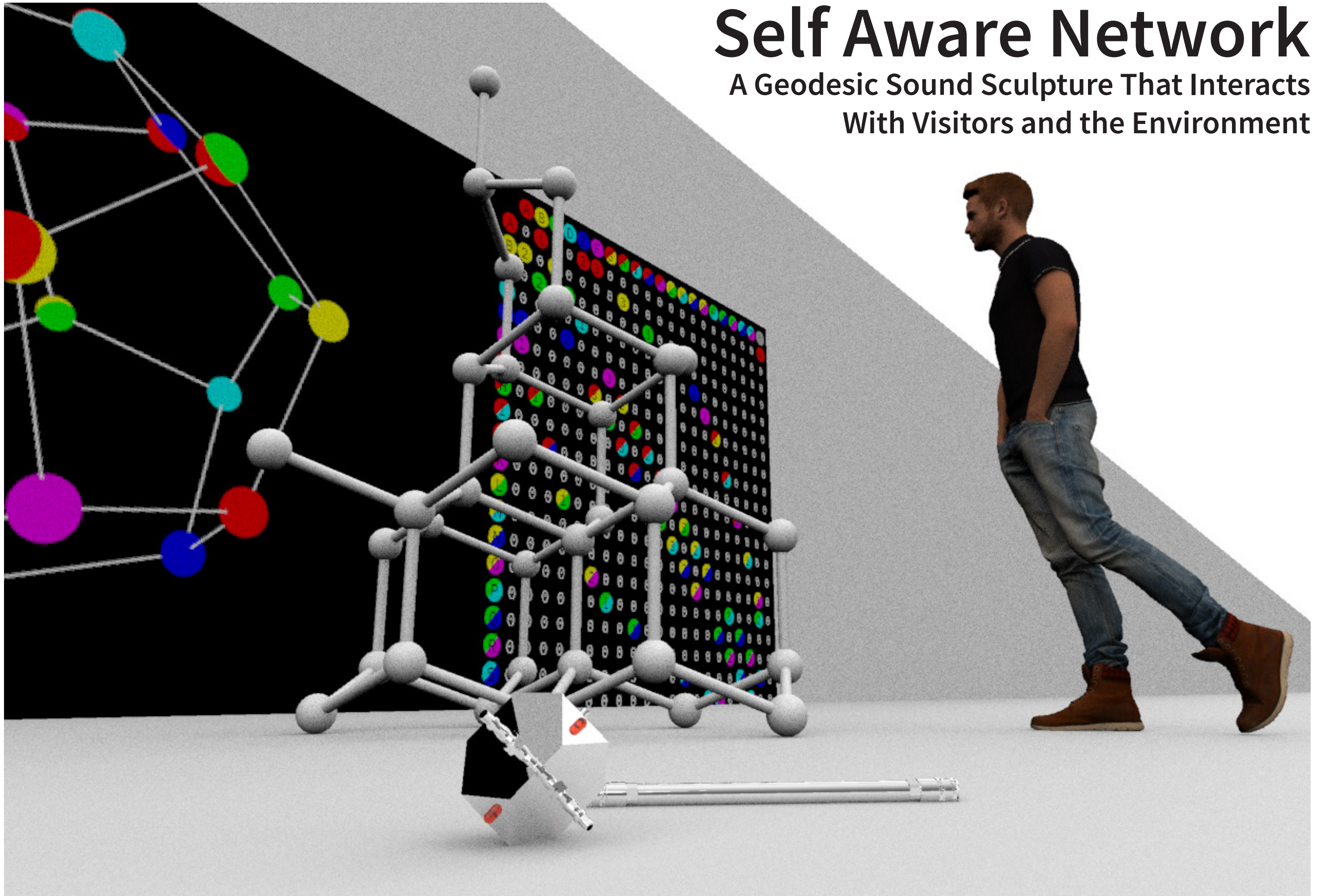


Self Aware Network

A Geodesic Sound Sculpture That Interacts
With Visitors and the Environment



Description

Abstract

The Self Aware Network (SAN) is an experiment about the future of architecture. It is a system for building intelligent structures that interact and communicate with the environment.

Eventually structures will acquire intelligence (AI), thereby being able to *understand* the environment. Finally structures become robotic and autonomously *adapt* to the environment. The vision is for architecture to become fluid, to constantly reconfigure itself and to follow the needs of the people and the environment.

