RFID as material in design

Timo Arnall

Intro:
I am an interaction designer working within industrial design at the Oslo School of Architecture & Design.

I run a design research project called Touch that has been running for a year and a half

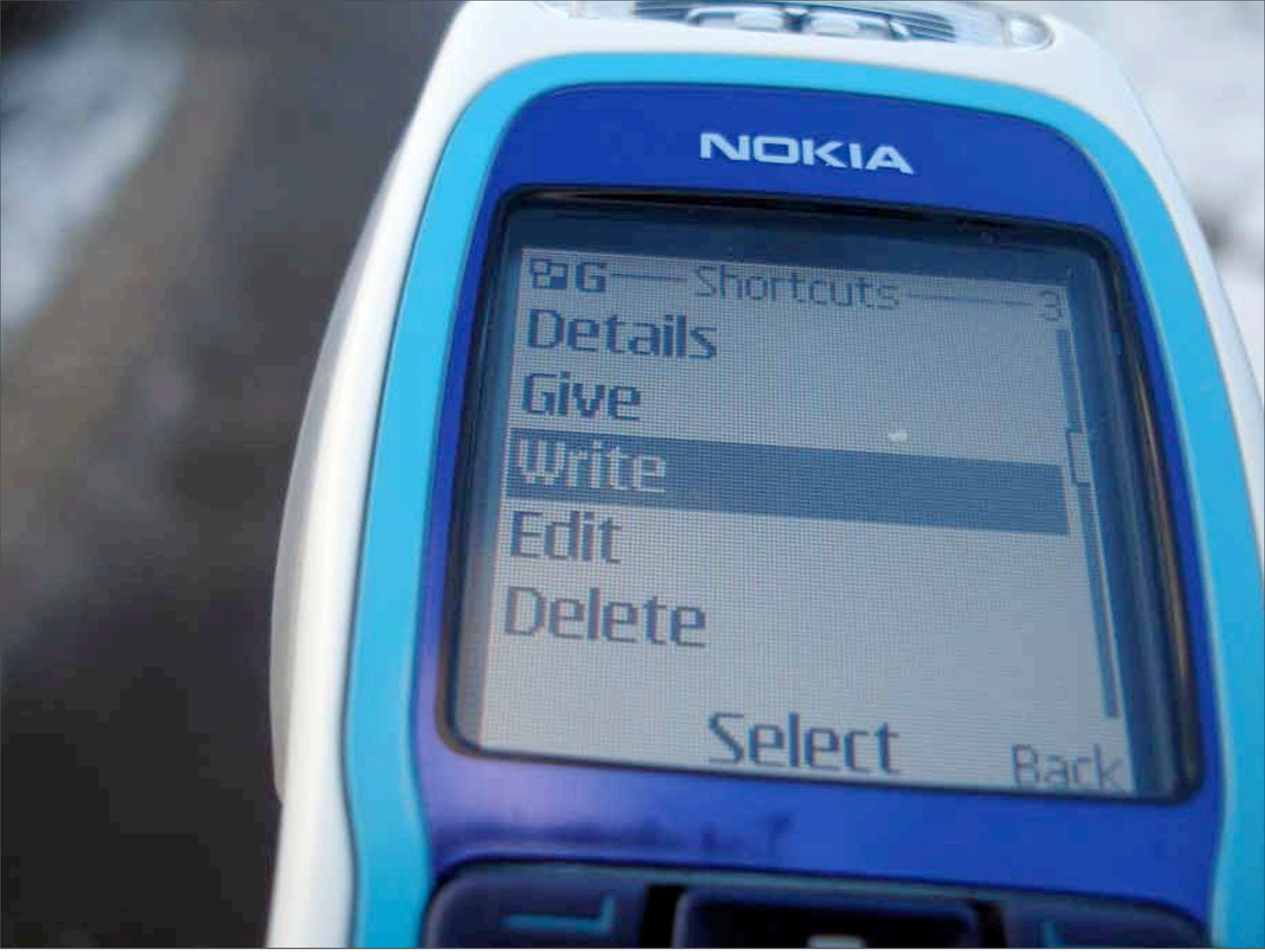
We have a team of :
Interaction design
Industrial design
Ethnography and anthropology
Software

We have between 10-15 Masters students each year.

So the Touch project emerged from

An interest in mobile interaction design

Have for a long time been interested in the idea of using the mobile phone as a platform for interacting with the physical world, in everyday activity.



The project was initiated by the development of RFID enabled phones from Nokia and others. In Japan there are tens of millions of phones with RFID readers.

Have integrated RFID readers
can read *and* write to RFID tags, as well as communicate to other devices

Significant: they enable a certain amount of agency over RFID, instead of being read, people are reading and writing.

RFID is usually structured that things or people are tagged, and someone else is reading, but here people have readers.

The project is exploring the use of RFID in a design driven process.

This means we look at experimental, playful, expressive applications. We look for patterns and inspiration in the designs that we create.

This is about the RFID front-end:

We work at the level of experience and expression:
What does it do? For what purpose?
How does it work, how does it feel?
What experiences does it create?

This approach deals with RFID by engaging with the technology as material. This sheds light on issues that are perhaps not covered elsewhere.

We don’t deal with fundamental RFID technology, privacy and security are not our main concern.

But we deal with issues like interaction, context, visibility and readability so we address some of these issues.

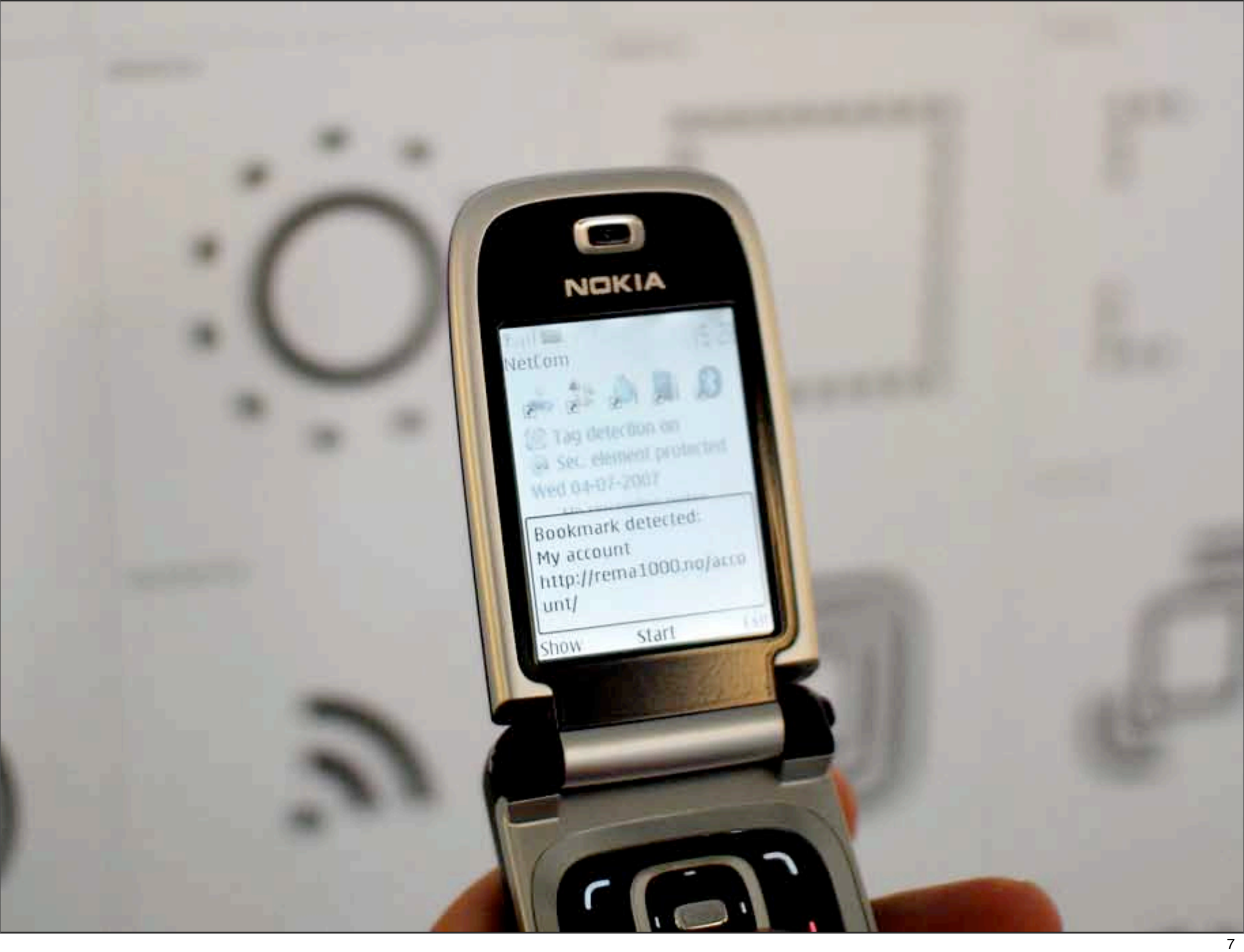
• So Now I want to go through the themes that have emerged from working with RFID as material within an interaction design process.

