A Recent History of Immersive Audio Experiences

HCI, Urban Sculpture, AI / ML, Artificial Life, XR

Lucian Parisi | MAT 200A | Fall 2025

HCI

Very Nervous System (1986–1990) – David Rokeby

- Description: Instillation translating body movement into sound
- Takeaways: Early example of realtime HCI where the space itself is the interface
- Tech Usage: Infrared video capture, custom image processing code, software-driven midi triggered synthesis output to multichannel speaker arrays.

Citation: Shanken, Edward. Art and Electronic Media, Phaidon, 2009. Chapter 4: Interactive Art

HCI

Very Nervous System (1986–1990) – David Rokeby

(2:13)

Citation: Shanken, Edward. Art and Electronic Media, Phaidon, 2009. Chapter 4: Interactive Art

HCI

Voice Tunnel (2013) – Rafael Lozano-Hemmer

- Description: 150-channel interactive tunnel audio-light installation. HCI with visitor speech input. 300 light beams pulse to amplitude
- Takeaways: Public dialogue embodied in a constantly changing sonic/light experience. Time distortion in an urban space via time distortion via delay and spatialization.
- Tech Usage: 150 distributed speakers (per participant sound mapping), microphone intercom, DMX lighting system, Dante audio matrix.

Citation: Lozano-Hemmer, Rafael. "Voice Tunnel" project description, 2013

HCI

Voice Tunnel (2013) – Rafael Lozano-Hemmer

Citation: Lozano-Hemmer, Rafael. "Voice Tunnel" project description, 2013

Urban Sculpture / HCI

Harmonic Bridge (2006) – Bill Fontana

- Description: Live sound sculpture using vibration sensors placed on London's Millennium Bridge. Real-time structural resonance was streamed into Tate Modern’s Turbine Hall
- Takeaways: Transforming the architecture into a generative sound instrument. Environmental sensing as interactive audio
- Tech Usage: Accelerometers, live audio streaming, distributed speaker playback

Citation: Citation: Fontana, Harmonic Bridge, Tate Modern, 2006.

Urban Sculpture / HCI

Harmonic Bridge (2006) – Bill Fontana

Citation: Citation: Fontana, Harmonic Bridge, Tate Modern, 2006.

Urban Sculpture / HCI

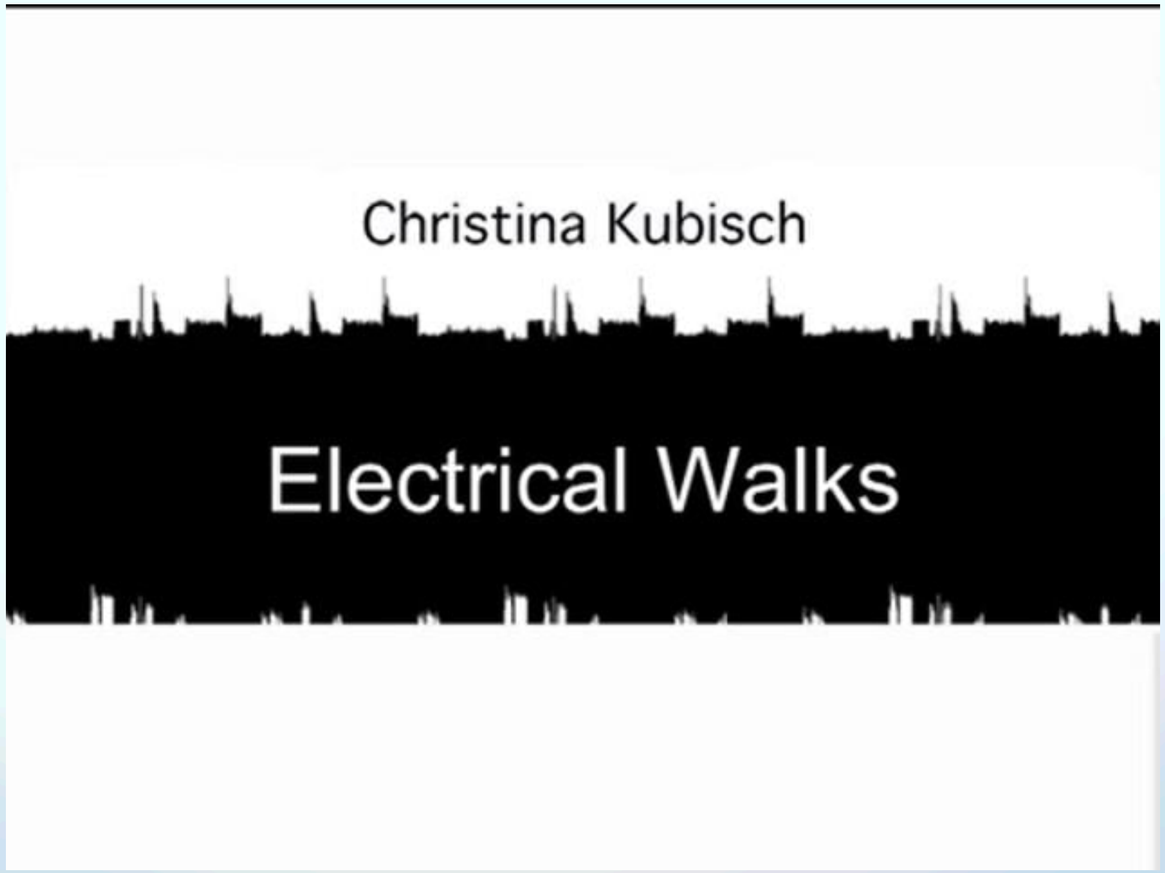
Electrical Walks (2003–present) – Christina Kubisch