For *Eyes of the City*, we will work with a one-off stainless steel life-size version of the already existing desktop system. The network consists of nodes and edges that can be manually reconfigured by visitors. The nodes communicate and send information to a central computer, the brain of the network. A projected image visualizes the network's self-awareness. Visitors can connect to the brain from their phones and influence how each node processes signals of information. These signals are made audible via speakers or headphones.

Network

The sculpture is comprised of a network .

Nodes have tetrahedral geometry. This is known as SP³ hybridization in Chemistry. This geometry is the basis for the hardest natural structure known to man, that of diamond. The shell of a nodes is made of stainless steel. Inside of a node there is a small computer, a microcontroller.

Edges have uniform length. Edges are connected to nodes using stainless steel quick-connectors, reliably used in pneumatics. The edges are hollow for optical communication among the nodes.

Self-Awareness

Everychange to the network configuration is sent to a central computer, the brain of the network. The brain is able to understand the topology of the network. It gains self-awareness. How the network sees itself is visualized and projected.

Senses

In addition to being able to sense reconfigurations, the network can sense gravity. Each node contains an accelerometer.

Visual communication

LEDs in nodes communicate their identity by color. This allows visitors to see the duality between the real structure and the projected structure visualized by the brain.

Auditory communication

The network forms a modular synthesizer with audio signals passing through nodes. The combined signals propagate to the root node from where they are made audible using speakers or headphones. Modulation depends on the spacial position of nodes. The sound scape reflects the topology of the network.

Visitor interaction

There are three stages of interactivity: (*see comic*)

- *Audio*: Users scan a QR code. This leads them to a simple web app which allows adjustment of how a node processes an audio signal. The sound scape of the structure adapts immediately. Audio interaction is self explanatory. No supervision is required.
- *Reconfiguration*: Visitors can adapt the network by reconfiguring nodes and edges. Reconfiguration is possible under supervision in scheduled weekly sessions and on demand.
- *Production*: On three weekends, there will be hands-on workshops where visitors participate in production. Each participant learns how to solder a circuit board and assemble a node. No prior knowledge is required. At the end of the workshop, the new nodes are connected to the network.

On-Site peculiarity

Following the action of visitors, the network organically grows and adapts to its environment. Three dimensional cells compartmentize space. This process is comparable to a railroad network growing over time and eventually redefining and compartmentizing the two dimensional space which defines our surroundings.

Provisional / Durable nature of the intervention

At the end of the Biennale, the network is fossilized. Before it is taken offline, the network's final state of self-awareness is preserved. A final sound scape is recorded.

The network lives on as a robust stainless steel sculpture. Batteries are replaced by permanent electrical wiring. That way the sculpture can remain lit. It requires little maintenance.

Next to the sculpture there is a QR code. By scanning the code, visitors are able to hear the network and they are able to see its final state of self-awareness.

Positioning

- *Space*: The network requires a space of at least two by three meters.

A larger space gives more room for experimentation with reconfiguration, and it allows for higher structures.

- *Projection*: A flat surface for projection is needed which may either be a semi transparent surface in the middle of the exhibition space (preferred) or a wall.
- *Reconfiguration*: For interactive sessions, temporarily additional space is needed to accomodate participants and spare construction elements.
- *Construction elements*: Unused nodes and edges are stored in flight cases.
- *Audio*: For playback of audio during the opening of the Biennale, speakers are mounted. Otherwise headphones hanging from the ceiling are provided.
- *Electricity*: For powering electronics and the projector, electricity is needed.
- *Workshop area*: For production workshops, a separate area may be used.

Material

Stainless steel, Electronics, Lighting

Sustainability

The stainless steel construction is both durable and recyclable. Batteries are rechargeable and will be recycled at the end of the event. Connectors are sourced from scrap. The ones that didn't pass quality control for air tightness are good enough.

Sharing

All construction plans for the desktop system as well as all source code is available under a permissive open source license at: github.com/feklee/san

Outlook

After scaling the network up, the next steps are to make it move and eventually to make it be able to self-reassemble. A test ground is needed, an architectural makerspace where people of all ages can collaboratively experiment and eventually revolutionize heavy construction and the way architecture interacts with us and with the environment.

Bios

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Feasibility

CVs / bios