Touch interactions

So, the term ‘touch interaction’ has emerged

Touch to pay
Touch order
Touch ticketing
Touch and connect

Touch is the new click



Passive RFID usually works over an extremely short range

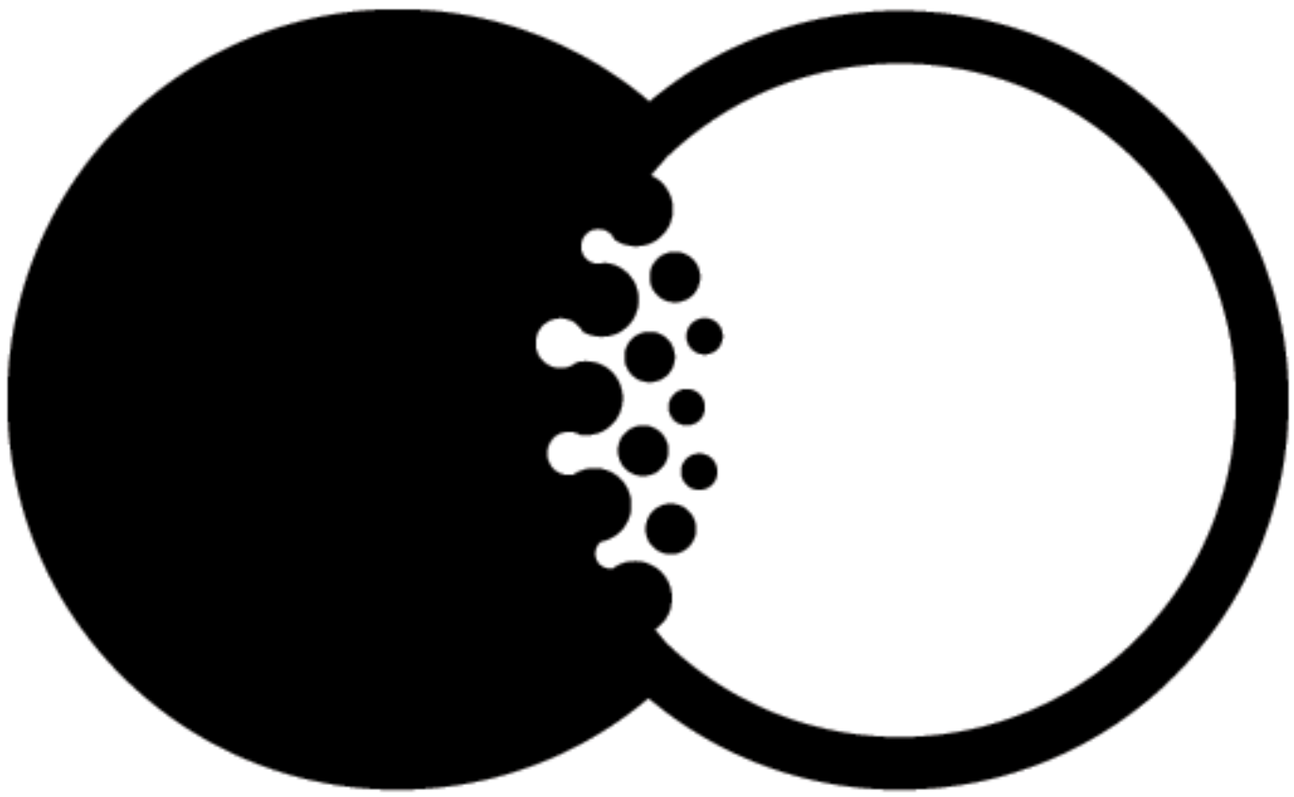
It appears to require ‘touch’

The models that are being used to design with RFID are predominantly based on simple metaphors:

Linking (touch a tag to be linked to a web-page)

Connecting (touch another phone to connect and transfer stuff)

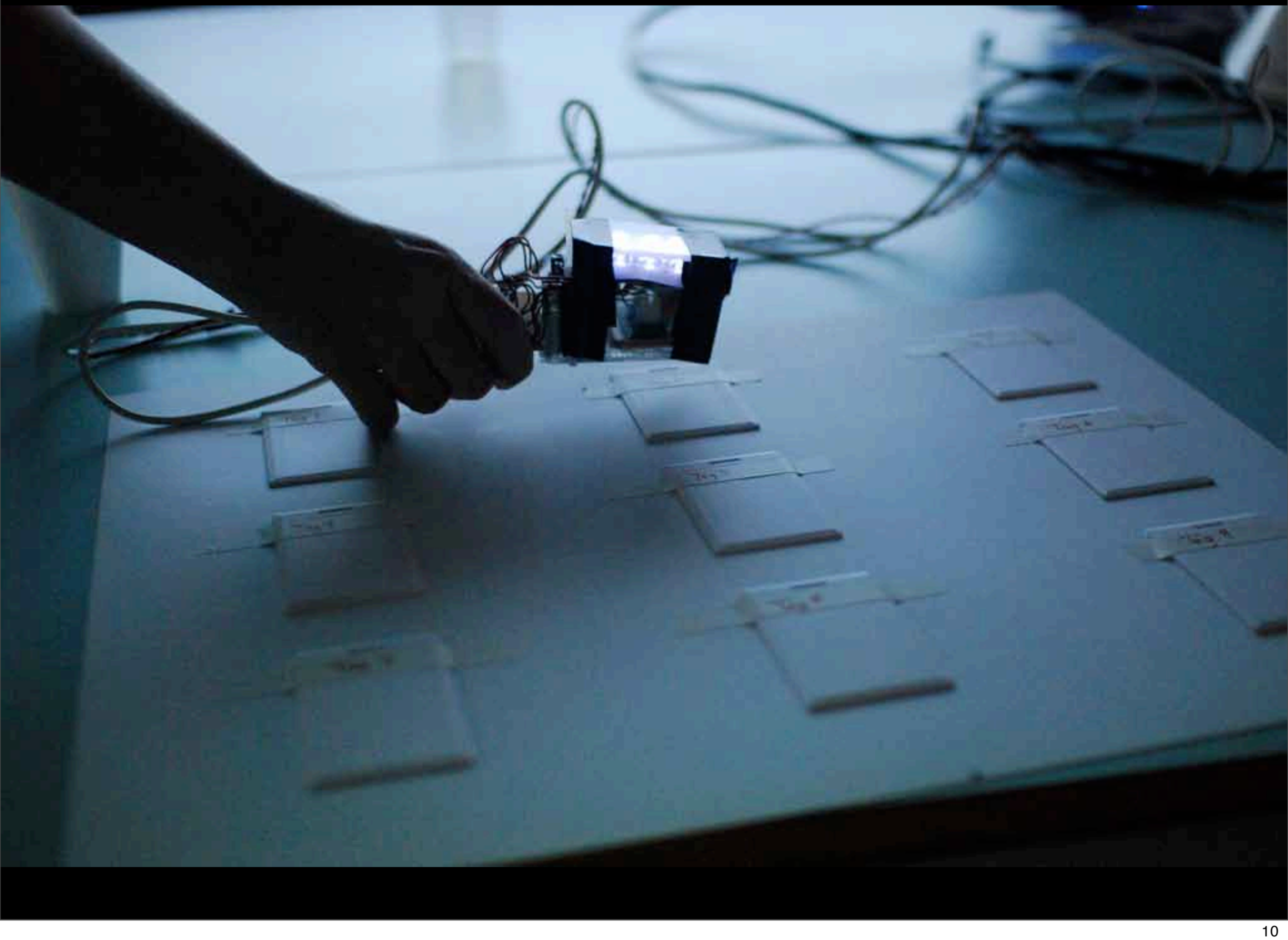
The button (touching a coffee machine instead of pressing buttons)



An RFID interaction is the result of two fields interacting with each other

These are interchangeable in most cases: can be a reader-reader, tag-reader, etc.

Much of our work now is in mapping out how these things work



And prototyping how they feel

This is a prototype of a haptic feedback RFID reader

Physical RFID material

The physical nature of RFID is important to address as designers

By looking at their physical form, we uncover how they work, feel, break, etc.

Much of the controversy about RFID stems from it’s size: it’s scary to have something small that might go unnoticed.

Readers have many forms, and can be integrated into a wide variety of products

Mobile phones as example

Other readers for door-locks, laptops, PDAs, and for integration into products

Sometimes they are symbolised, sometimes not

What is clear is that the reader is usually never visible: embedded below plastic

Many sizes (within reason)

Tags becomes encapsulated in all sorts of forms

They have become everyday objects in many parts of the world

Again, the tag is usually not visible, they look like plastic cards, toys or tokens

This is how RFID is seen by the public (a friendly face)

But RFID is also a very unreliable technology

It breaks easily, simply by folding or bending

Sensitive to temperature, moisture and shock

Easily destroyed with magnetic fields

data corruption

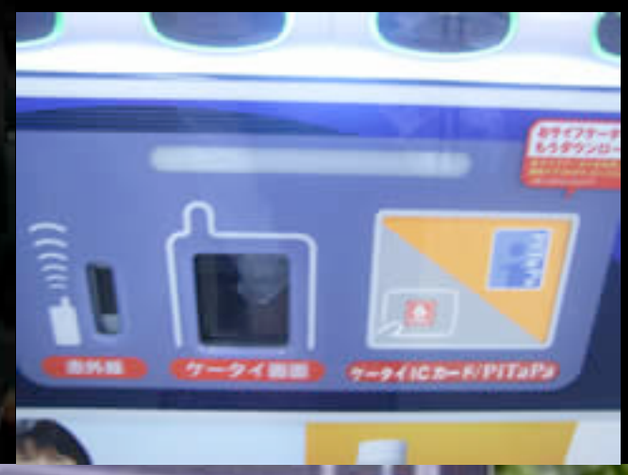
interruption

Fairly insecure

Visibility

Managing the visibility of RFID

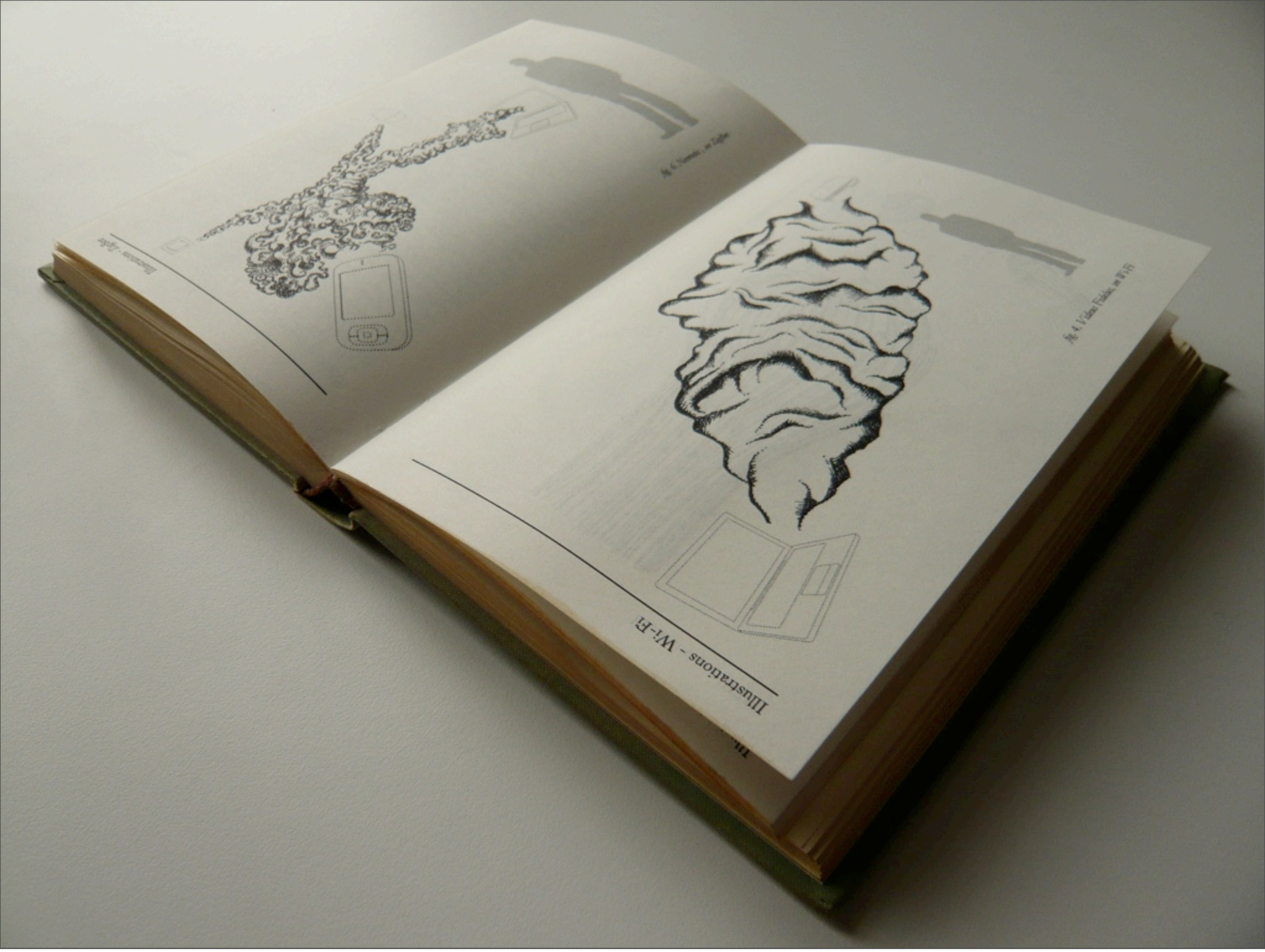
Unlike barcodes or other similar technologies RFID is invisible in as much as we don’t see the radio waves that create the function or interaction.



