Hidden Systems

Black Box Ethics

Oliver Moldow, Tonya Nguyen, Rashad Timmons, Hailey Windsor

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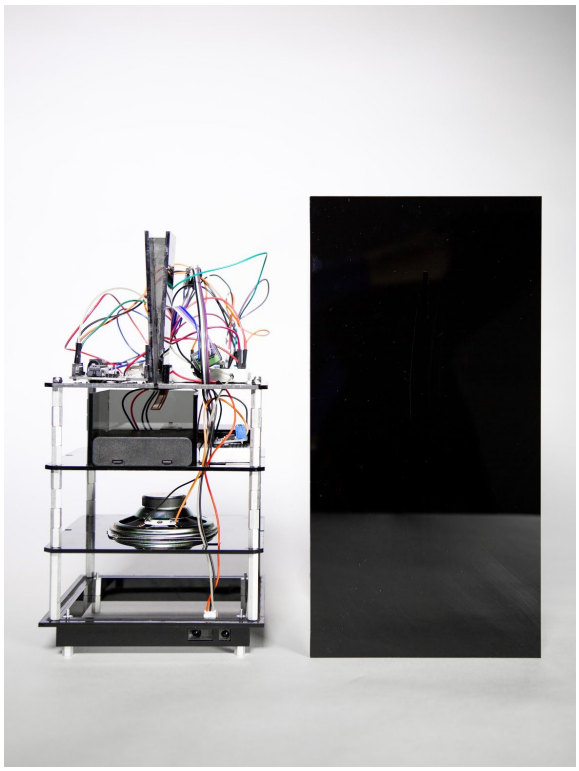
Our protest object aims to counteract the framing of algorithms as opaque technical systems. Media researcher Taina Bucher argues that the framing of algorithms as black boxes can imbue them with figurative power and reinforce the idea that certain algorithmic processes are unknowable. This logic creates a functional opacity for some algorithms, enabling them to obscurely shape and order our engagement in sometimes harmful and exploitative ways.

Algorithms increasingly inform more aspects of our daily lives—from how we communicate and get around to what music we listen to. Algorithms, too, have become deeply entwined with other significant arenas of social experience. Today, they are used to evaluate applicants' personality during job interviews, to make determinations about interest rates in mortgage lending, and to predict patterns in criminal activity and behavior. As more agency is distributed to algorithms to make determinations in such high-stakes scenarios, it becomes imperative that we demand transparency in how these algorithms are designed, produced, and executed. We use the language of *light*, *transparency*, and *openness* with intention as functional antonyms to ideas of darkness, opacity, and obscurity. The latter words characterize the prevailing discursive frameworks used to describe algorithms systems today. We protest that received language by countering what Bucher calls the manufactured "unknowability" of algorithms. In what follows, we discuss in detail our object, appropriately named **Heuristic Algorithm**, along with the design motivations that influenced its fabrication and programming.

Heuristic Algorithm



Heuristic Algorithm is an exploration of hidden mechanisms with the visual metaphor of the black box. Upon stepping within range of the mysterious box, a futuristic cacophony assaults the user. Thereafter, the box verbally prompts the user to stop the noise by inserting a quarter. When change has been inserted, the futuristic sound ends and is replaced with a statistic on exclusionary algorithms or other tech “black box” systems. Statistics include:

- “Researchers at UC Berkeley found that financial technology lenders using algorithmic models discriminated against Latinx and Black borrowers by charging higher interest-rates.” (Bartlett et al., 2018)

- “74% of Facebook users indicated they were not aware the site estimates their interests and preferences based on their online behaviors to deliver them targeted advertisements.” (Hiltin & Rainie, 2019)

- “More than 60 jurisdictions across the United States utilize algorithmically-driven criminal risk assessment tools, despite evidence that such tools can display bias against black defendants.” (ProPublica, 2016)

- “Netflix accounts for 15% of total downstream volume of traffic across the entire Internet, which has major implications for energy use and environmental impact.” (Sandvine, 2018)

Through disseminating such facts, we aim to unmask the black box surrounding these processes. Our object also performs its own black box operation via the currency exchange, as the final destination of the inserted funds will be donated to **Black Girls Code**, an organization based in Oakland working to increase the representation of underrepresented communities n tech. According to its founder Kimberly Bryant, Black Girls Code aims to “introduce programming and technology to a new generation of coders, coders who will become builders of technological innovation and of their own futures.” We share the sentiment with Bryant that should more Black girls end up in the room as the algorithms we interact with daily are devised, less bias may make its way into these complex systems.