- Description: A series of interactive urban soundwalks using custom electromagnetic induction headphones that reveal hidden EM fields across cities
- Takeaways: City becomes interface for interaction and augmenting listening experience
- Tech Usage: Pure analog signal processing (no DSP!) Hand-built induction headphones, portable amplifiers, EM transduction circuits

Citation: Citation: Kubisch, Electrical Walks project archive, 2003–ongoing.

Urban Sculpture / HCI

Electrical Walks (2003–present) – Christina Kubisch



(5:20)

Citation: Citation: Kubisch, Electrical Walks project archive, 2003–ongoing.

Urban Sculpture / HCI

Time Square (1977–1992; reinstated 2002) – *Max Neuhaus*

- Description: A continuous drone resonating from beneath a Times Square ventilation grate. The sound seems to occupy a “volume” in space rather than a point source
- Takeaways: Foundational work in public sound installation; demonstrates sound as sculptural presence and early spatial augmentation of infrastructure
- Tech Usage: Resonant cavities, concealed transducers (no visible equipment), continuous tone generation

Citation: Neuhaus Estate, *Times Square* documentation

Urban Sculpture / HCI

Citation: Neuhaus Estate, *Times Square* documentation

Urban Sculpture / HCI

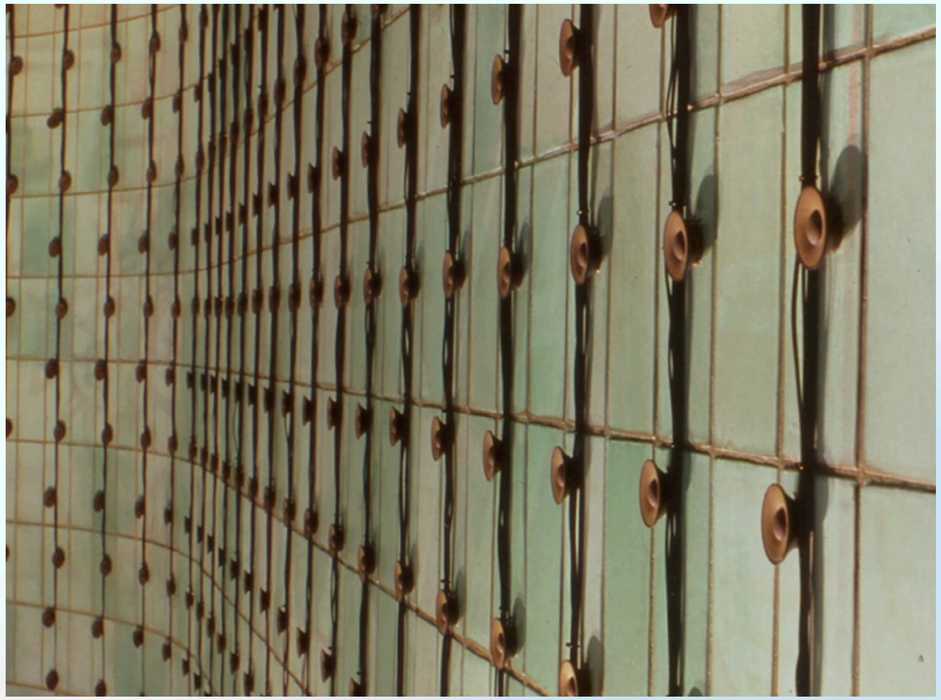
Silent Music (Spaces for Listening) (1994–present) – Robin Minard

