ROOK – Urban Play and Data Visualization

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INTRODUCTION

Rook is playful data visualization device aiming at the dissemination of air quality data. The Rook unit accesses the database of the *Hollandse Luchten* (henceforth HL) project, which collects data on air quality in Nord-Holland via a network of sensor kits distributed to the local population and displays it in an interactive way using lights and mist. The eerie and mysterious effect of the colored mist aims at a playful and enticing effect on its users, while, at the same time, spreading awareness on one of the key sustainability issues of the region. People can interact freely with the machine so to explore its working and the data it conveys.

This paper aims to contextualize and describe the design process behind the creation of Rook and to propose some reflections on playfulness, citizenship and data visualization.

MEDIA ARCHITECTURE AND PLAYFUL CITIZENS

Smart cities' ability to produce data offers interesting opportunities but raises several issues concerning privacy, instrumentalist urban planning, sustainability (Greenfield 2013), but also the democratization of the production and communication of these data (Kitchin 2014).

There has been a proliferation of bottom-up smart citizenship projects focusing on environmental monitoring (air quality, water pollution, environment temperature…) thanks to low cost sensors and microprocessors and the possibility to create IoT devices in maker spaces (Salim & Haque, 2015). Citizen sensing (Gabrys, 2019) or participatory sensing (Waal & Dignum, 2017; Balestrini, 2017) indicate initiatives that use open technologies in a bottom-up way to involve citizens in the processes of data collection and analysis. Such projects typically make data available on screen-based online platforms or dashboards, displaying diagrams and numerical data that are not simple for the general public to understand nor particularly engaging (Hoggenmueller et al., 2018). Moreover, the data requires a specific action and interest from the citizens to be found and is then experienced individually (Moere & Hill, 2012).

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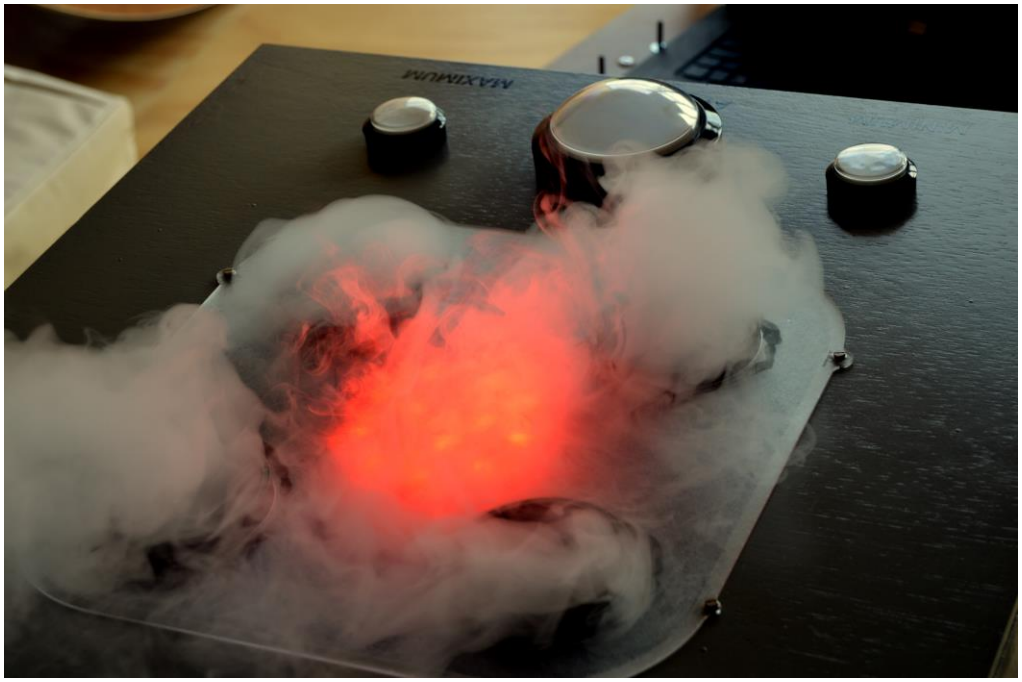

Figure 1: The Rook unit.

