

Hear and now

An audio-visual installation

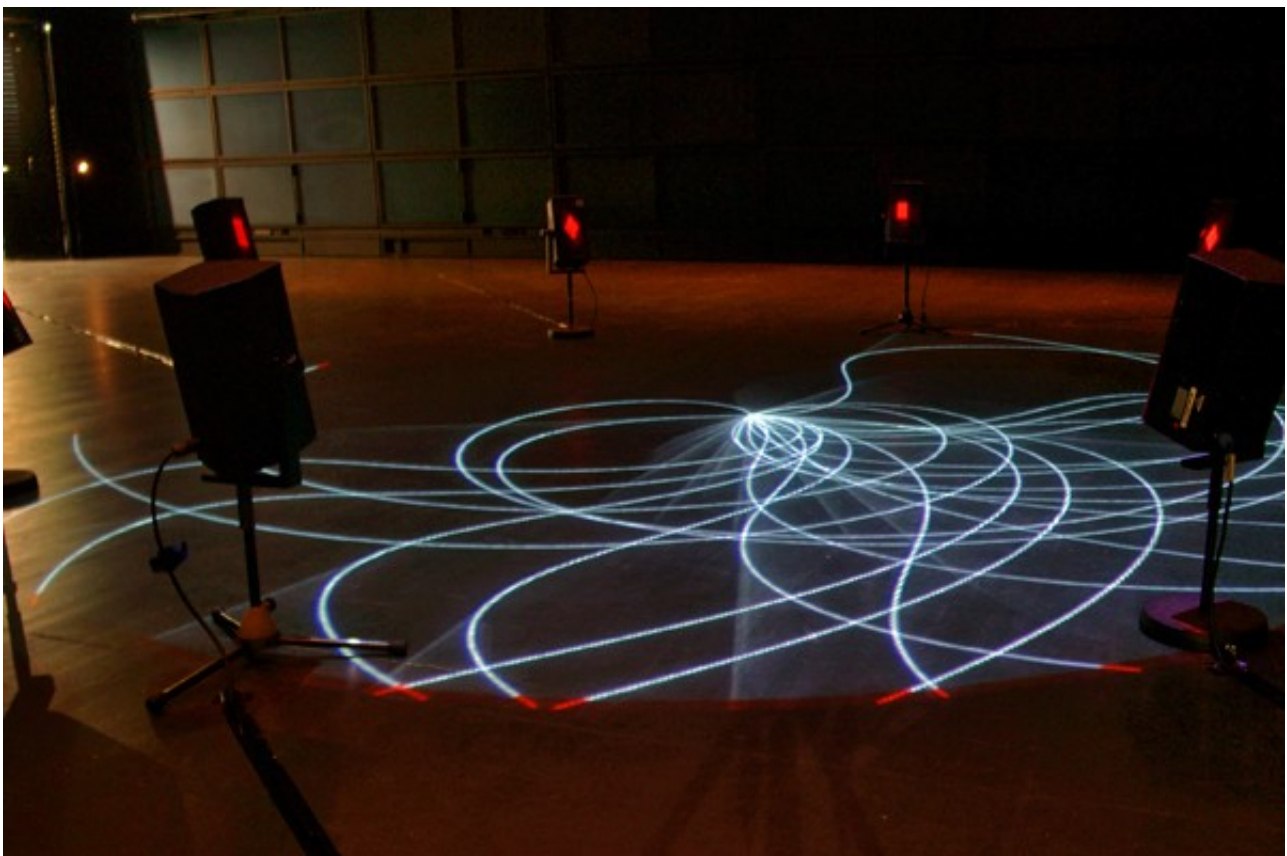
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- Summary of project

Hear and now is an audio-visual installation. A floor projection shows the trajectories of a nonlinear dynamical system flowing from the center outwards. When the particles reach the end of the trajectory, their position is represented by sound entities moving on a circle through 8 speakers. The dynamical system generates a constantly changing audio-visual cluster.