- Description: An ongoing series of site-specific installations using dozens or hundreds of ultra-small loudspeakers placed on walls, ceilings, or suspended in air, producing quiet, intimate sound fields that reshape a space's atmosphere.
- Takeaways: Argues that spatial audio can function as acoustic architecture rather than foreground media. Fundamental question he asks: how can we shape a sound environment?
- Tech Usage: Custom speaker arrays; site-specific tuning (based on resonance of materials and spaces) ; generative or long-looped sonic materials

Citation: Minard, Robin. Silent Music: Between Sound Art and Acoustic Design. Kehrer Verlag, 2010.

Urban Sculpture / HCI

Silent Music (Spaces for Listening) (1994–present) – Robin Minard



Citation: Minard, Robin. Silent Music: Between Sound Art and Acoustic Design. Kehrer Verlag, 2010.

Urban Sculpture / HCI

Sound Installations in Transit Spaces (2000s) – various works

- Description: Gentle sound interventions in airports (Toronto Pearson), train stations, and public corridors. Designed to reduce stress and guide movement.
- Takeaways: Use of “sound curtains” or “sound zones” to delineate architectural pathways. Foundational acoustic design thinking.
- “conditioning the space” (using spatial acoustic treatment) vs “articulating the space” (using spatialized gestures to move sounds) as two kinds of installations
- Tech Usage: Directional speakers, distributed arrays, architectural acoustics modeling, site-specific frequency masking analysis

Citation: Minard, Robin. Silent Music: Between Sound Art and Acoustic Design. Kehrer Verlag, 2010.

Urban Sculpture / HCI

Sound Installations in Transit Spaces (2000s) – various works

Citation: Minard, Robin. Sound Environments: Music for Public Spaces, 1999

AI / ML

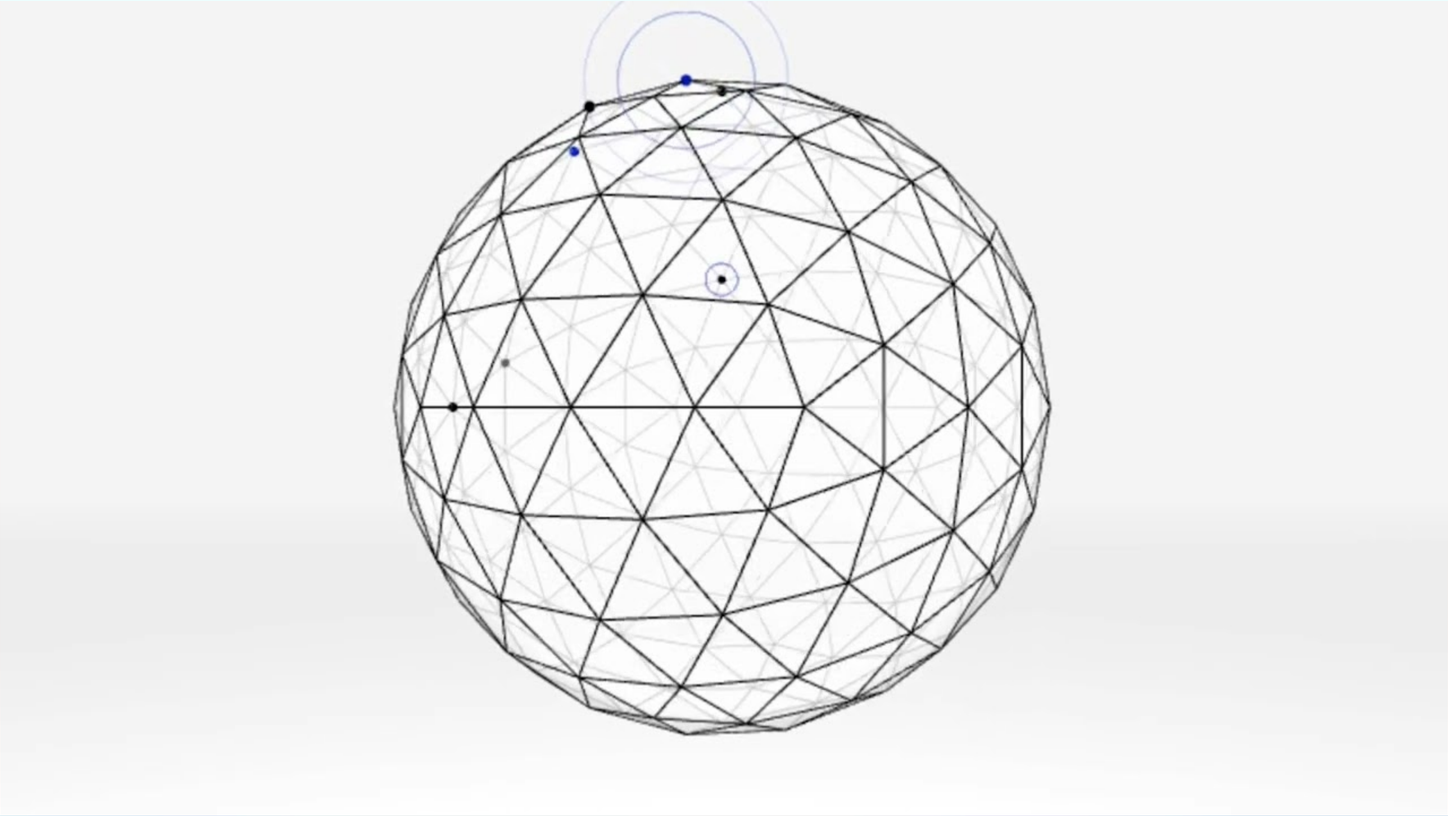
Sound of the Earth: Chapter 3 (2022) – Yuri Suzuki

