Spatially Perturbed Collision Sounds Attenuate Perceived Causality in 3D Launching Events

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Perceived Causality in Launching Event

Examples of Launching Events

- Good launching example (time delay = 0 msec)
- Bad launching example (time delay = 400 msec)
Literature

- **Brian Scholl**

- **Guski and Troje**

Previous Work
Extend 2D Visual Displays to 3D Virtual Environment
VR Devices for the Virtual Environment
Instructions before Experiments

In the following experiment, you will watch videos of two balls in motion. You will view the videos in an immersive virtual environment.

In each video, a red ball moves toward a blue ball.

![Red ball moving towards blue ball]

The red ball moves until it comes into contact with the blue ball.

![Red and blue balls in contact]

Afterwards, the red ball stops and the blue ball moves rightward.

![Blue ball moving rightward]

Press the ‘Next’ button when you are ready to move to the next page of instructions.
Sound Synthesis

![Graph showing Sound Volume vs Distance]

- **2D Sound**
- **3D Sound**

Distance from Viewer (meter)

Sound Volume
Experiment Design

- 2D Causal Perception-Exp.1
- 3D Causal Perception-Exp.2
- Spatially Perturbed Collision Sound-Exp.3
2D Causal Perception-Exp.1
Results
Experiment Design

- 2D Causal Perception-Exp.1
- 3D Causal Perception-Exp.2
- Spatially Perturbed Collision Sound-Exp.3
3D Causal Perception-Exp.2

Please look for the symbol “+” to the right of the screen.

After you facing towards it, press the ‘Next’ button to proceed to the testing trials.
If you look to the right, you will see a ‘+’ symbol.

Please find the symbol and face towards it. After you are facing towards it, press the ‘Next’ button to proceed to the testing trials.
Results
Experiment Design

- 2D Causal Perception-Exp.1
- 3D Causal Perception-Exp.2
- Spatially Perturbed Collision Sound-Exp.3
Spatially Perturbed Collision Sound-Exp.3
Spatially Perturbed Collision Sound-Exp.3
Spatially Perturbed Collision Sound-Exp.3
Results

[Graph showing causal ratings and time delay]
Results
Contributions

- Replicated previous work of causal perception in a virtual environment
- Examined the effect of spatially perturbed auditory collision indicators
- Measured how well humans can estimate sound location in a VR setup
Future Works

Irregular Shape

Interaction
THANK YOU!

Project Page:
https://www.duotun-wang.co.uk/spatially-perturbed-collision-sound

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