance or multi-distance stereo Head Related Transfer Functions (HRTFs) are prepared and used for creating binaural audio processing. The process decouples and processes the HRTFs for each ear. In the synthesis phase, the appropriate HRTF, the delay of the direct and reflected rays and attenuation for each ear is chosen and applied to each direct and reflected rays in the room.

## APPLICATIONS

This synthesis method has wide and important applications in the games, entertainment, virtual reality, and augmented reality fields, including also conferencing, music production, and sound design.

## INTELLECTUAL PROPERTY INFO

This technology is patent pending and available for licensing and/or research sponsorship

## PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	<a href="#">2019055572</a>	03/21/2019	2017-069

Additional Patent Pending

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## OTHER INFORMATION

### KEYWORDS

Binaural sound recordings, audio processing, HRTF, sound design, digital audio reproduction

### CATEGORIZED AS

- ▶ **Computer**
  - ▶ Software
- ▶ **Engineering**
  - ▶ Engineering
  - ▶ Other

### RELATED CASES

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