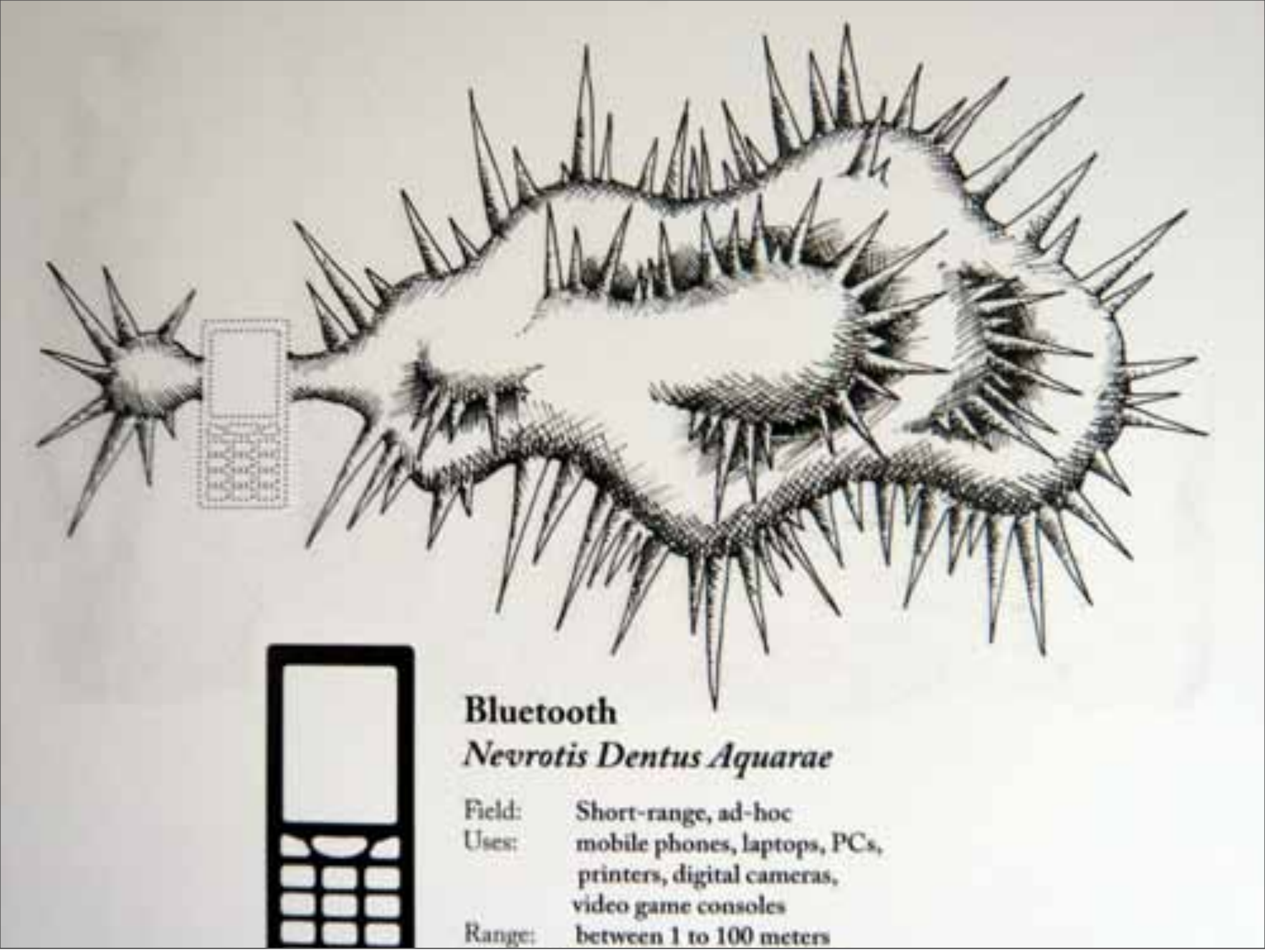
We might choose to expose the technology, the antennae, but it is usually hidden.

This packaging inside of materials, under surfaces, means that it’s ‘readability’ must be designed. This is critical.

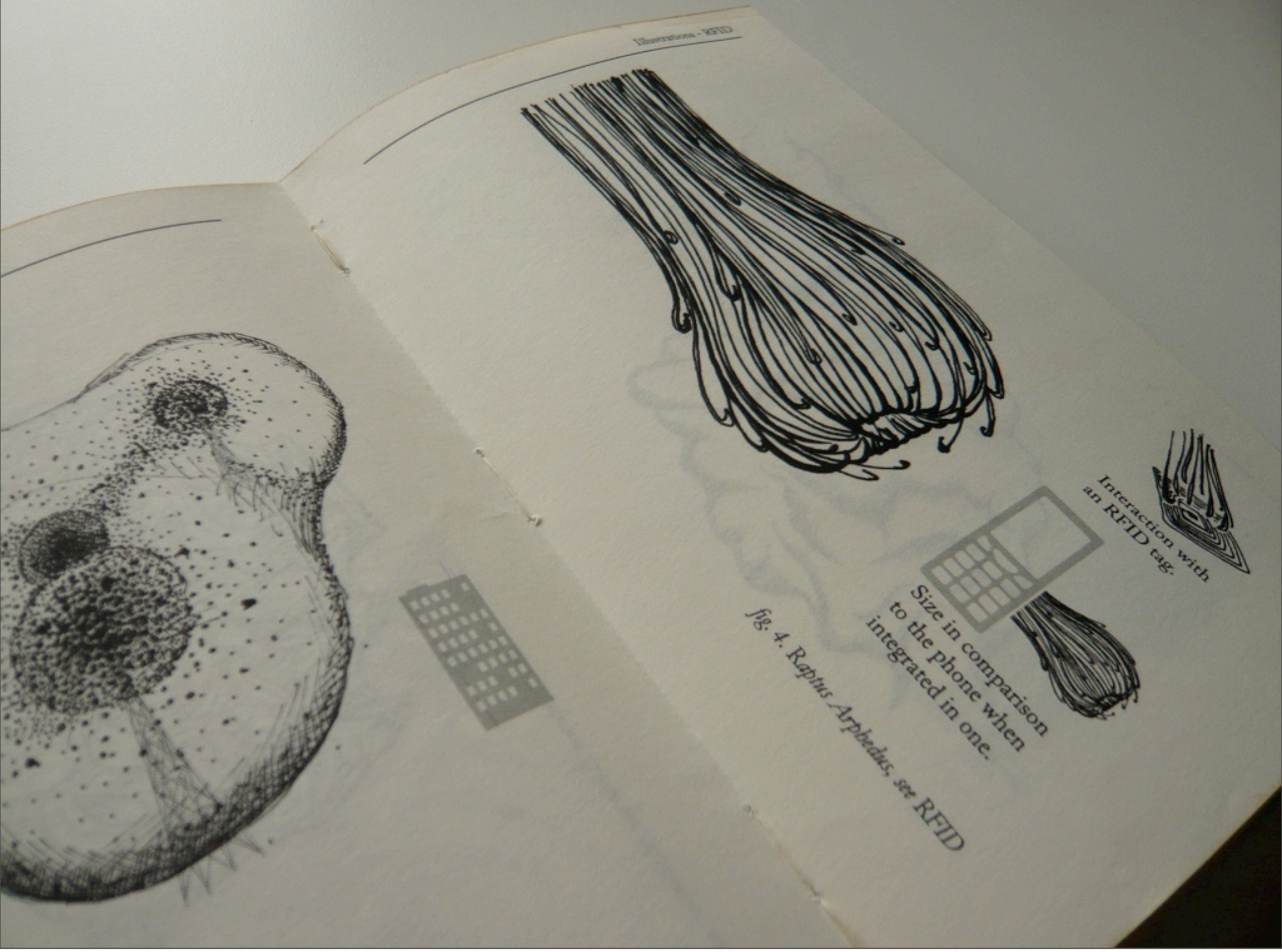
Managing visibility is a perfect job for us designers.