- Description: A geodesic sound dome that plays AI-clustered crowdsourced field recordings based on timbral proximity and user latent space exploration
- Takeaways: Deals with geopolitical boundaries by grouping audio via similarity rather than location
- Tech Usage: Audio ML clustering (MFCC-based features), Google Artists + Machine Intelligence platform, multi-speaker sphere

Citation: Tribe, Mark, et al. Digital Art: 1960s to Now, Thames & Hudson / V&A, 2024. See Chapter 6: Data and Systems

AI / ML

Sound of the Earth: Chapter 3 (2022) – Yuri Suzuki



Citation: Tribe, Mark, et al. Digital Art: 1960s to Now, Thames & Hudson / V&A, 2024. See Chapter 6: Data and Systems

AI / ML

WDCH Dreams (2018) – Refik Anadol

- Description: LA Philharmonic's digital archive (45 TB) processed via machine learning to create immersive projection and generative ambient spatial audio.
- Tech Usage: Deep learning and GAN, projection mapping, 8-channel spatialization system, large-scale dataset training

Citation: Bishop, Bryan. "WDCH Dreams: LA Phil Seen Through Data." LA Phil, 2018.

AI / ML

WDCH Dreams (2018) – Refik Anadol

Citation: Bishop, Bryan. "WDCH Dreams: LA Phil Seen Through Data." LA Phil, 2018.

Artificial Life

Autopoiesis (2000) – Ken Rinaldo

- Description: 15 vine-like robotic sculptures that respond to each other and audience presence through sound
- Takeaways: Emergent behavior through motion and sonic communication
- Tech Usage: Networked microcontrollers, telephone tones for communication, proximity sensors

Citation: Shanken, Edward. Art and Electronic Media, Phaidon, 2009. Chapter 5: Artificial Life and Robotics

Artificial Life

Autopoiesis (2000) – Ken Rinaldo

Citation: Shanken, Edward. Art and Electronic Media, Phaidon, 2009. Chapter 5: Artificial Life and Robotics

