
Wearable Computing

To look at the wearable computing scenario
Find problems plaguing such devices in present context,
Understand various human factors and variables involved in designing and envsioning wearable products.
Proposing scenarios and prototype a scenario.

RESEARCH

EXPERIMENT

LITERATURE STUDY

- 5 Text Books
- 40 Research Journals
- 100 Articles/Blogs
- Discussions

USER STUDY

- 60 Questions
- 250+ Users Surveyed
- 5+ Interviews
- Observations

DEVICES STUDY

- 500 Devices Catalogued
- 4 Live Studies
- 20 In depth study

DESIGN

- 5 Scenarios
- 1 Prototype

// WHY

Why wearable computers are the next step to human and technical evolution. Ideas such as man machine singularity become possible with computers worn on our body.

History of Wearable computing

The development of progress of wearable computing devices from 1960 to 2010

// WHAT

What is a wearable computer? What are its essential characteristics and paradigms? Understanding them and nalysing the contemporary wearable computing devives, their wearability, usage, types, technology involved, and functions

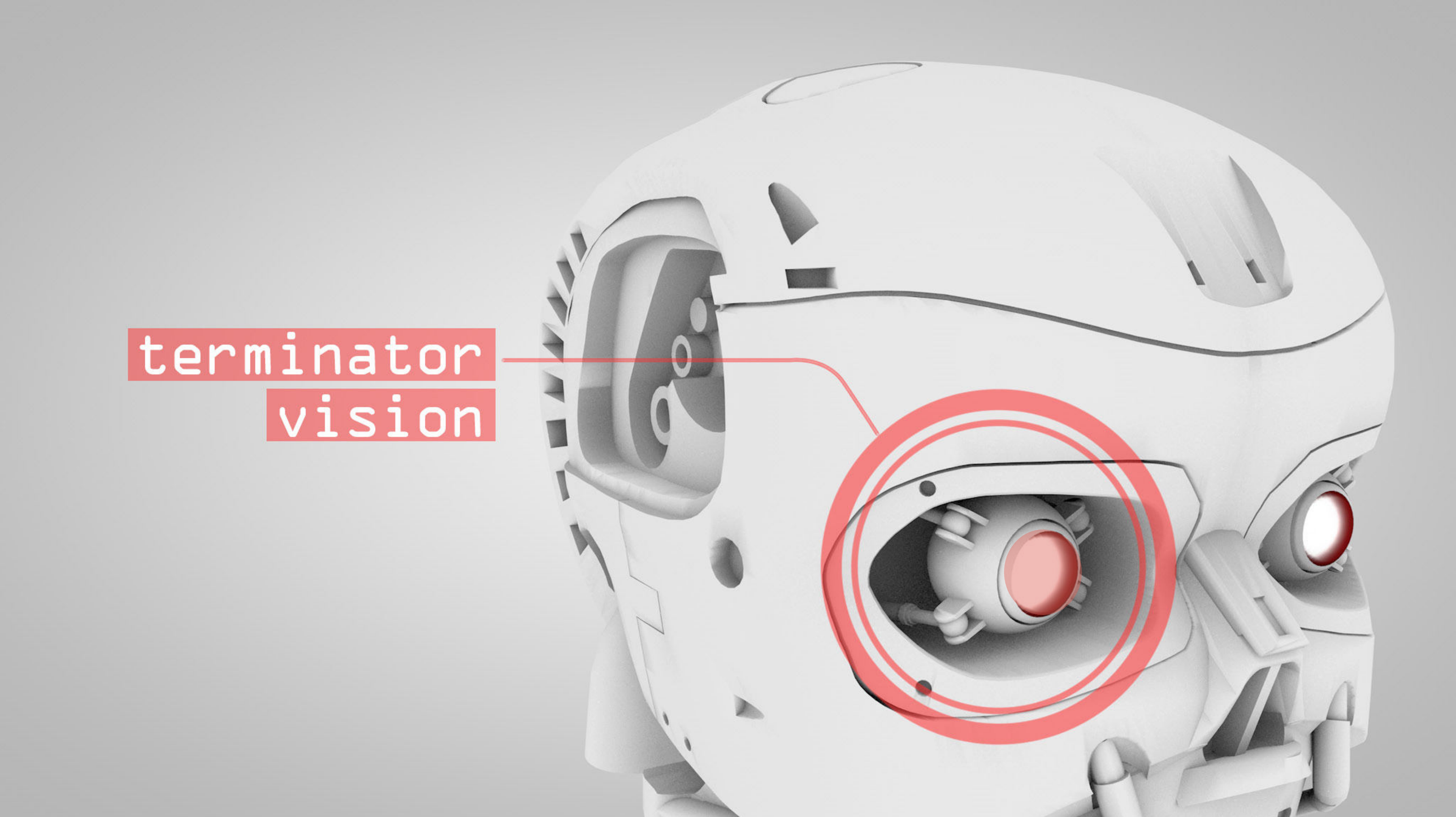
issues with wearable devices

Why have wearble computers not gained acceptance by the people? What problems plague current devices, finding these problems,

// HOW

Understanding the variables that get involved in design when a computer is worn on the body, in 24/7 paradigm.

// WHY

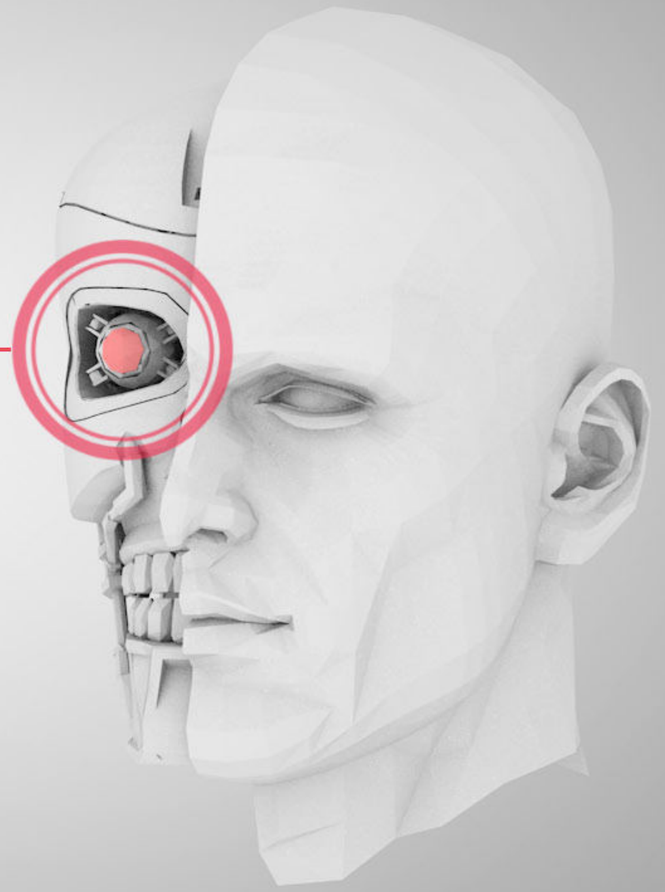

terminator
vision

why?