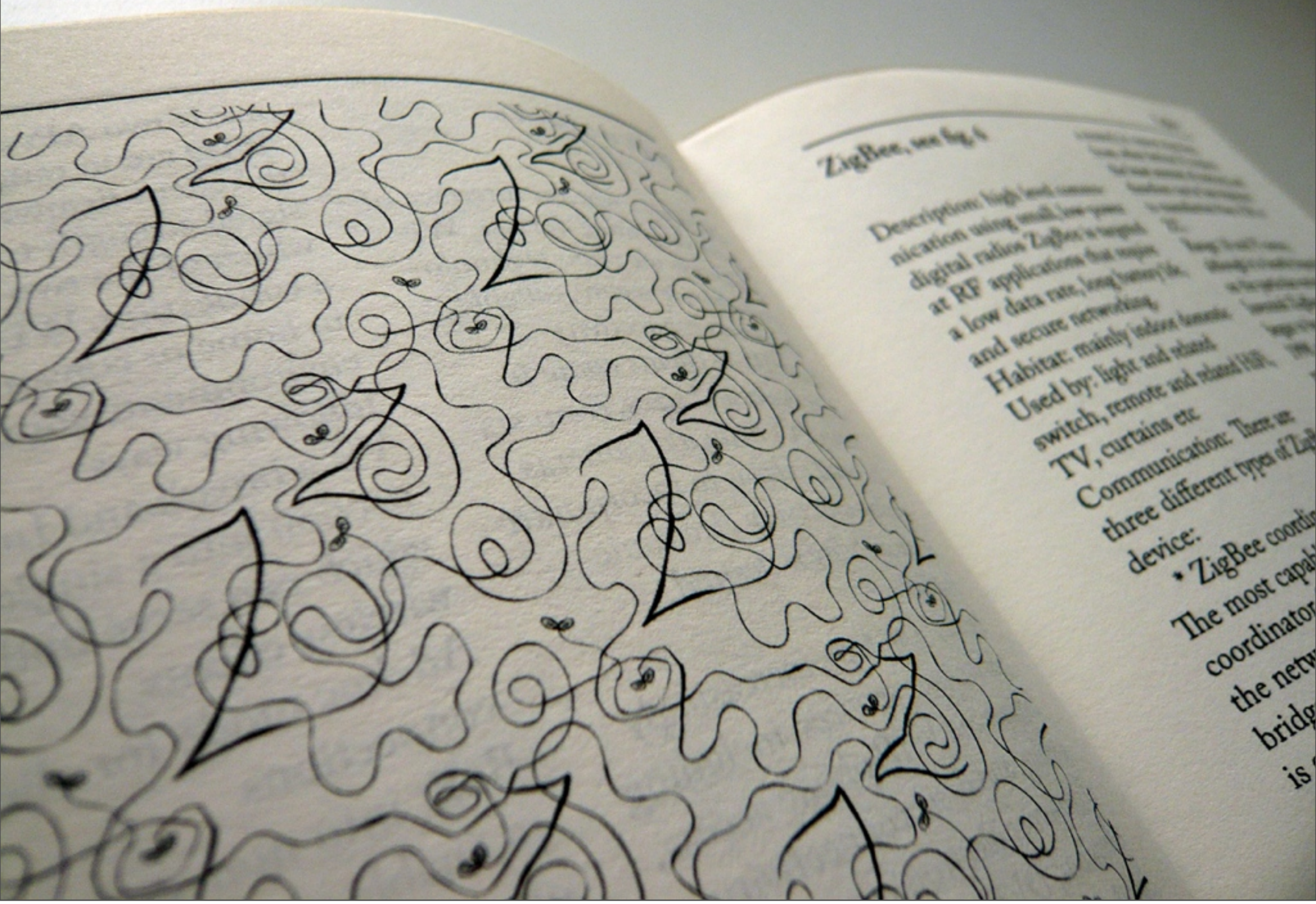
This was a project by one of my students that took on the task of visualising various radio phenomena. She used the form of an encyclopaedia to look at the ‘flora and fauna’ of radio.



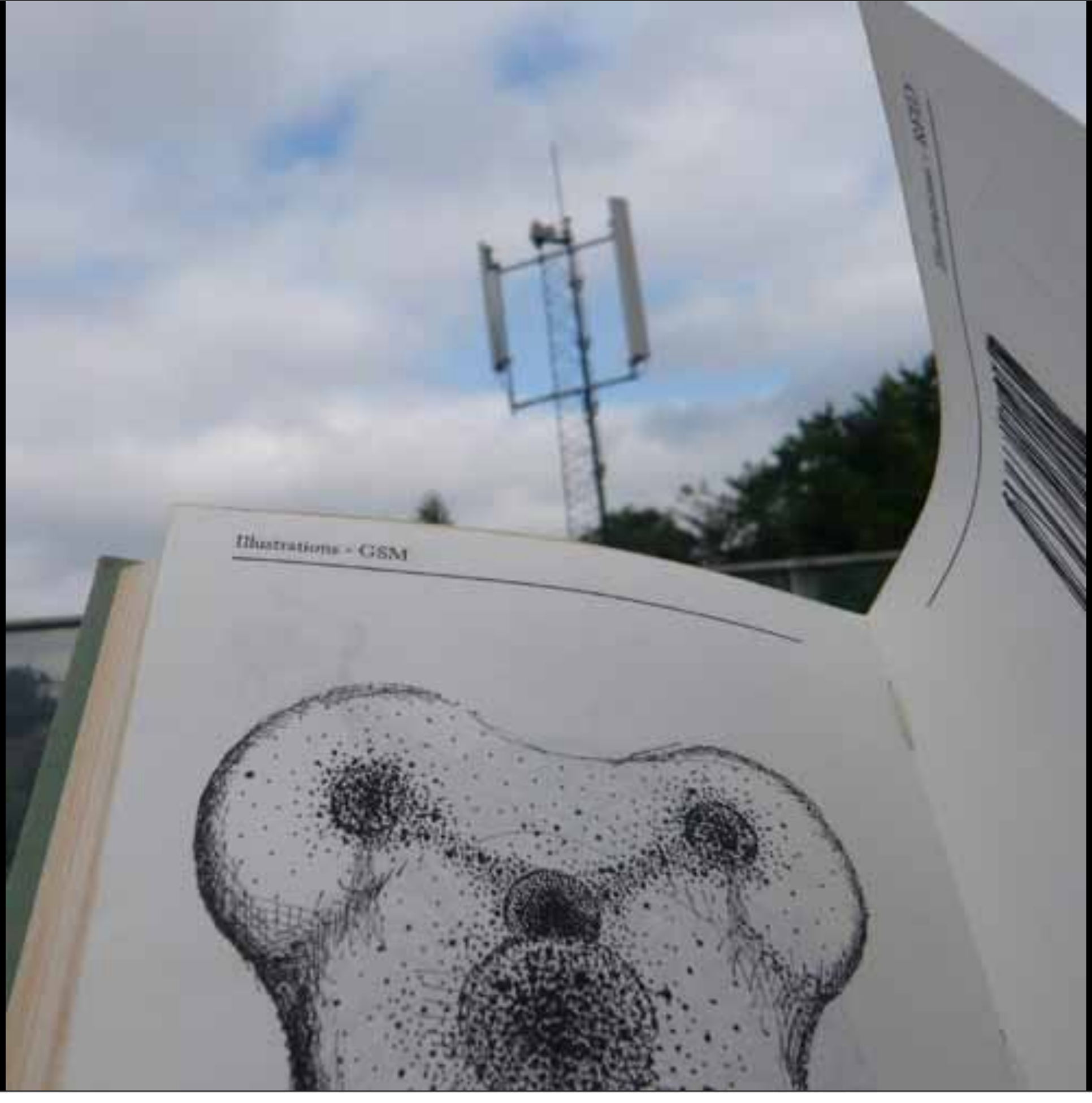
She sketched out how she thought fields would look if they were visible.


Illustrations - RFID
Interaction with an RFID tag.
Size in comparison to the phone when integrated in one.
fig. 4. Raptus Arphedus, see RFID

Here is RFID



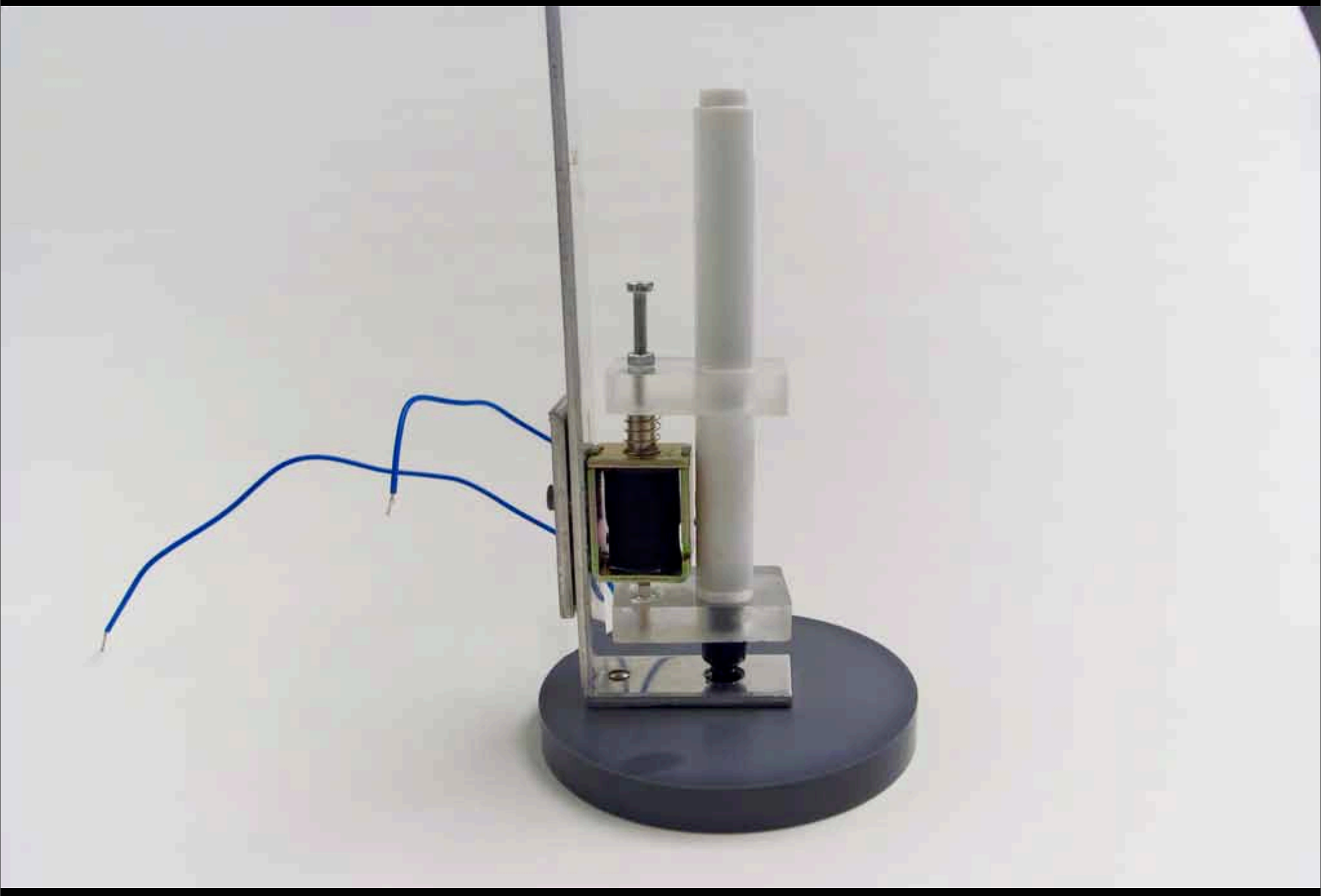
This is the visualisation of another radio field, Zigbee.



Here she looked at GSM.