Artificial Life

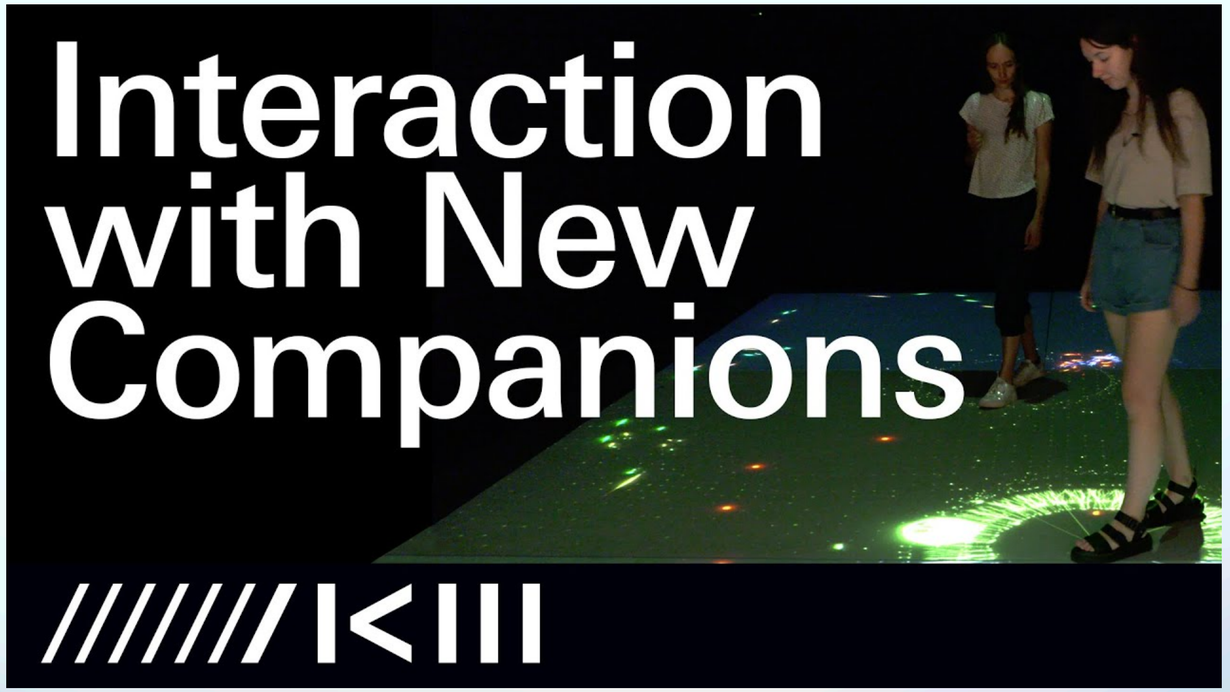
Agents (2022) – ZKM BioMedia - Ludger Brümmer and Yasha Jain

- Description:Swarming artificial creatures rendered in XR space, reacting to visitors and spatialized in multichannel audio. Similar to AlloSphere installations
- Tech Usage: Unity, real-time tracking, multichannel ambisonic audio, OSC for linking agent position to spatial audio, several agent algorithms

Citation: ZKM Karlsruhe. BioMedia: The Age of Media with Life-like Behavior, 2023. See Section: Artificial Agents.

Artificial Life

Agents (2022) – ZKM BioMedia - Ludger Brümmer and Yasha Jain



Citation: ZKM Karlsruhe. BioMedia: The Age of Media with Life-like Behavior, 2023. See Section: Artificial Agents.

XR

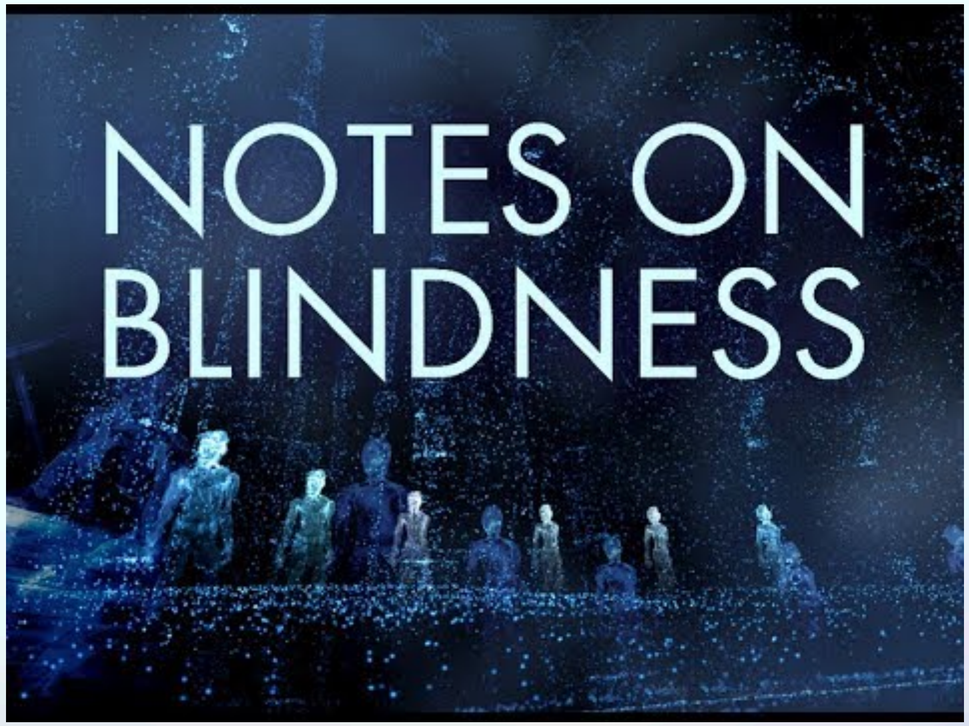
Notes on Blindness: VR (2016) – Artefact & AudioGaming