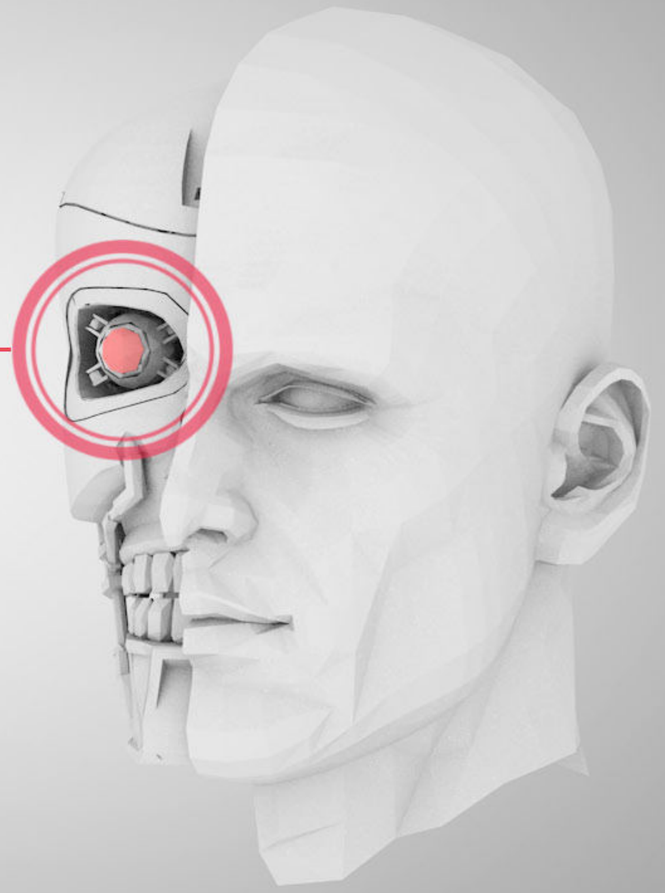
did it fascinate me?

did it tickled my brain?