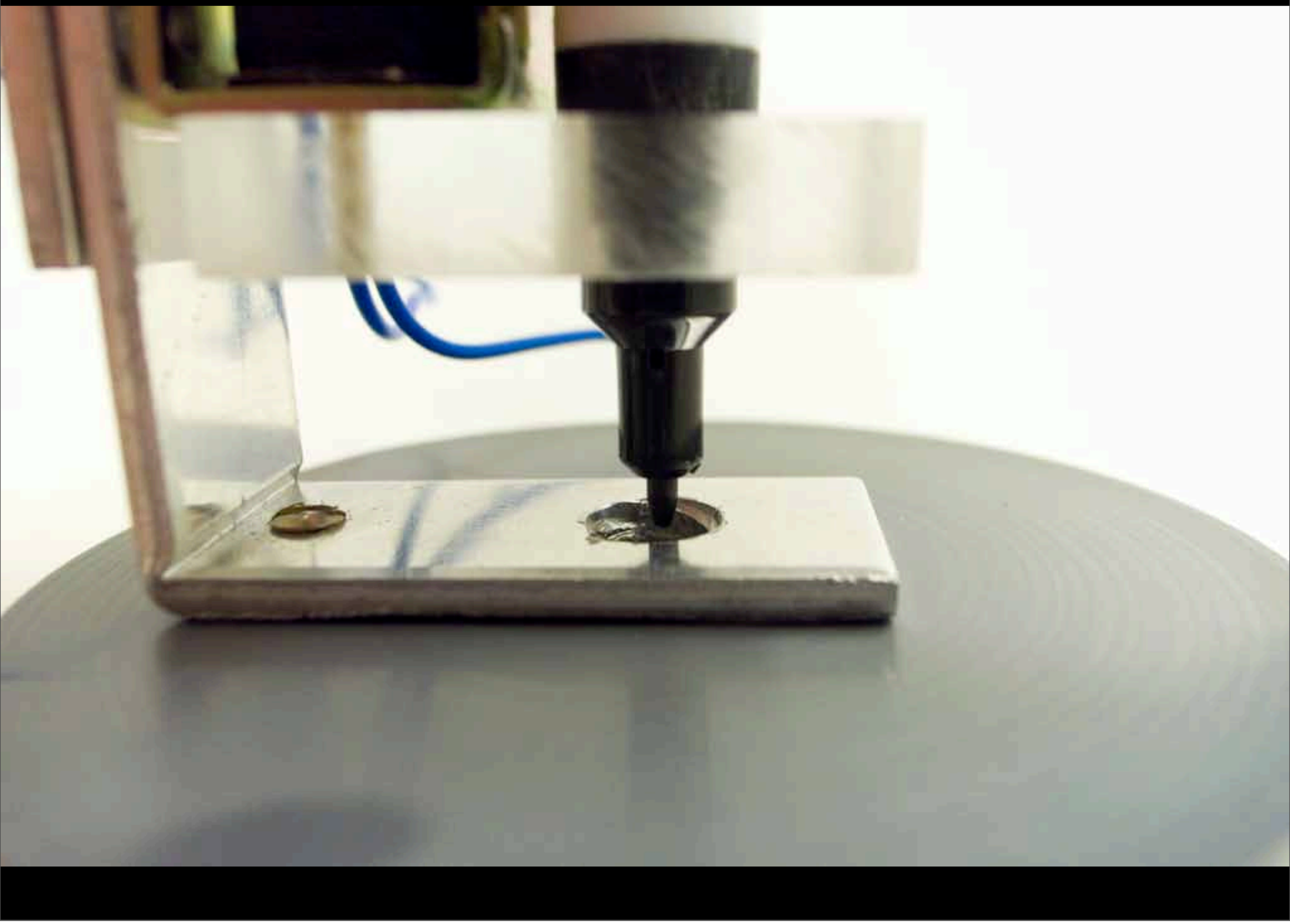
In this project my student addressed the issue of visibility, but she also created an interesting landscape of fictional mental models about fields.

It may not be technically accurate, but it allows us to visualise, compare and discuss fields otherwise hidden

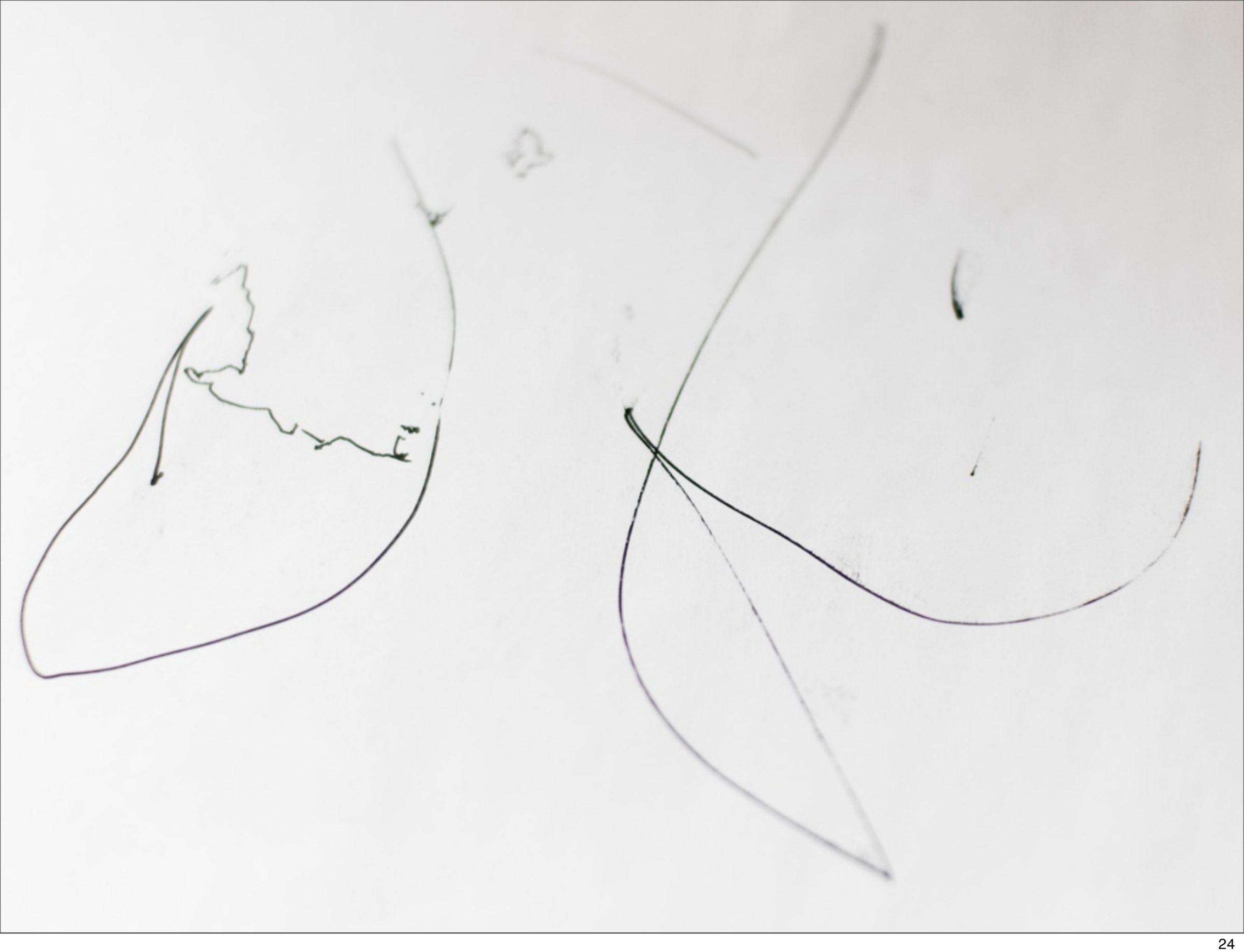


The RFID pen was a project with Schulze & Webb

Developed to simply map out RFID fields



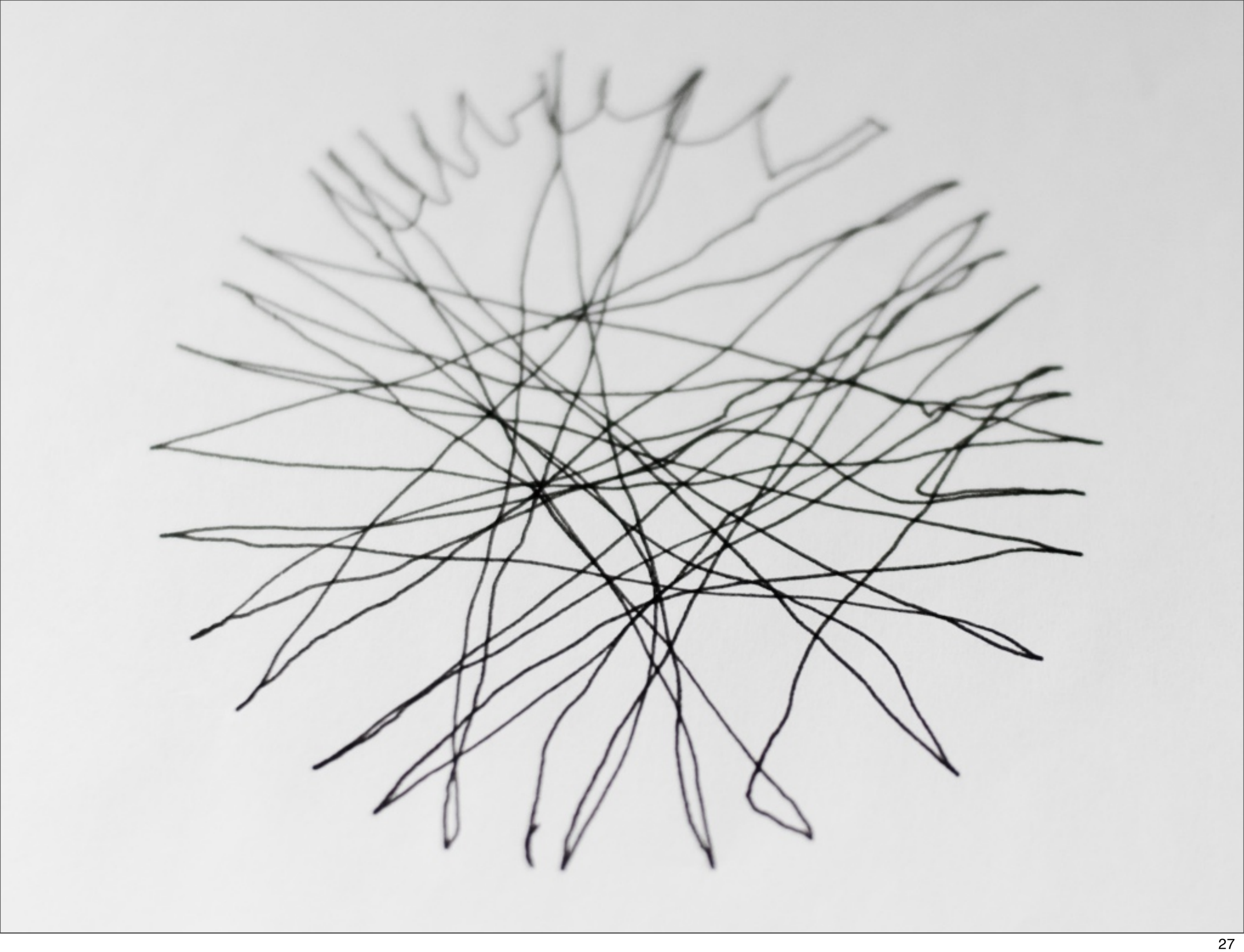
The pen contains and RFID reader that pushes the pen onto paper when it detects the presence of an RFID tag.