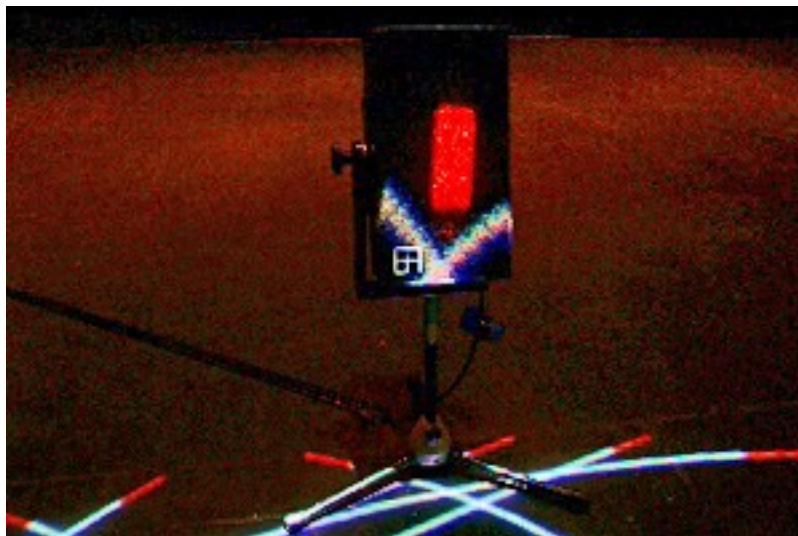


- Project description

Hear and now is an audio-visual installation consisting of a floor projection and a circular audio setup with 8 speakers. The visual projection on the floor is a set of slowly moving lines. Each of these lines represents a particle's trajectory in a nonlinear dynamical system defined on a circle. The trajectories flow from the center of the circular setup outwards toward the speakers. From the center of the installation, the spectator can observe the moment when the trajectories arrive at the border of the circle. There, the actual positions of the particles in the trajectories are transferred to the loudspeakers via distinct acoustic entities. These sounds move according to the changing positions of the particle's trajectories. Rather than moving randomly, the dynamical system forces the majority of the particles to move in a cluster, as can be seen in the visualizations provided.

The dynamical system driving the installation is "chaotic itinerancy," as described by the Japanese scientists Kaneko, Tsuda and Ikeda. In the current implementation it will be realized with 25 particles moving in the interval between 0 and 2π . Each of these 25 particles exerts a potential of periodic shape on all the others. In order to minimize their potential energy¹, the particles start to form a cluster and oscillate around its center of gravity. On the way to the gravitational center, the particles take up momentum², and some of the faster ones leave the cluster and rotate around the circle. In the running dynamical system, the momentum is constantly redistributed amongst the particles. This allows for an ever-changing cluster composition, varying in terms of which particles are in and which are out.

The cluster itself moves slowly. The sound is not only changed by the spatialization that is controlled by the particles, but also by further parameters such as particle speed and the actual particle-cluster distance, also fast movement can be acoustically recognized. In other words, the acoustics reflect the actions of the dynamical system.



1 this is the amount of energy that comes from their relative positions to the other particles.

2 This corresponds to the kinetic energy that is related to the particles speed

- Artist's statement

Hear and now

Although my approach to this installation is mostly informed by my background in nonlinear dynamics, I think that all the fascinating properties of this system should be easy to discover even without this knowledge. I want this installation's underlying system to be as transparently communicated as possible, but I think that details about the dynamics are not absolutely necessary in order to enjoy it.

The basic property of the system, namely the formation of a cluster with ever-changing constituents, has been compared to brain dynamics, for example. Here, the cluster can be interpreted as the categories that a neural network is able to build. Since this cluster is dynamic, it is always changing its shape and content, which is reflected by the actual constituting particles. This compares to the ever-changing content of categories we build in our cognitive processes.

Another, more philosophical, approach to this phenomenon can be found in Heraclitus' notion of *pantha rhei*. This idea is expressed in more detail in the following well-known sentence:

We both step and do not step in the same rivers.

We are and are not .

When we enter the installation, we always discover a dynamical cluster that is clearly recognizable, but whose nature is constantly changing.

In my opinion, nonlinear dynamical systems are full of possible links to philosophically interesting issues. I have always been convinced that nonlinear dynamics could be used for art installations. With regards to the chaotic itinerancy and its use in the installation *Hear and now*, I am addressing amongst others the question of anticipation in non-periodic patterns. The representation of dynamics by the sound entities will always be delayed for exactly the amount of time that it takes for the particle's trajectory to move from the center to the border of the circle. This makes the spectator anticipate through visual clues where the sound will come from in the next few seconds.

Hear and now addresses the visual and auditory senses. The visual sense is particularly able to detect the shape of the cluster which never disappears but is also never the same. The acoustics help to distinguish the different particles with their distinct sound qualities. This allows to discover the system's essential property, which is the ever-changing state of the cluster in terms of its composition. The sound samples are the question words, who, where, how, when, what and why. 25 of them were selected from 12 languages. The choice was motivated since it is always a question that forces us to rethink established categories.

Hear and now invites the audience to enter a space in progress but without destination.



- Acknowledgments

During my work at „hear and now“, I was substantially supported by Hans Diebner, Frank Halbig, Sebastian Fischer, Tamar Tembeck, Florian Dombois and the Institute Y at the HKB in Bern as well as by Katrien Reist and the PROGR in Bern. For further support during the premiere during the festival „Flying Circus“, I would like to thank the team of the Institute for music und acoustics at the ZKM in Karlsruhe. Further I like to thank the people who lend me their voices: Olga Artes, Jayyoung Bang, Doga Cigsar, Paulo Fereira-Lopes, Shingo Inao, Petra Kaiser, Irina Koutoudis, Sendi Mango, Juriij Pavlica, Grégoire Qvenault, Pablo Rober, Olivia Toffolini, Steina and Woody Vasulka and Susanne Wurmnest.