cybernetic
organism



enhanced
organism



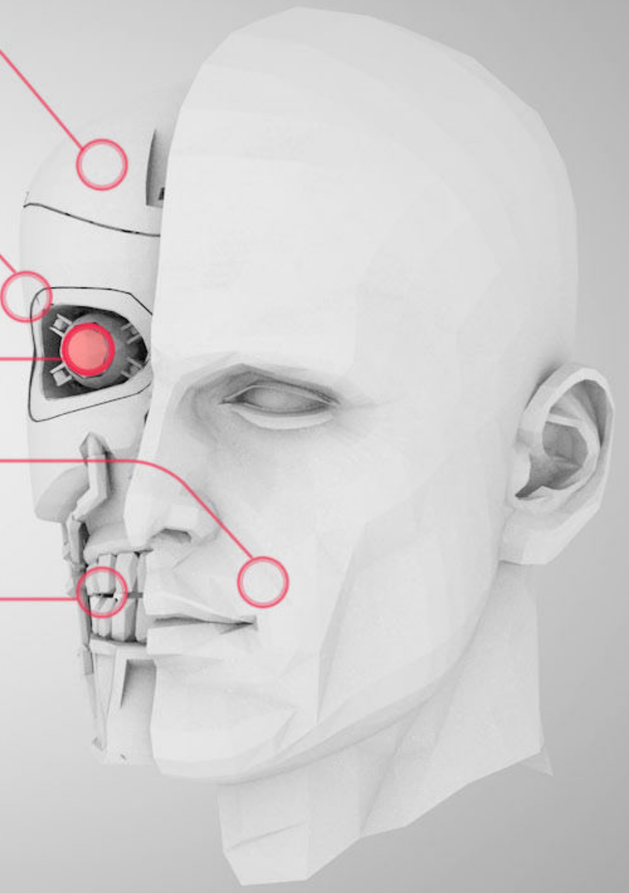
coginitive

mechanical

digital

biological

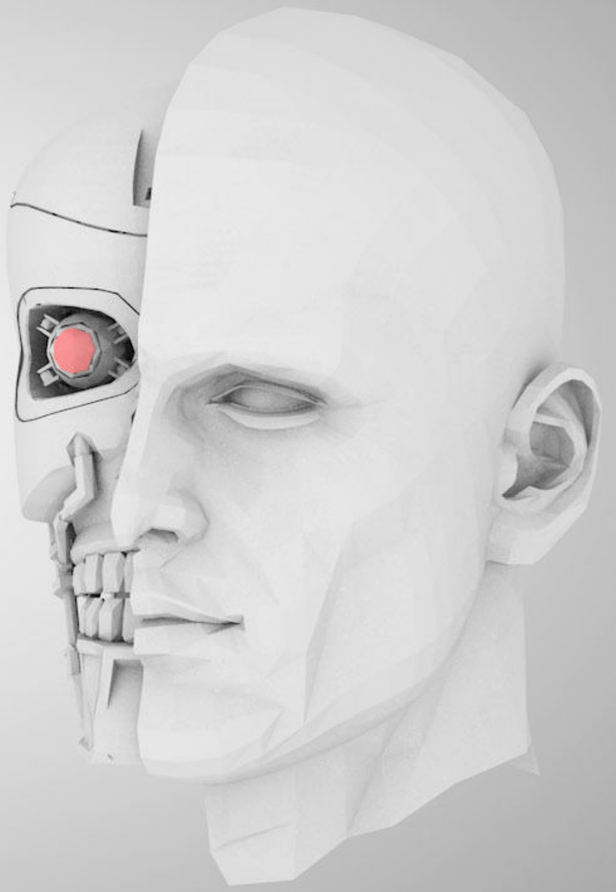
physical



a new kind of

evolution

overceding the natural one



throughout the

evolution

parallel to the natural one

difference

augment

