
Drum Roll: A Data Physicalization of Real-Time Radiation Sensor Readings

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Abstract

Drum Roll is a data physicalization of nuclear radiation threats featuring an automated drum which is constantly playing a drum roll based on real-time radiation sensor readings of the *Tihange Doel Radiation Monitoring* network (TDRM). We describe the background, the design and the underlying technology of the presented object.

Author Keywords

Data physicalization; Design; Data processing; Interaction design; awareness design; design and emotion; information aesthetics; physical computing; TDRM.

CSS Concepts

•Human-centered computing~Visualization~Visualization application domains~Information visualization

Introduction

Drum Roll is an installation consisting of an automated drum constantly playing a drum roll which is generated from real-time *radiation* sensor readings. The drum is controlled by a publicly available dataset from the non-profit *Tihange Doel Radiation Monitoring* network

(TDRM) [1]. The TDRM network consists of 25-30 sensor nodes located in the geographic region around the Belgian power plants Tihange and Doel. It provides current radiation readings to detect anomalies in the radiation levels and possible alarming events. For the presented data physicalization [2] project the input data is translated into the mechanical movement of the drum sticks: higher radiation levels result in an intensified drum roll, lower radiation in softer playing. As long there is no catastrophic event, the drum roll stays more or less constant. Once the installation is set up and connected to the internet it runs fully autonomously throughout the exhibition.



Figure 1: 'Drum Roll'. Installation view.

Concept

The drum roll was chosen as metaphor for the tension and threat of a possible nuclear accident, and as a reminder of the risks of the given situation: The nuclear reactors operated in those facilities belong to the oldest reactors in Europe. As they age, the risk of accidents

increases every year of their operation. Due to a rather untransparent information policy of the authorities in charge the idea of a transnational network to monitor the radiation in the region was implemented by the TDRM project, starting in 2016.

To design and build a physical representation of the TDRM data which would engage the audience on a more emotional level, we strived for other modalities than visual. Instead of providing any type of radiation meter, it should rather give a feeling of the conveyed data. Besides the drum as a metaphor, its very physical and tangible way of generating sound caught our interest; a clear contrast to the invisible threat of radiation.

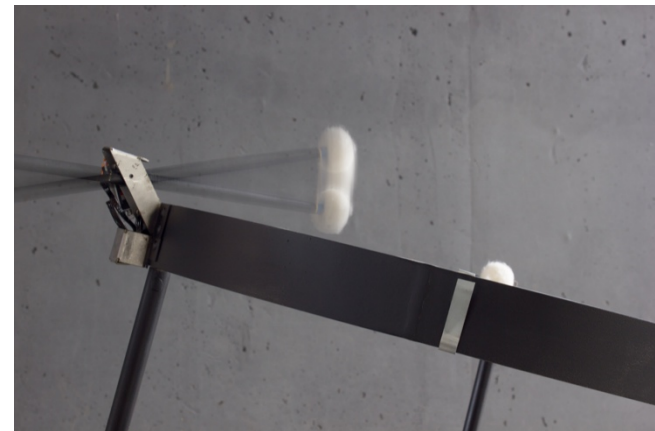


Figure 2: 'Drum Roll'. Installation view, detail.

Design

Construction

Drum Roll consists of a metal frame (approx. 80cm ø) which holds a transparent timpani drum skin. The construction stands slightly tilted on three metal legs. Attached to the frame there are two structures to hold a drumstick each, as well as its moving mechanism.



Figure 3: Detail of the mechanics with solenoid.

Control

The mechanics are built around solenoids which apply force to the sticks to beat the drum skin. They are controlled by an Arduino-board through a standard H-bridge driver-circuit. The radiation sensor values are polled twice a minute via a WIFI-connection from the TDRM website and are translated into a square-wave signal, where changes in frequency and duty-cycle result in changes of speed and intensity of the played drumroll. The control electronics and its power-supply are contained in a box, wired to the drum and can be placed out of sight.

Context

Drum Roll was developed in an interdisciplinary student project on 'Data-Driven Objects' at the Chair of Human-Computer Interaction at the Bauhaus-University Weimar. The groups aim was to research, develop and to prototype ideas by following the question how data can be conveyed with dynamic physical objects and how to design multimodal approaches of representing data.



Figure 4: Installation view. The object was exhibited at the university's annual exhibition as well as in an art gallery in Berlin. (Galerie Eigenheim, Berlin)

References

- [1] <https://tdrm.fiff.de/> last accessed: February 18, 2020
- [2] Andrew Vande Moere. Beyond the Tyranny of the Pixel: Exploring the Physicality of Information Visualization.