Observation Documentation

Materializing Opaque Technical Systems

Interfacing with Heuristic Algorithm models a process that already occurs in our everyday lives. We unknowingly relinquish data to a myriad of social networking platforms, and that data is scraped and funnelled into virtual black-boxes. Our use of new media platforms involves an implicit agreement to have our online behaviors analyzed by metrics that produce outcomes largely serving the interests of large technology companies. These processes also reinforce preconceived notions of power and value. In addition to marketing tools such as Facebook ads or Amazon Prime, algorithms have been used to augment racial profiling, technological warfare, and have put people of color and women into algorithmically confined boxes. Very often, the data collected and assumptions made by these algorithmic systems are reflective of social processes that are often inequitable (discriminatory, racist, gendered). Examples of 'bad' or oppressive algorithms include Microsoft's Tay, Google's Search Engine *Displaying Black People as Gorillas,* and, most explicitly, racialized facial recognition software.

Given that algorithms are used to evaluate people's data in unknown ways, we decided to model this covert interaction into Heuristic Algorithms interface. Some of the questions we asked were

- What does the black box symbolize?
- How might we leverage this metaphor?
- What should determine the input?
- What should determine the output?

By answering these questions, we were able to leverage conceptual design and emotional design (Don Norman). We determined that the input should be some form of exchange—namely, money. **We used money as an input because personal data has become a product that is heavily sought out and monetized.** In line with Marx's notion of *commodity fetishism*, we were interested exploring how **human behavior and personal data are increasingly imagined as commodities in an information economy rather than byproducts of social relationships between individuals.**

Despite our dark theme, we wanted interactants to take something away from interfacing with the black box. To emphasize **unveiling opaque systems,** we decided the output would be a **truth about these hidden technical systems and their inherent consequences.** We realize that this implementation is rather prickly—very often, we put technology up to a pedestal and assume that it is "right" or "correct." Although our output is a **truth, it is also a nod to the blind acceptance of current realities and the blind trust of technical systems.**

Literature Review

Much of the impetus behind our object is influenced by scholars like Bucher, Safiya Noble, Virginia Eubanks. This group of researchers is at the forefront of contemporary discourses pertaining to **algorithmic bias**, **data privacy**, and **the sociology of technological systems** writ large.

Taina Bucher's *If...Then: Algorithmic Power and Politics* (2018) investigates the agency of algorithms in shaping and creating meaning in our contemporary media environment, arguing that algorithmic systems wield power and are political in their ability to set parameters for interaction, influence when and how digital phenomena appear, and determine what is "intelligible and sensible."

Safiya Noble's *Algorithms of Oppression: How Search Engines Reinforce Racism* (2018) explores the power of algorithmically-curated database systems, namely Google's search engine, in reinforcing prevailing stereotypes about women of color (Black women and girls in particular). Part of Noble's work is about challenging the framing of Google search as the arbiter of accurate knowledge and information (codified in the common adage "Just Google it"), and insisting on its identity as a large, highly-technical advertising company.

Finally, Virginia Eubanks's *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (2018) interrogates the effects resulting from the implementation of automated decision-making systems in the domains of employment and finance, human and health services, policing and law. She argues that "the most invasive and punitive systems are aimed at the poor," demonstrating how issues of race, gender, and class rest at the heart of our data-driven society.