Our first tests revealed results like this

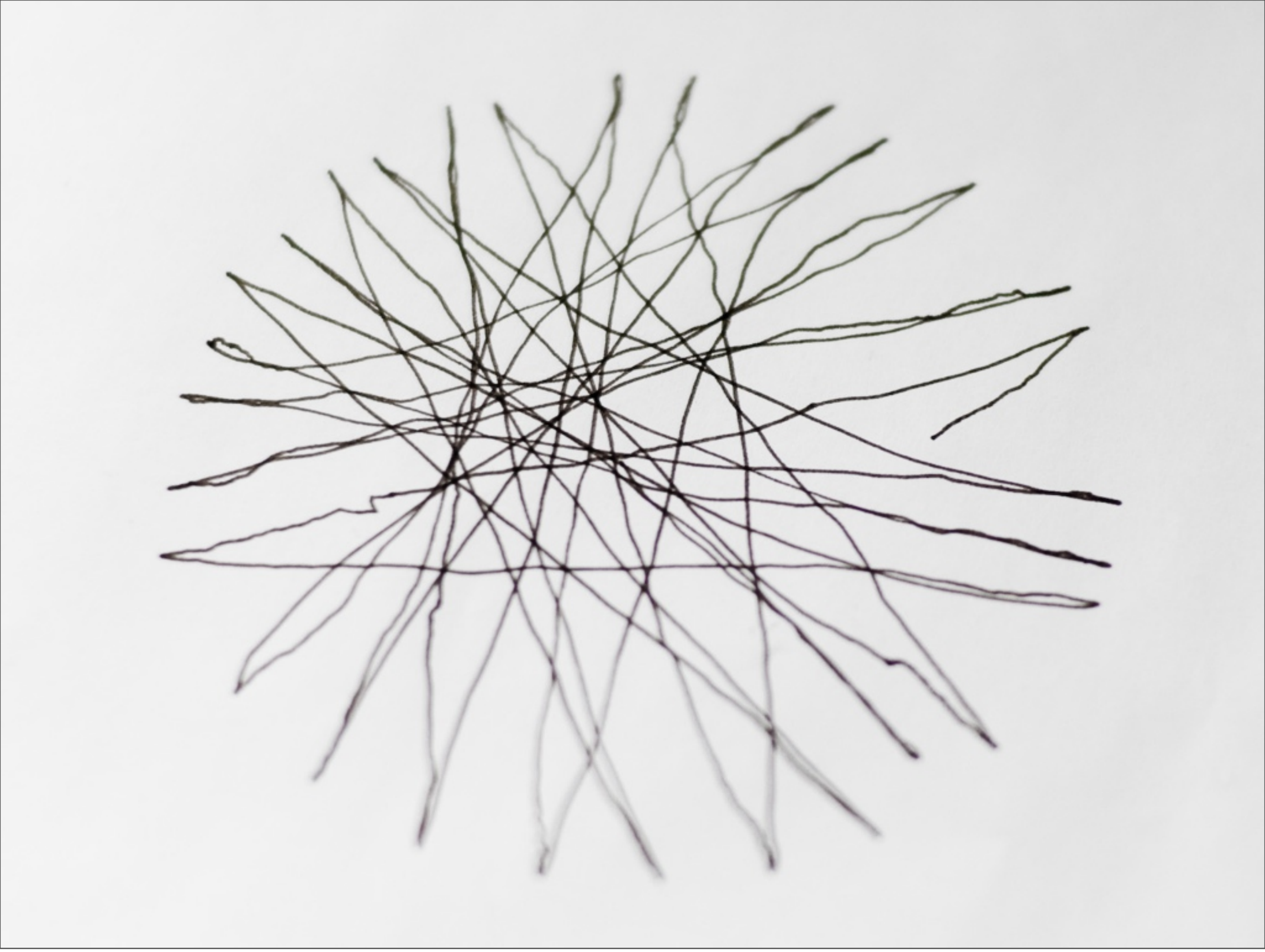
But they gradually evolved

Into understandable visualisations



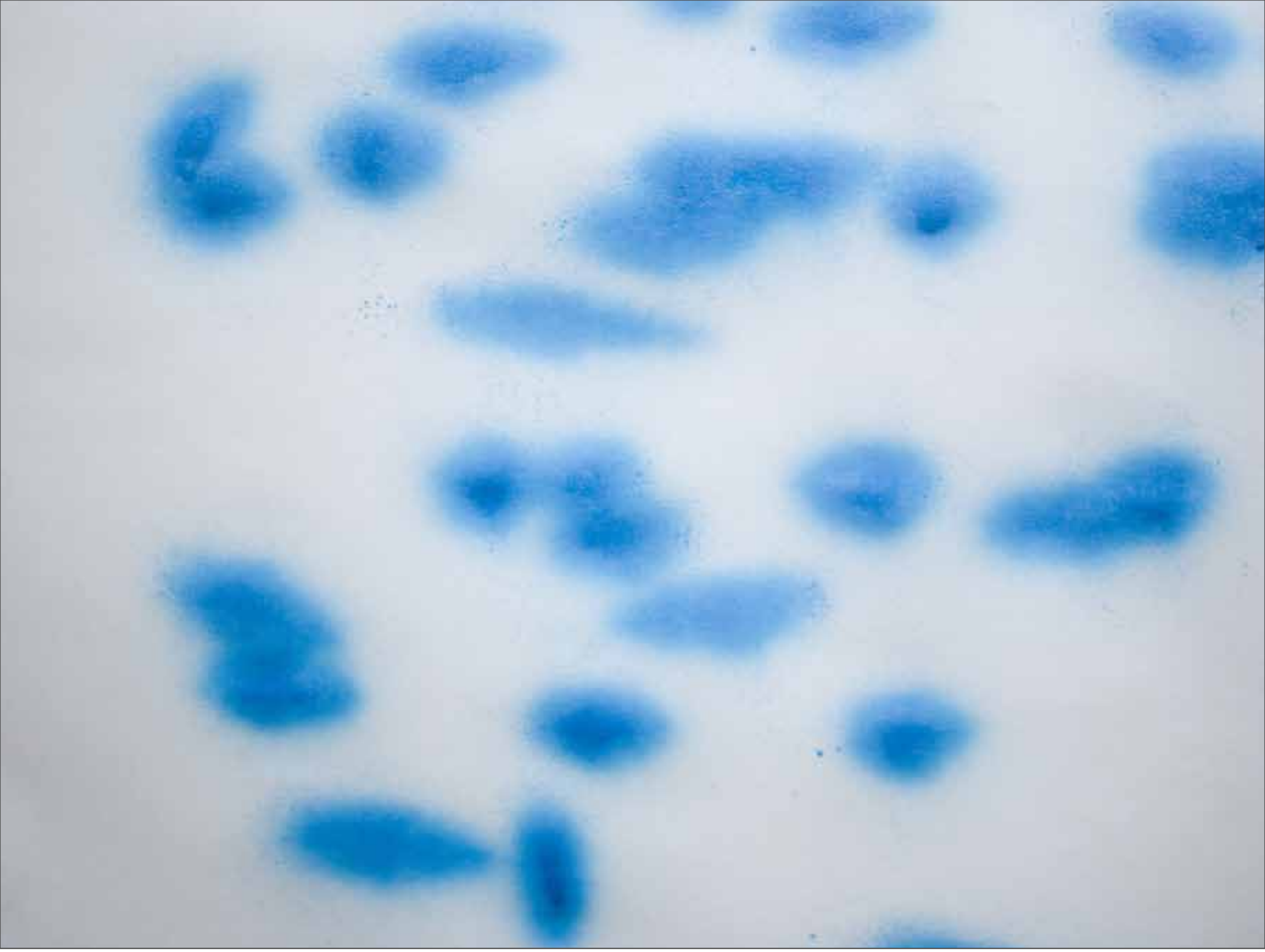
And in the end rather accurate mappings

As it turns out the RFID fields with the reader we were using are perfectly circular.



These mappings allows us to see the ways that RFID fields inhabit physical space.

The pen led to a larger project looking at RFID, painting and typography
This is a spray can that works in a similar way to the pen, when it detects an RFID tag it paints...



In the initial phase it has given us simple mappings of RFID patterns, but we hope to build a way of creating large scale typography and pictograms with the system.