Using media architecture devices in public spaces democratizes data communication (Koeman, 2017) while making data tangible, and enabling a collective experience of digital information. Visualization interfaces located in public spaces, when displaying meaningful information for the community, can raise awareness and eventually lead to behavior change (Moere & Hill, 2012). Playfulness and *ludic design* (Gaver 2009), by breaking a screen-saturated routine and offering new non-individualized ways of interacting with physicalized data, can further increase noticeability and engagement. Adopting ludic design in the public spaces is also a way of challenging the way we think about cities in a whole, connecting them with the ideas of Ludic City (Stevens 2007) and Playable Cities (Nijholt 2017).

ROOK

The Rook unit is a 54 x 54 x 72 cm (length x depth x height) machine. When activated, the mist-maker inside the unit produces mist from clean water via ultrasonic vibration, which will be expelled on top of the unit and colored with an RGB light, producing a haunting effect. The colors of the mist represent the air quality registered by one of the HL sensor kits. Rook does not collect additional data. Rook is connected to WiFi and its code allows it to retrieve the hourly data of Particulate Matter 2.5 micrometers (PM25) using the HL API (in a scale from 0 to 150µg). The colors exhibited in Rook are coded accordingly with the colors displayed in the HL maps, using a wide spectrum ranging from green (low concentration of PM2.5) to yellow (medium), to red (high) – levels defined according the directive 2008/50/EC of the European Parliament.

Rook has three buttons. When activated they will show the hourly average, minimum and maximum levels of PM 2.5 from a specified sensor kit. The users can experience the changes in air quality by pressing the different buttons and seeing the colors of the smoke change. However, Rook's mist is not only for show: being perfectly safe, players can touch it, play with it, smell it, blow it away and so on. In other words, Rook allows a playful interaction with the mist. At the same time the mist often acquires rather menacing nuances of red, indicating a high level of pollution. The playful interaction, therefore, also invites critical reflection. This dissonance – represented in the word "rook", a chess piece in English, but meaning "smoke" in Dutch – is how Rook aims to be effective.

Rook is made to be effective both indoors and outdoors so to be positioned in different spaces such as museums and research centers (Rook is currently featured at climate change center *BRAK*! *Ijmuiden* in North Holland) as well as in the open during public events.

While designing this project three main principles guided our decisions:

- First, we wanted to devise for a non-screen way of visualizing smart citizen's initiatives, in order to create awareness. This led us to media architecture and installations in public space
- Second, we wanted to allow for a playful interaction so to maximize engagement. This led us to using mist and its affordances.
- Third, we wanted to avoid a top-down approach and to propose "our" solution. We made data visualization as transparent as possible: the colors displayed by Rook reflect those used in HL maps, but do not directly indicate a situation of danger, only the level of PM2.5.

Our design rationale was based on an exploration of the metaphoric potential of using air as a medium to illustrate data about air itself. We aimed at making air "visible", creating a machine that would "reveal" its invisible properties. At the same time, we built on the literature, researching the potentials of urban gamification (Thibault 2019), media architecture and tangible data visualization to reach a broader audience, make data easier to understand, and engage citizens in a meaningful way.

From a research perspective, Rook aims to contribute to the exploration of the intersection between smart city, media architecture and playful design. Devices such as Rook, that avoid task-oriented functionalities and promote playful and surreal moments of meaning-production, allowing for curiosity, exploration and reflection (Sengers et al. 2005), could help us go beyond current approaches to citizenship based on data collection, and expand the *smart* debate to the presentation of meaningful data in the public space. We should bring the *control room* to the public environment, not only via open data in API and dashboards, but also in the physical space.

Figure 2: The Rook unit.

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