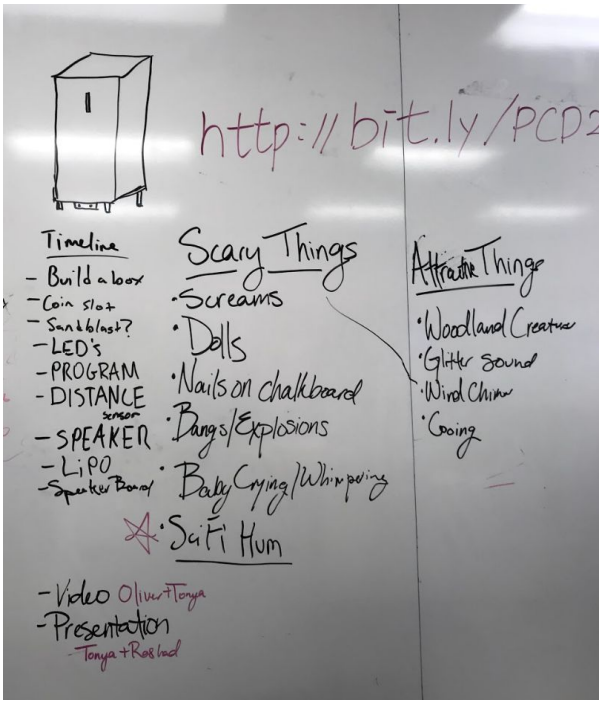
These texts grounded our analysis and provided supplementary research for thinking about our concept and design. Following in the path of these scholars, **we aim to counter the framing of algorithms as black-boxed systems by bringing to light information related to the technology companies and algorithmic structures we interact with often.**

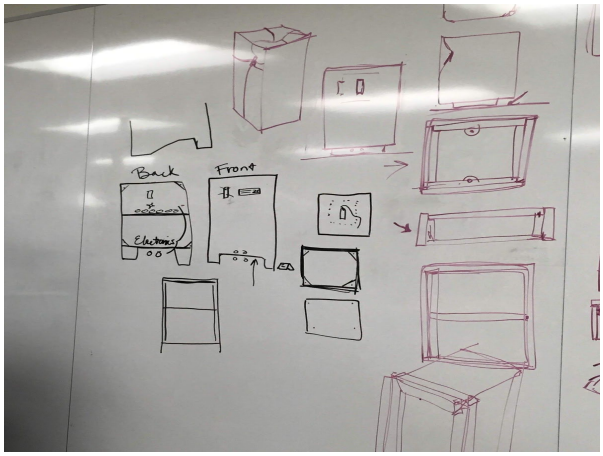
Process

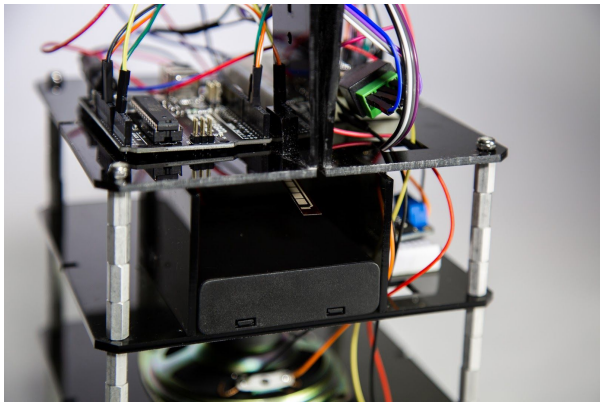
Materials

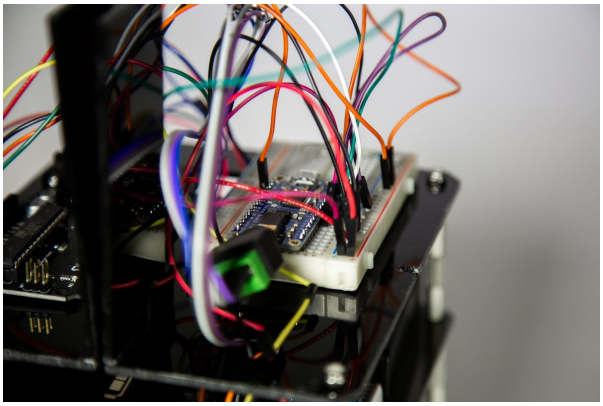
1. Arduino Uno
2. Adafruit Sound Board FX
3. IR Sensor
4. Flex sensor
5. Battery Pack
6. Lipo
7. Speaker
8. Black Acrylic
9. Standoffs