Readability and context

Readability: term from typography

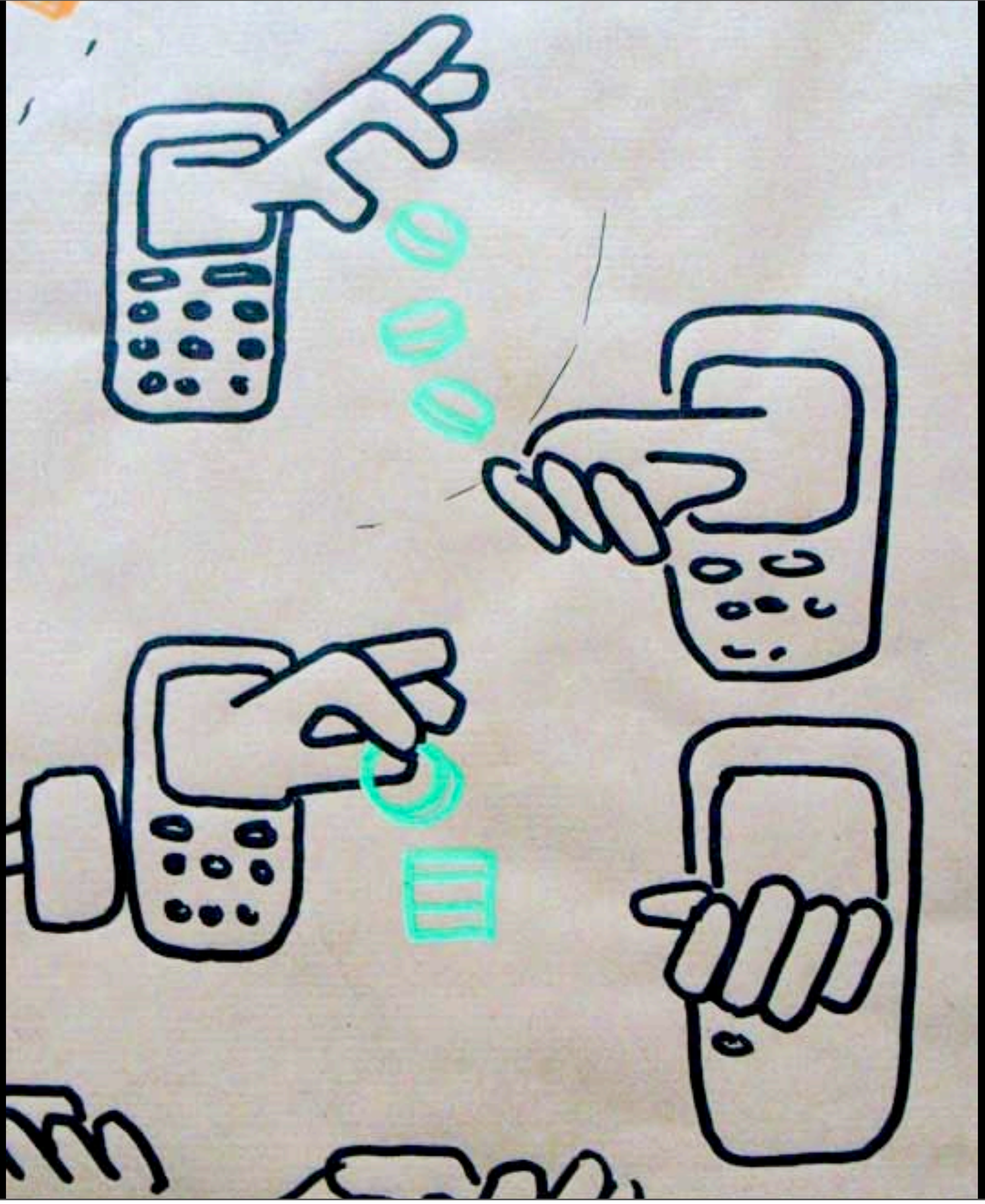
“Readability is the relative ease with which a face can be read when characters are arranged in words, sentences, and paragraphs.”

So it’s taking the basic form of letters (which must be legible) and finding ways of making text accessible in context.

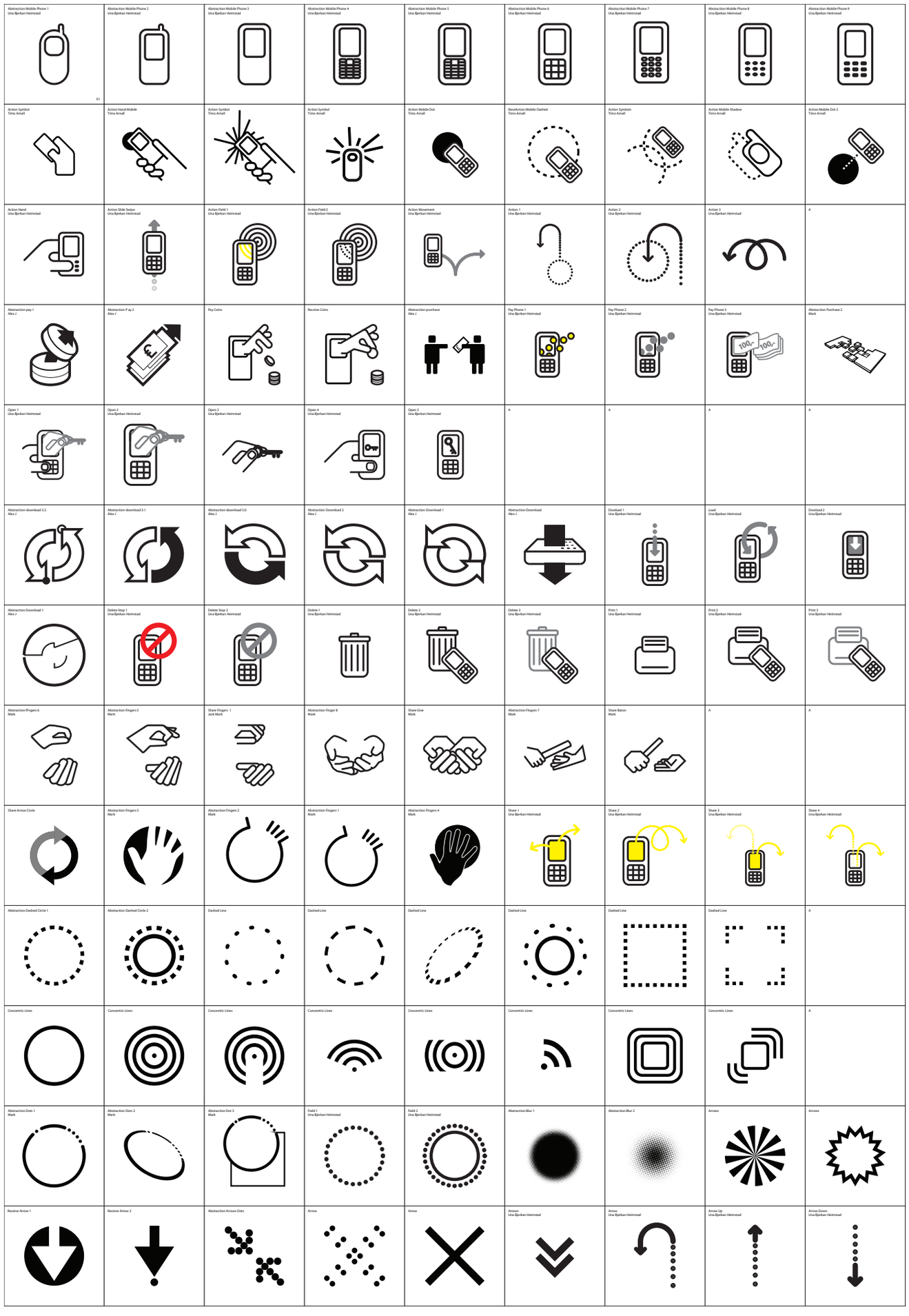
We can think of RFID as the basic forms, that we need to make ‘readable’ in a social/cultural sense

This is a project that we’re working on with Schulze & Webb, Central Saint Martins and Nokia.

It attempts to find ways of visualising, finding graphic languages, for RFID based interactions

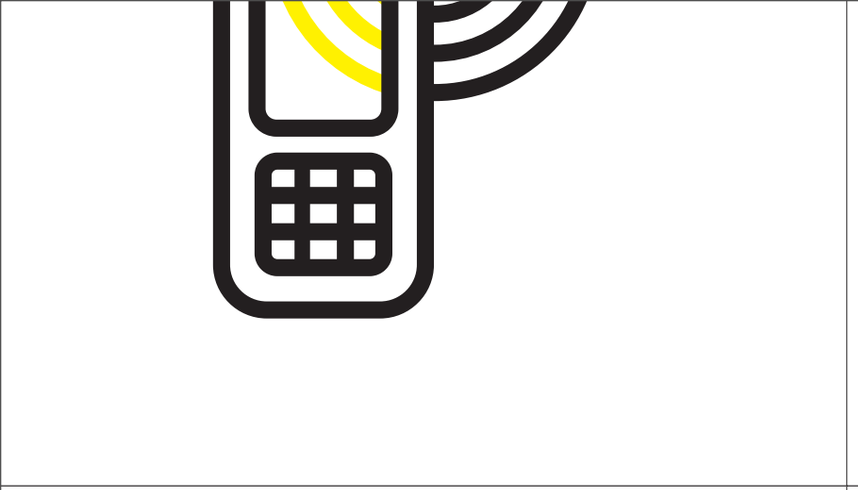


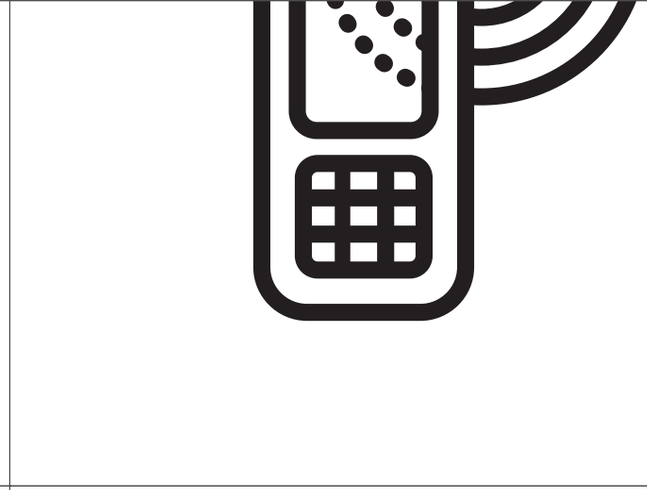
Here we are looking at character, humour and expressive ways of explaining simple but risky payment interactions.



This is the work so far.

There are a wide diversity of icons, that deal with different aspects of making RFID readable.

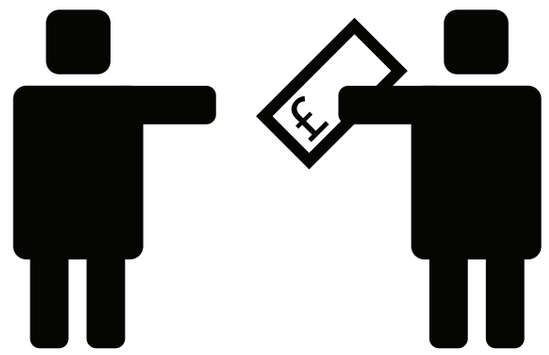




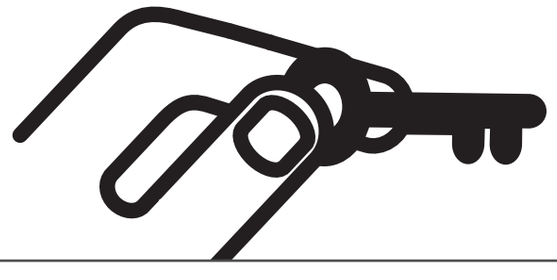
Pay Coins

Receive Coins

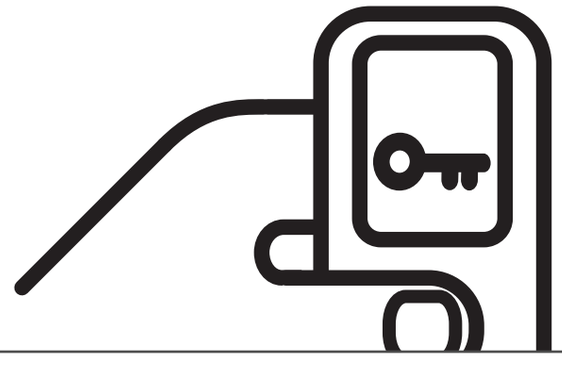
Abstraction-purchase
Alex J



Open 3
Una Bjerkan Heimstad



Open 4
Una Bjerkan Heimstad



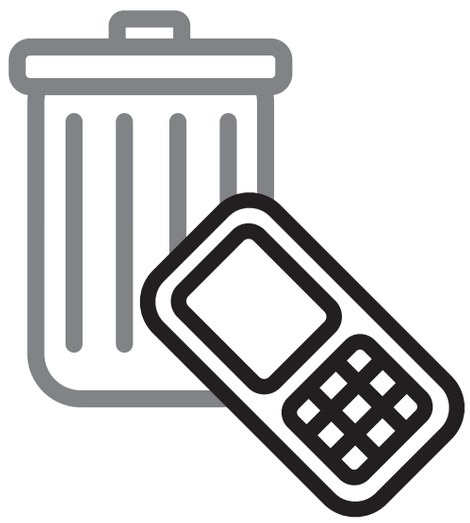
Open 5
Una Bjerkan Heimstad

It tries to express the important parts of the interaction:

What will a particular tag do?