the ability to

augment

the ability to

augment

ourselves

ability to use

//tools

ability to use

//tools

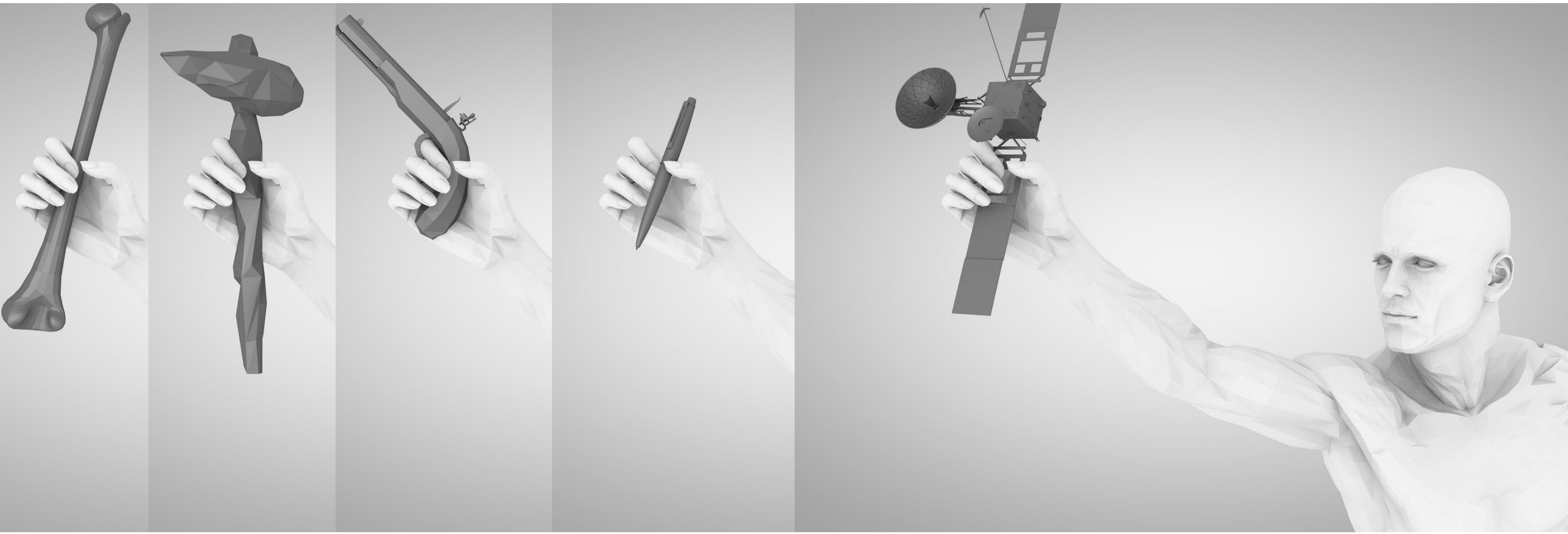
make them

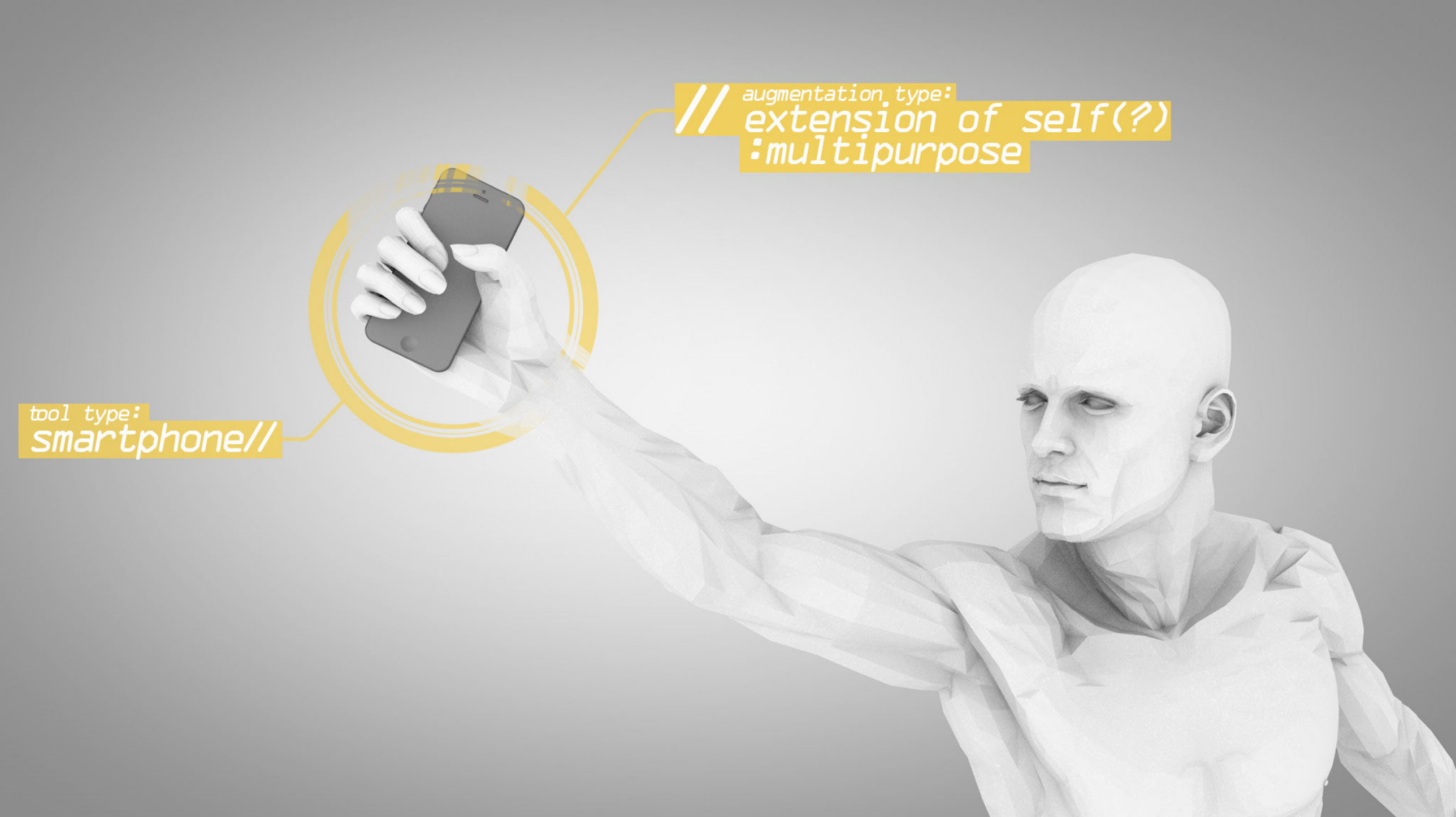
ability to use

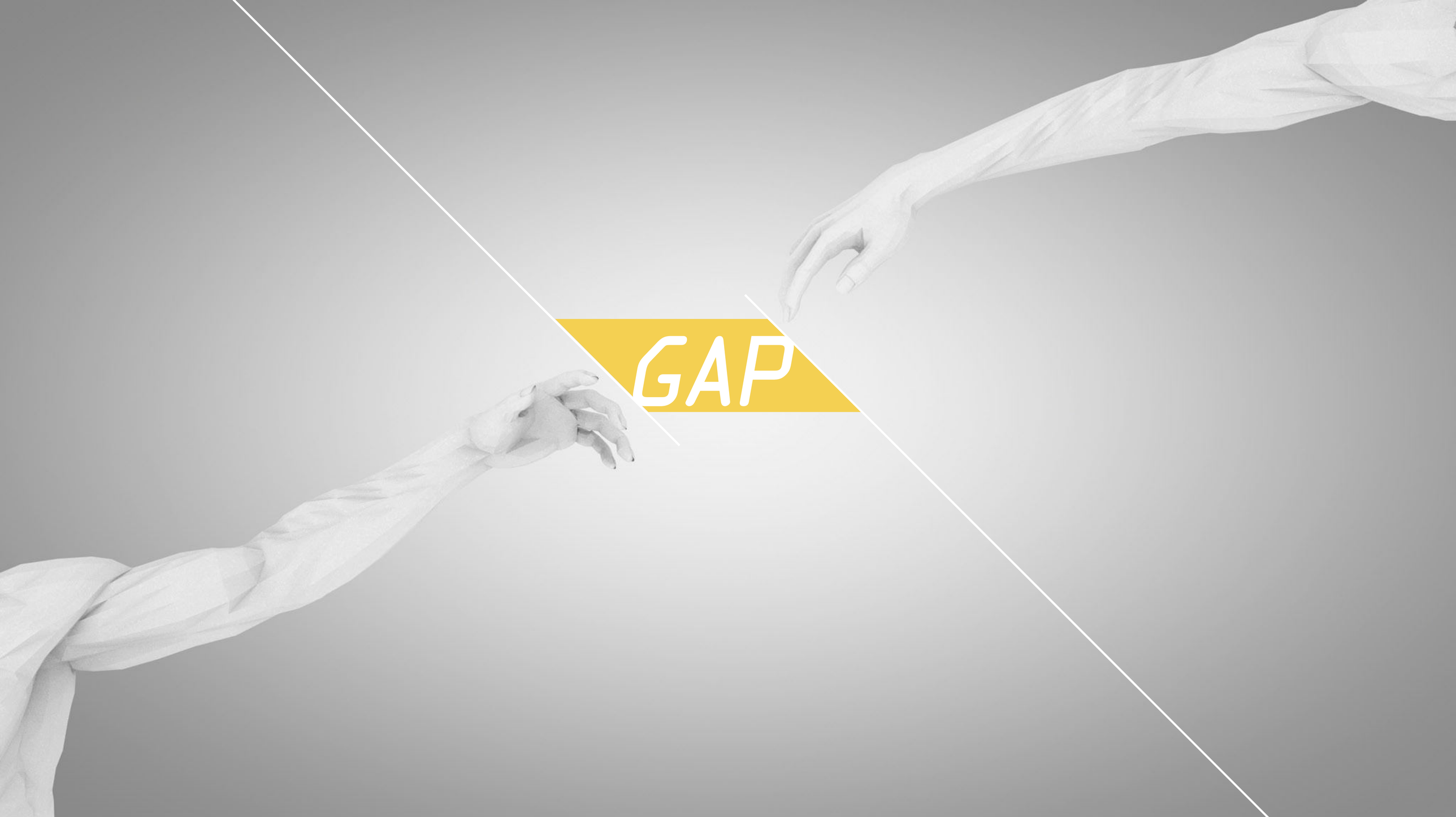
//tools

make them

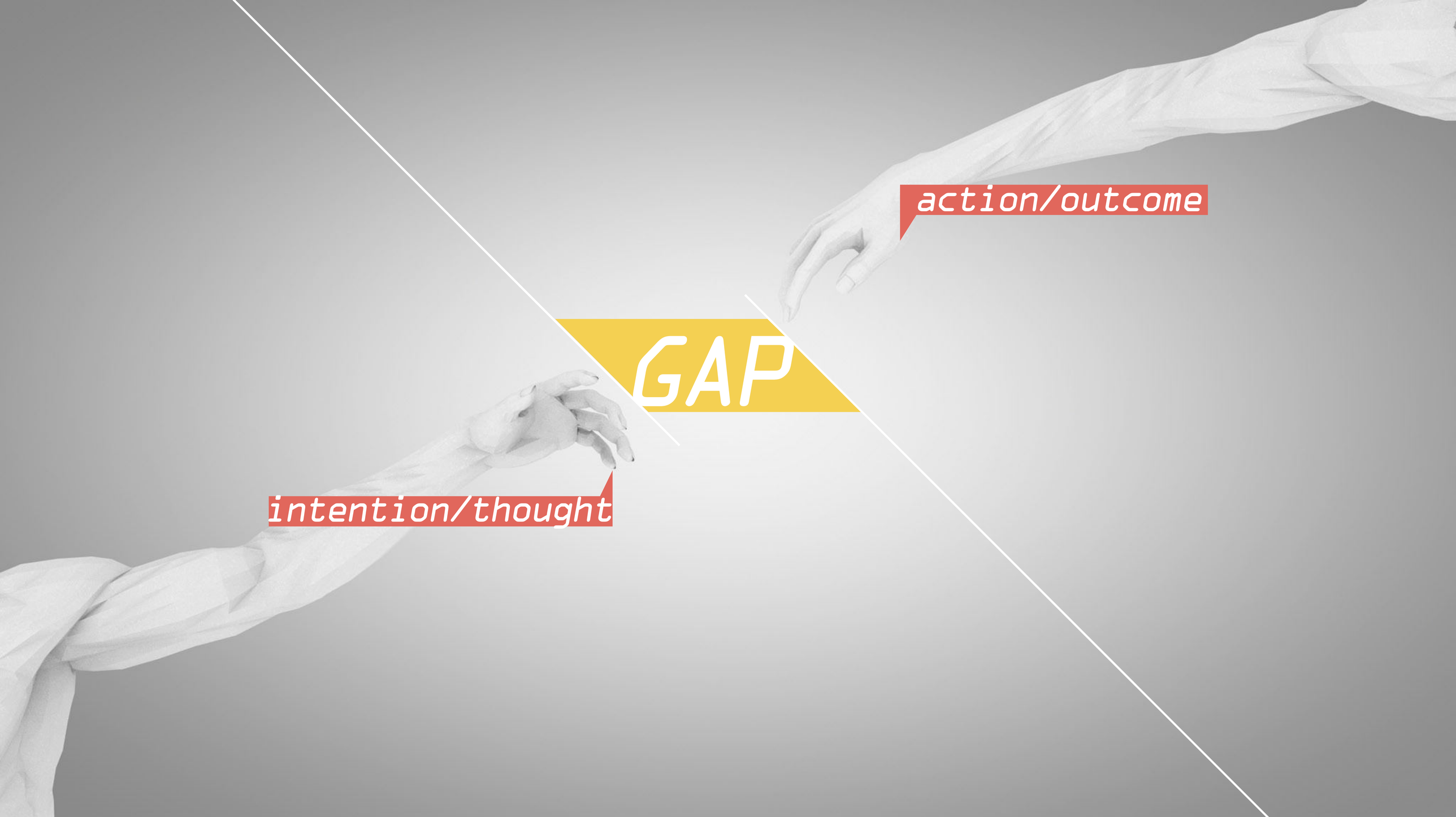