- Description: VR narrative that recreates sensory world of a blind man using head-tracked binaural audio
- Takeaways: Audio as dominant XR channel, narrative engagement through attention-triggered scenes and acoustic memory
- Tech Usage: Used ambisonics for ambient beds and interactive 3D audio objects rendered with head tracking. Real-time HRTF processing enabled immersion via dynamic binaural filtering that adapted to head orientation

Citation: Battaglia, Andy. "Notes on Blindness VR: Meditation on Acoustic World," Artnet, 2016.

XR

Notes on Blindness: VR (2016) – Artefact & AudioGaming



Citation: Battaglia, Andy. "Notes on Blindness VR: Meditation on Acoustic World," Artnet, 2016.

XR

RE-Animated (2018) – Jakob Kudsk Steensen

- Description: VR reconstruction of extinct bird's ecosystem, featuring generative audio responsive to procedural landscape
- Takeaways: Environmental storytelling through data
- Tech Usage: Unreal Engine, AI ecology simulation, procedural ambient sound linked to environment parameters, head tracked HRTF

Citation: Kadist Art Foundation. "Jakob Kudsk Steensen: RE-Animated," 2018

Happy Holidays!

References

- Wilson, Stephen. Information Arts: Intersections of Art, Science, and Technology. MIT Press, 2002.
- Shanken, Edward. Art and Electronic Media. Phaidon, 2009.
- ZKM Karlsruhe. BioMedia: The Age of Media with Life-like Behavior. 2023.
- Tribe, Mark, et al. Digital Art: 1960s to Now. Thames & Hudson / V&A, 2024.
- Lozano-Hemmer, Rafael. "Voice Tunnel" and "Climate Parliament" project pages.
- Battaglia, Andy. "Notes on Blindness VR: Meditation on Acoustic World," Artnet, 2016.
- Kadist Art Foundation. "Jakob Kudsk Steensen: RE-Animated," 2018.
- Bishop, Bryan. "WDCH Dreams: LA Phil Seen Through Data." LA Phil, 2018.
- ISEA Archives. "Akousmaflore: Sensitive and Interactive Musical Plants," 2009.
- Fraunhofer IDMT. Sylopp, “Human-Centered Machine Learning,” 2020.
- Brooklyn Museum. “Monet and Venice Atmos Installation,” 2025.
- Polygon Live L-ISA Festival Report, 2025.
- Fontana, Bill. Harmonic Bridge. Tate Modern, 2006. https://resoundings.org/?portfolio=harmonic-bridge
- Fontana, Bill. Sound Sculpture Through the Golden Gate Bridge (1983). https://resoundings.org/?portfolio=sound-sculpture-through-the-golden-gate-bridge
- Kubisch, Christina. Electrical Walks (2003–present). https://christinakubisch.de/en/works/electrical_walks
- Kubisch, Christina. Cloud (2011). https://christinakubisch.de/en/works/cloud
- Neuhaus, Max. Times Square (1977–92; 2002–present). https://www.max-neuhaus.estate/en/times-square
- Neuhaus, Max. Drive-In Music (1967). https://www.max-neuhaus.estate/en/drive-in-music
- Neuhaus, Max. Sound Works (Audio & Documentation). https://www.max-neuhaus.estate/en/audio-and-video