Introduction to Principles of Spatial Audio Technology

Spatial Audio: Physics and Perception

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Outline

The psychophysical nature

The principles behind spatial audio technology are of multi- or transdisciplinary nature.

Spatial audio technology relies on *psycho-physical* perceptions

This means, it exploits spatial hearing, which is a psychological phenomenon. . .

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There is a general consense of a dichotomy between a physical world and a perceived world.

The physicist measures phenomena, developing mathematical models to describe them. (even the scientifically interested psycho-physicist does that!)

The musician is more concerned about the artistic expression.

The physician is solely concerned with the functioning of the perception.

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The technologist needs to tap into all three fields.

The technology's whole purpose is to enable communicational uses, be they artistic or utilitarian.

Spatial audio technology as a term implies a listener who perceives sound of intentionally applied spatial attributes.

This listener, i.e. a human being, has a background which influences how she or he listens, so there is always also a cultural side to this too.

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“I see your point”, said the blind man...

We generally agree that we use the eye to see and the ear to hear

But when perceiving a stimulus, is it ever only just visual or just aural?

Still, we can only find out by suppressing all other senses what one particular sense contributes to the perception of a sensation.

Thus, often we end up working with a very limited model of the listener!

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Perceiving Space

The perception of space, might be the abstraction of the more immediately spatial senses of touch and motion, and our visual space thus “learnt”, rather than directly sensed

if we hear a sound source in a different place than where we see it, it is problematic to say which position is false,”the auditory event and the sound source are both sensory objects, after all”. (Blauert, 1996)

Let’s not forget that, despite the importance we give to visual cues, our visual spatial perspective is limited to roughly a semi sphere in the direction we are facing. We hear however, all around us, getting more initial spatial cues through the ear than the eye.

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Multi Sensory Perception

Essentially, all perception of space is always multi-sensory

Our perception is coloured by our cultural, learnt or cognitive understanding of the perceived object. (we *interpret* the stimulus)

Sensory experience, or *perception* stands for an integrated whole which represents the environment as we perceive it.

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But: single sensory perception still matters!

Studying the senses separately still makes perfect sense, as, for example, the correlation between the stimulus of sound with the perception of sound still has an overwhelmingly stronger correlation than, for example the stimulus of light has on the perception of sound.

But when it comes to the perception of space, we have to be aware of its multi-sensory and cognitive nature, as it is*impossible* to perceive space as a single-sensory experience.

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...for next session

assignment

What is the ideal spatial audio reproduction and why? What spatial audio reproduction do you have at home? Why could there be a *problem*?

Reading: Zvonar on Spatial Music

Summary

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