improvise them

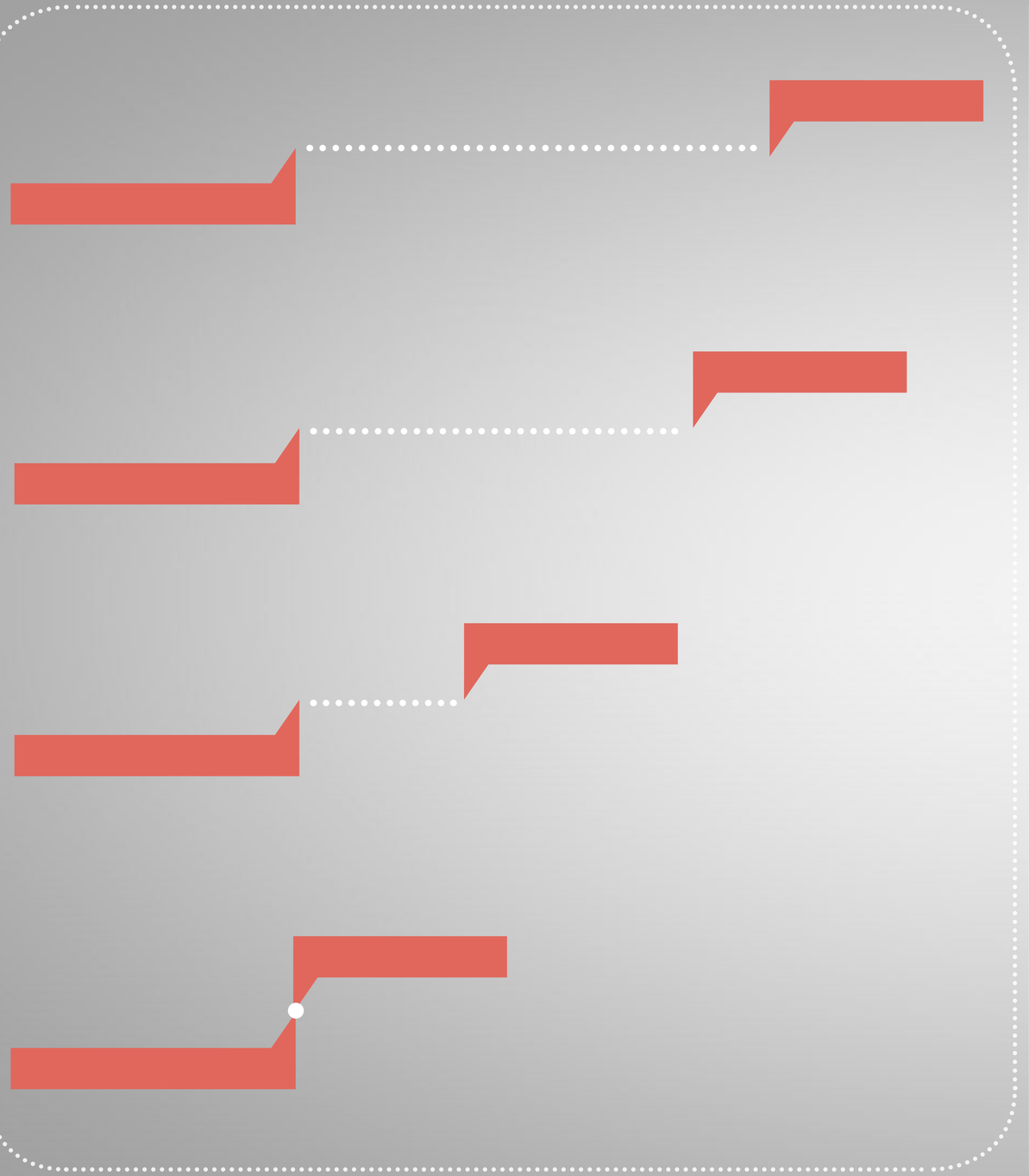



// augmentation type:
extension of self(?)
:multipurpose
tool type:
smartphone//


GAP


GAP
intention

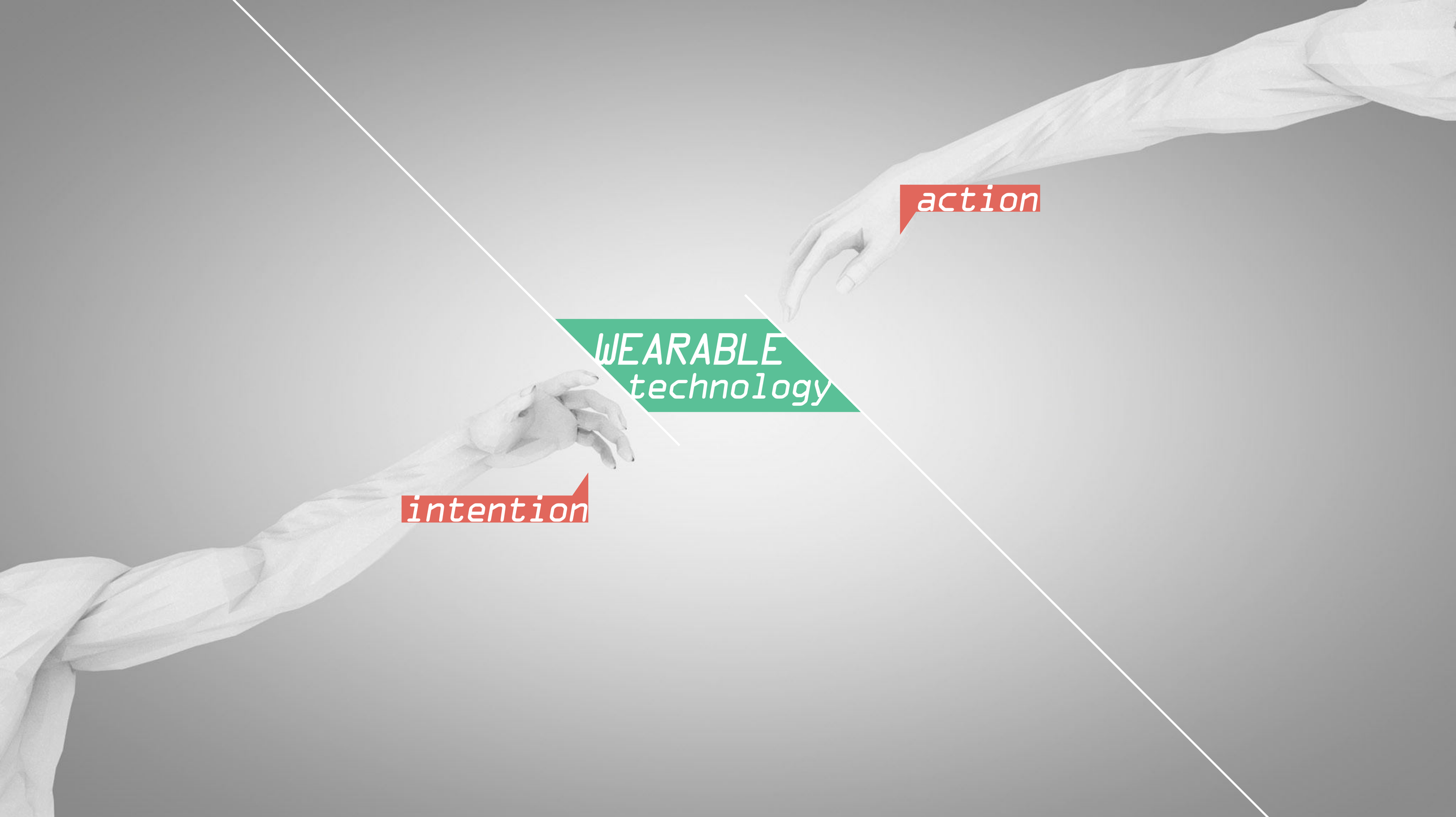

action/outcome
GAP
intention/thought



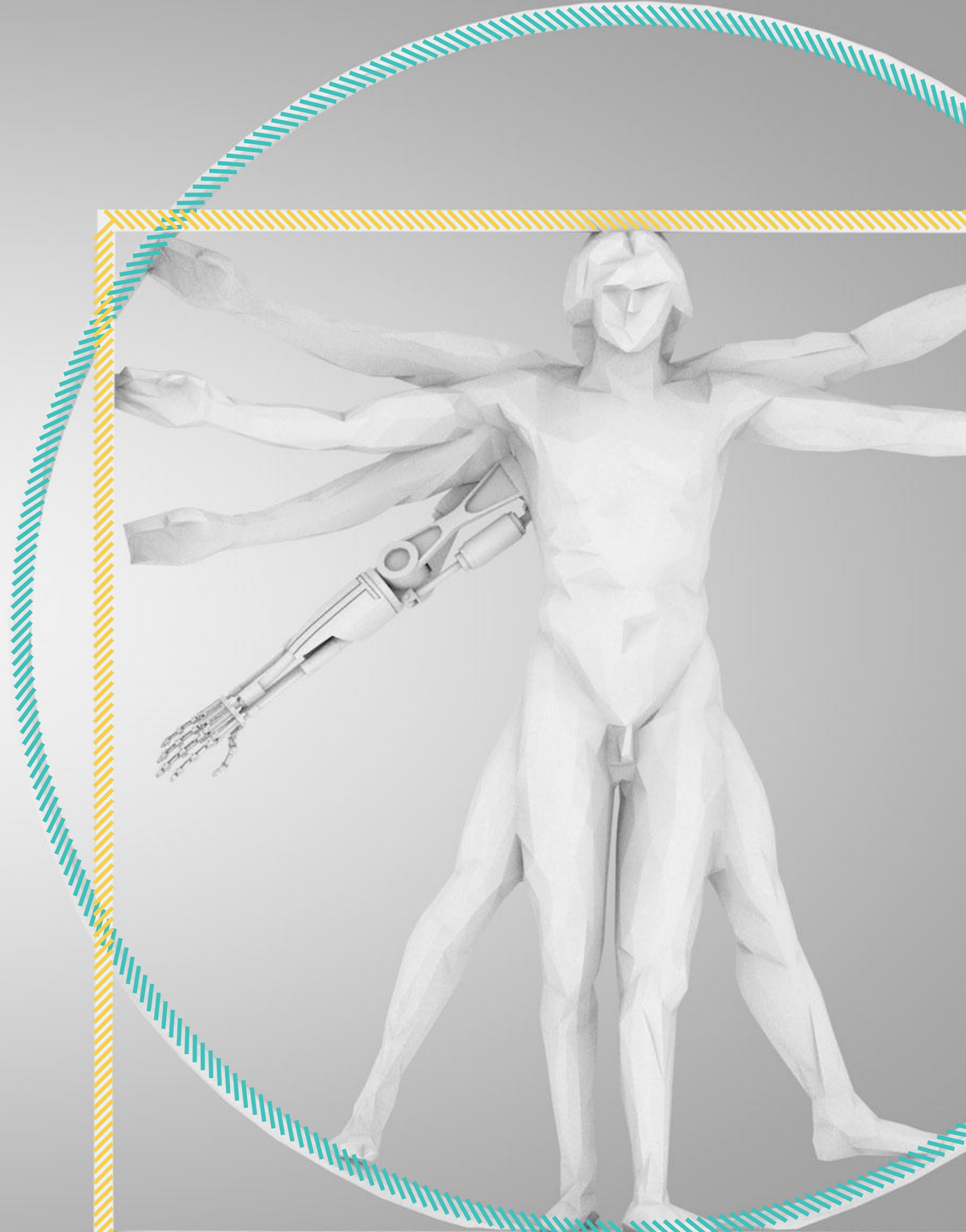
It all comes down to