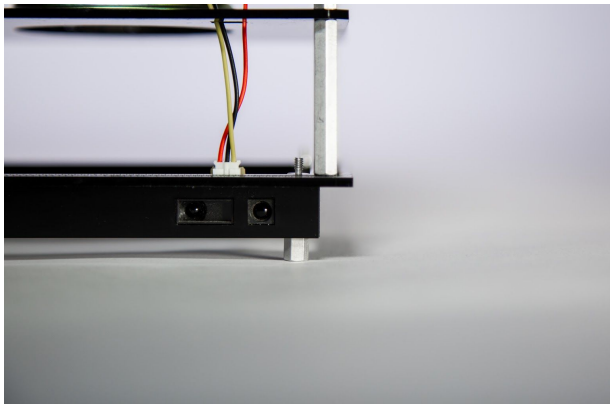
Process

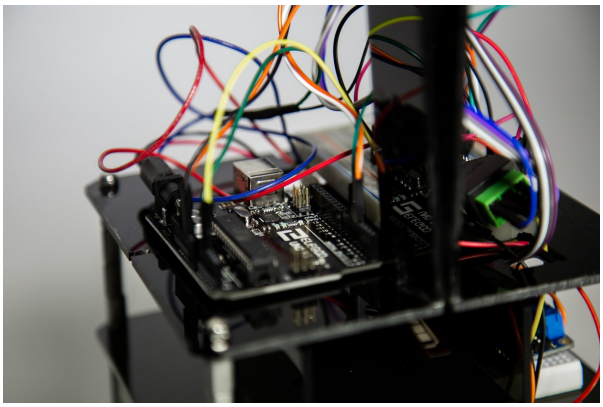


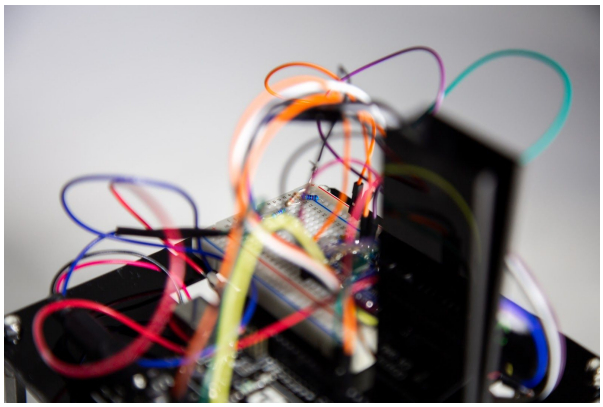












Design

The design was heavily influenced by the science fiction classic *2001: A Space Odyssey*. In the film, there are a series of black monoliths that appear at critical moments in the history of humanity. We wanted to emulate that ominous figure in form and HAL 9000, the quintessential example of technology gone wrong, in character.

The interior design was inspired by the design of the Apple Mac Pro, which is able to stack a number of components on the inside of the product without affecting the exterior finish. It was important to us in our process that the interior frame be entirely separate from the exterior facade. This way, it is possible to see either none of the interior workings or all of them, in a way reflecting the dichotomy between the black-box and the truth.

Sounds

We used audio from Ryoji Ikeda's "The Transfinite," as suggested by Kuan-ju.

Programming

Black Box – Github

We used an Arduino Uno and an Adafruit Sound Board to control the Heuristic Algorithm. To do this, we used the IR sensor to detect distance and changes in proximity to the black box and a flex sensor to determine if interactants inserted a coin.

IR Sensor

Whenever interactants came within proximity to the box, it would emit a jarring, white noise. If the user came closer, the volume would increase; the box would also verbalize directives such as “insert coin to disengage” or “take out your wallet right now.”

Flex sensor

The flex sensor was used as a trigger— it determined if users inserted a coin into the black box. Each time a coin was inserted (sensor was flexed), the black box would state a fact about algorithmic oppression, discrimination and inequality, or unsustainability in technology.