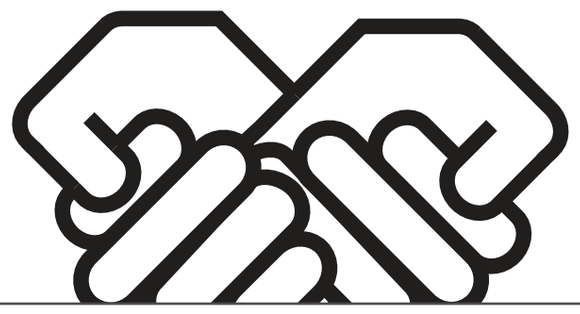
Delete 2
Una Bjerkan Heimstad

Delete 3
Una Bjerkan Heimstad

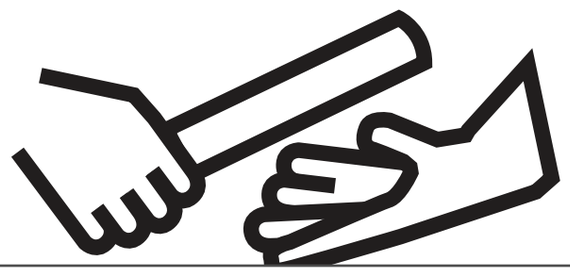


Print 1
Una Bjerkan Heimstad

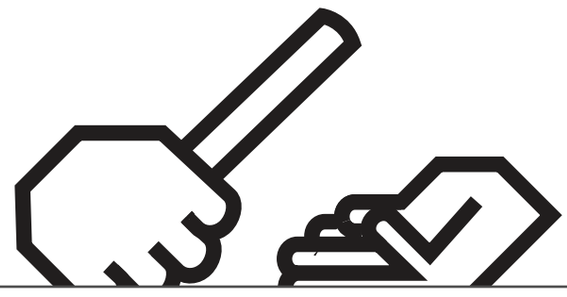
Share Give
Mark



Abstraction Fingers 7
Mark



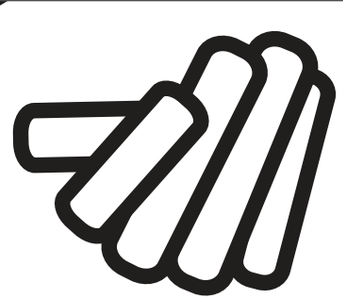
Share Baton
Mark



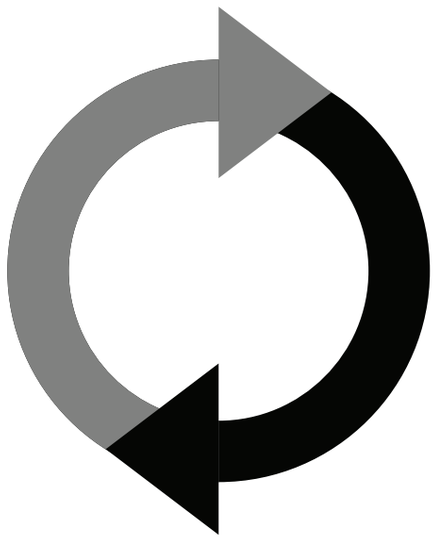
How much risk is involved?

What is the risk: personal data, losing data, losing money?

What goes on in the background: network, where does my data go?

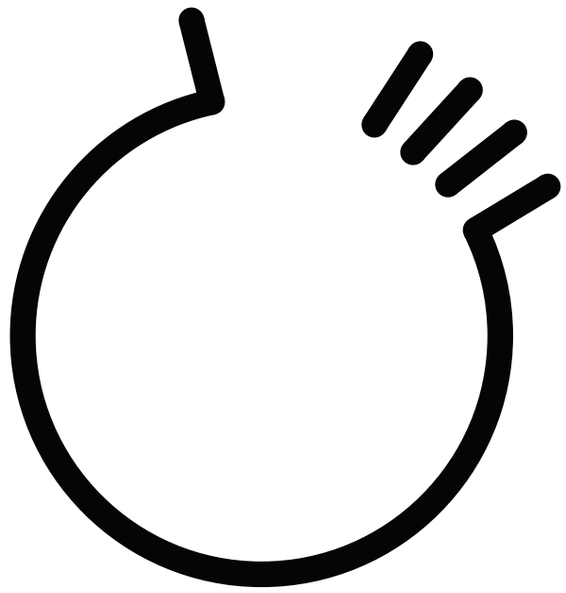


Arrow Circle

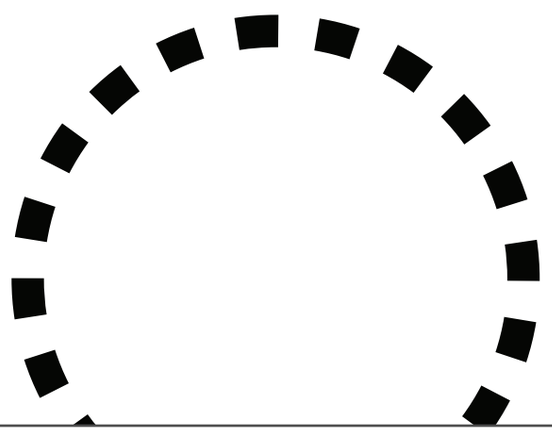


Abstraction Fingers 3
Mark

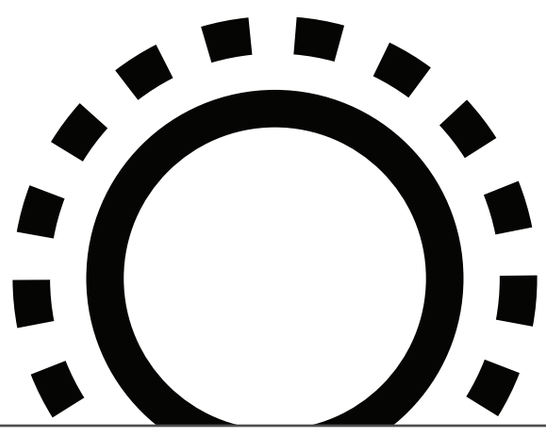
Abstraction Fingers 2
Mark



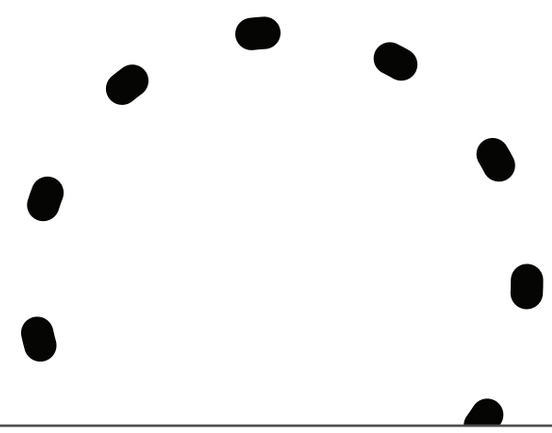
ction Dashed Circle 1



Abstraction Dashed Circle 2



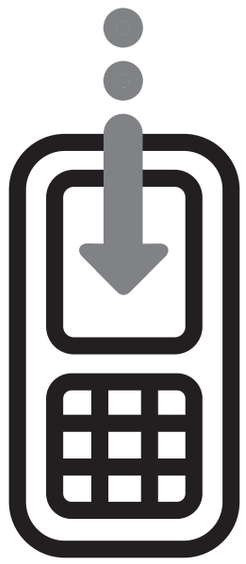
Dashed Line



What is the risk: personal data, losing data, losing money?

What goes on in the background: network, where does my data go?

Dowload 1
Una Bjerkan Heimstad



Load
Una Bjerkan Heimstad

Dowload 2
Una Bjerkan Heimstad

Print 1
Una Bjerkan Heimstad

Print 2
Una Bjerkan Heimstad

Print 3
Una Bjerkan Heimstad

What goes on in the background: network, where does my data go?

So in summary (and with images of projects I don't have time to talk about)

This design approach gives us knowledge of the nature of RFID, including all of its failures, magic, problems and opportunities.

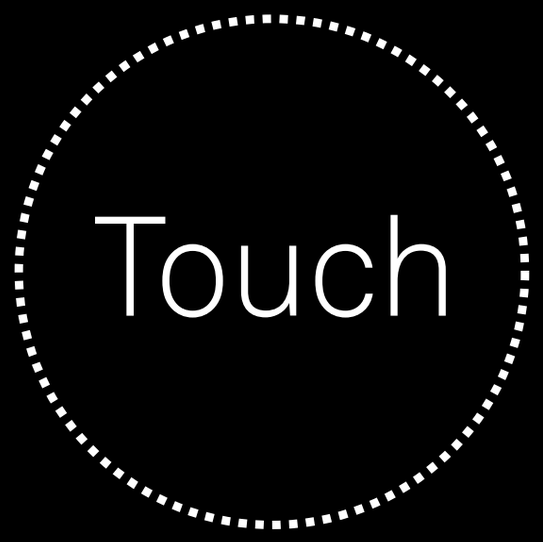
RFID in many ways is still hugely undefined. It is a space of potential interaction.

We are not interested in a machine-readable world, but in self-contained systems that serve some purpose.

Through these investigations we're anticipating the kind of functions, the kinds of interactions, and creating models for the ways that it should work.

This teaches our users about RFID, and we hope enables them with some agency.

Images:
'Skål' the playful media player for young children
The 'Orooni' interactive table
'Sniff' the dog for blind or partially children



www.nearfield.org

Thanks!