//"reducing the time between intention and action"

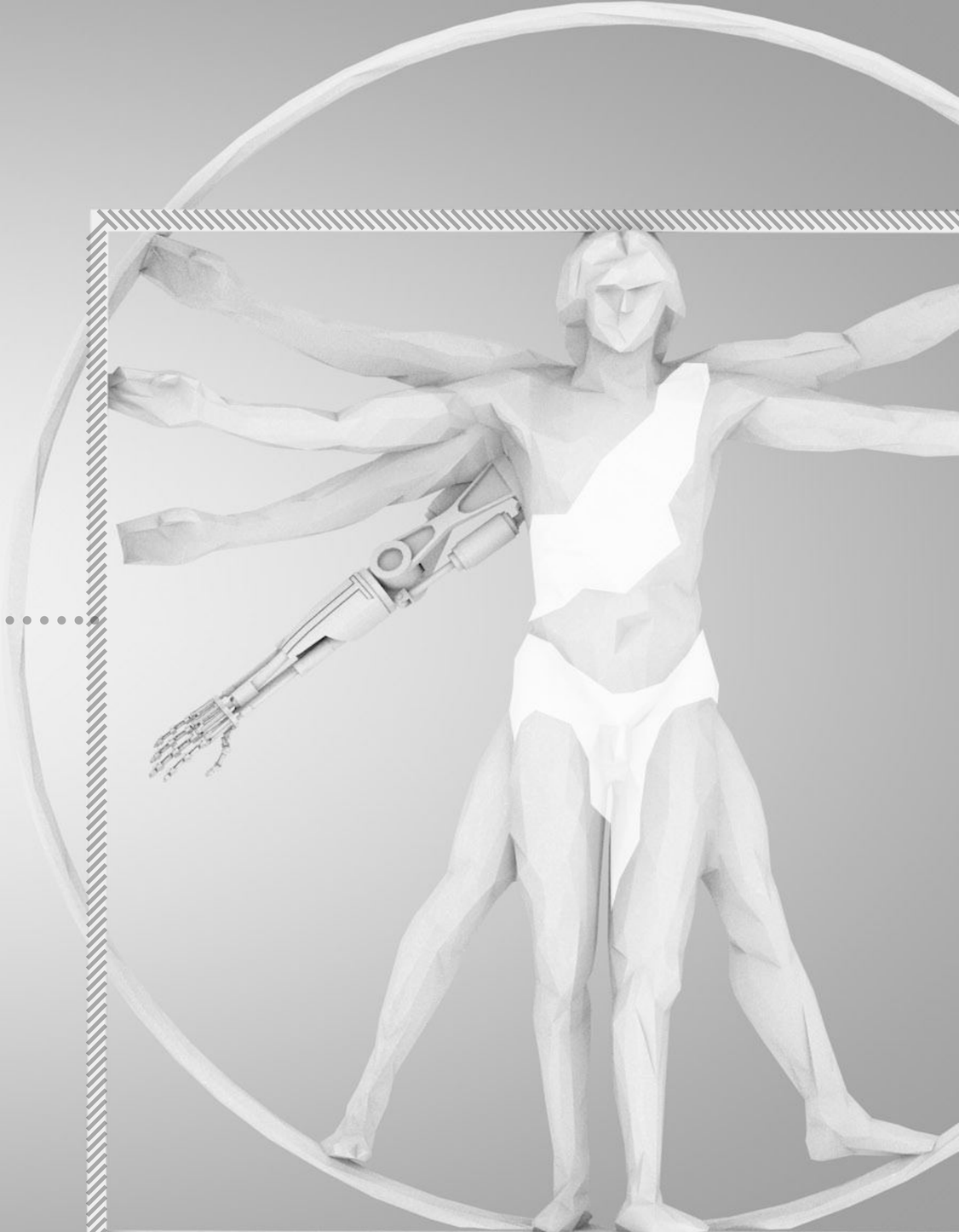
{ Google CEO Larry Page calls this as the mission statement }


action
WEARABLE
technology
intention

we have always
tried to put
things within our
reach,
accessible
with least
time and effort,
preferably close to
our bodies.



clothes //

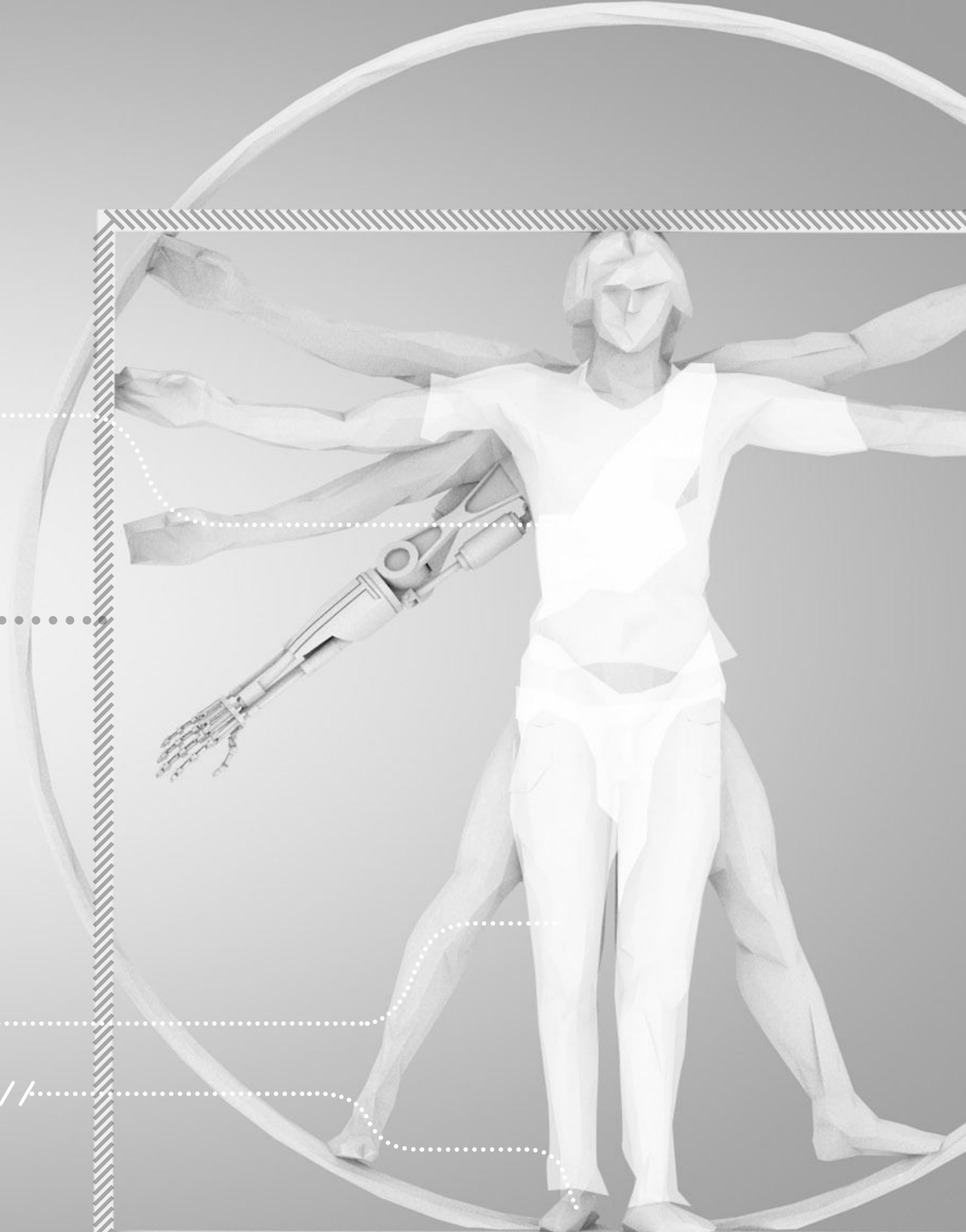


better clothes//

shirt//

trouser//

shoes//



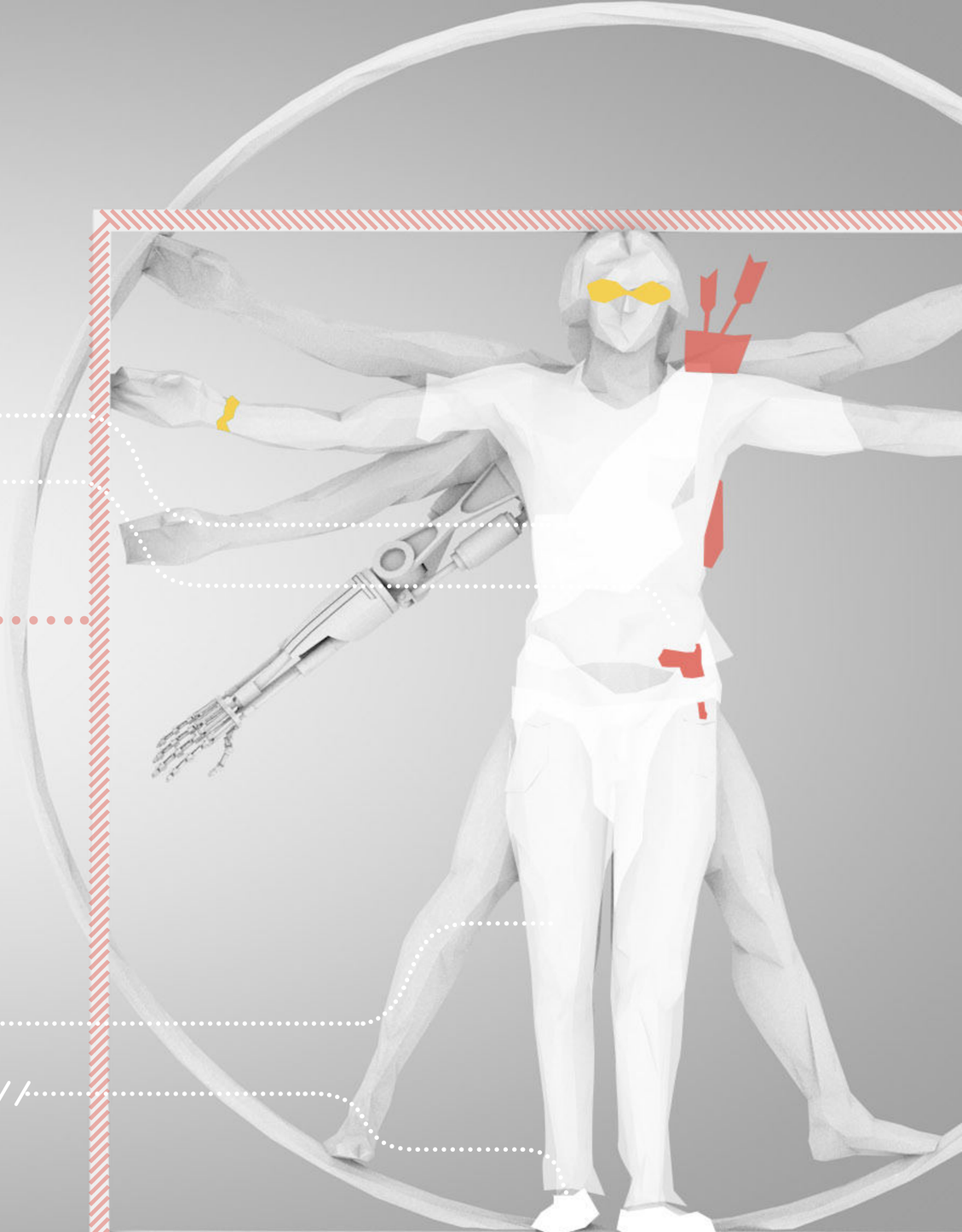
weapons //

shirt//

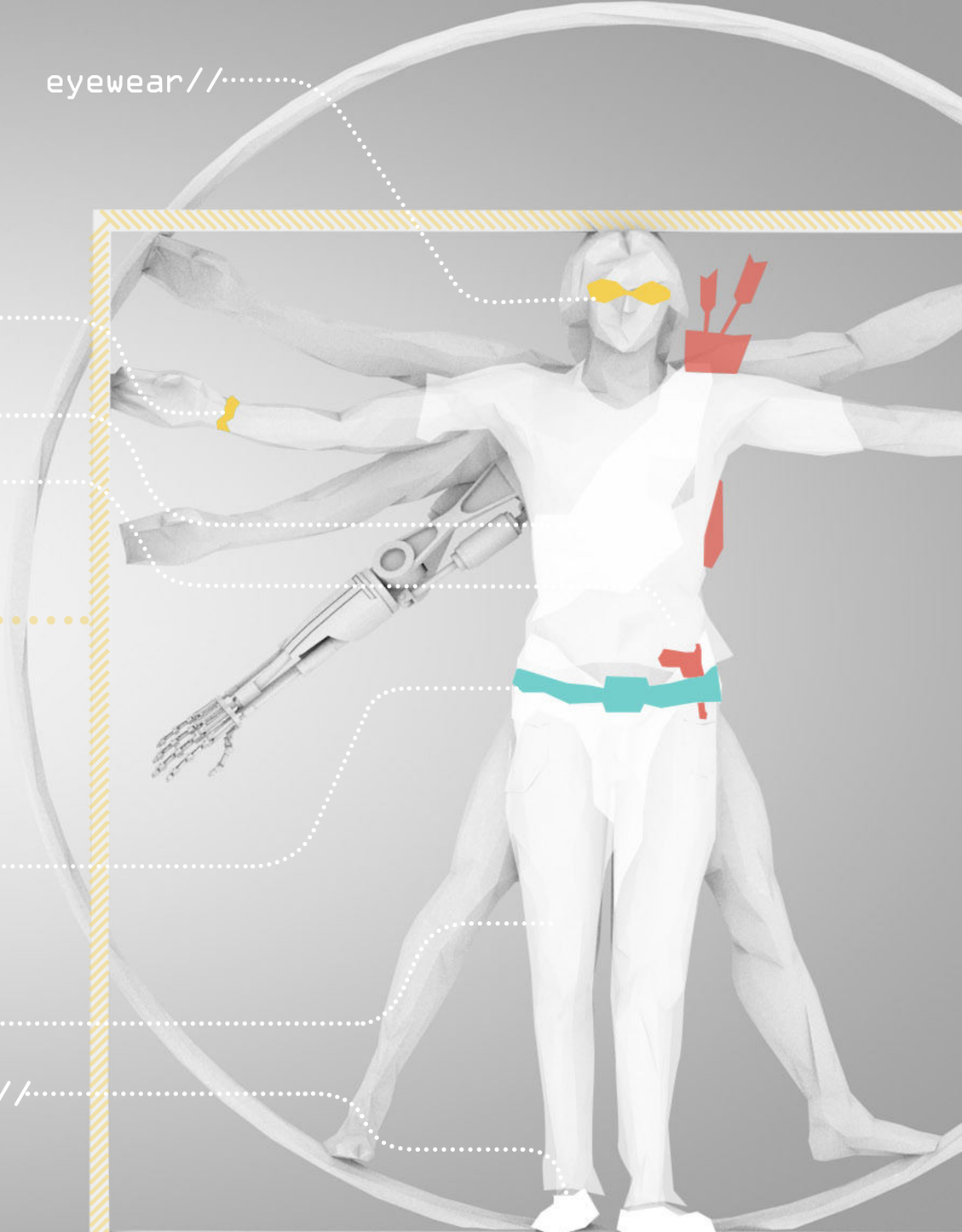
gun//

trouser//

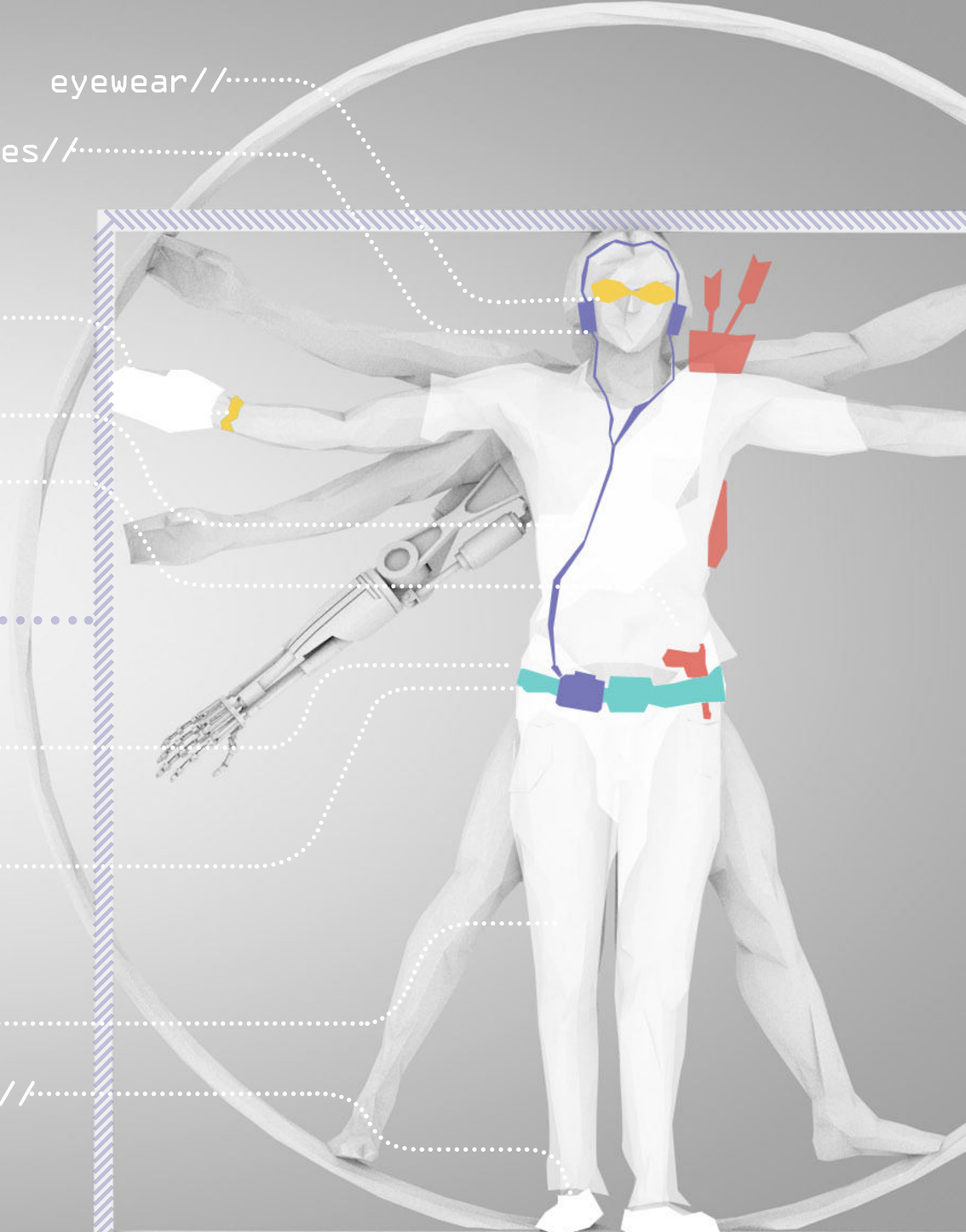
shoes//



accessories //



entertainment //



pockets //

eyewear//

headphones//

watch//

shirt//

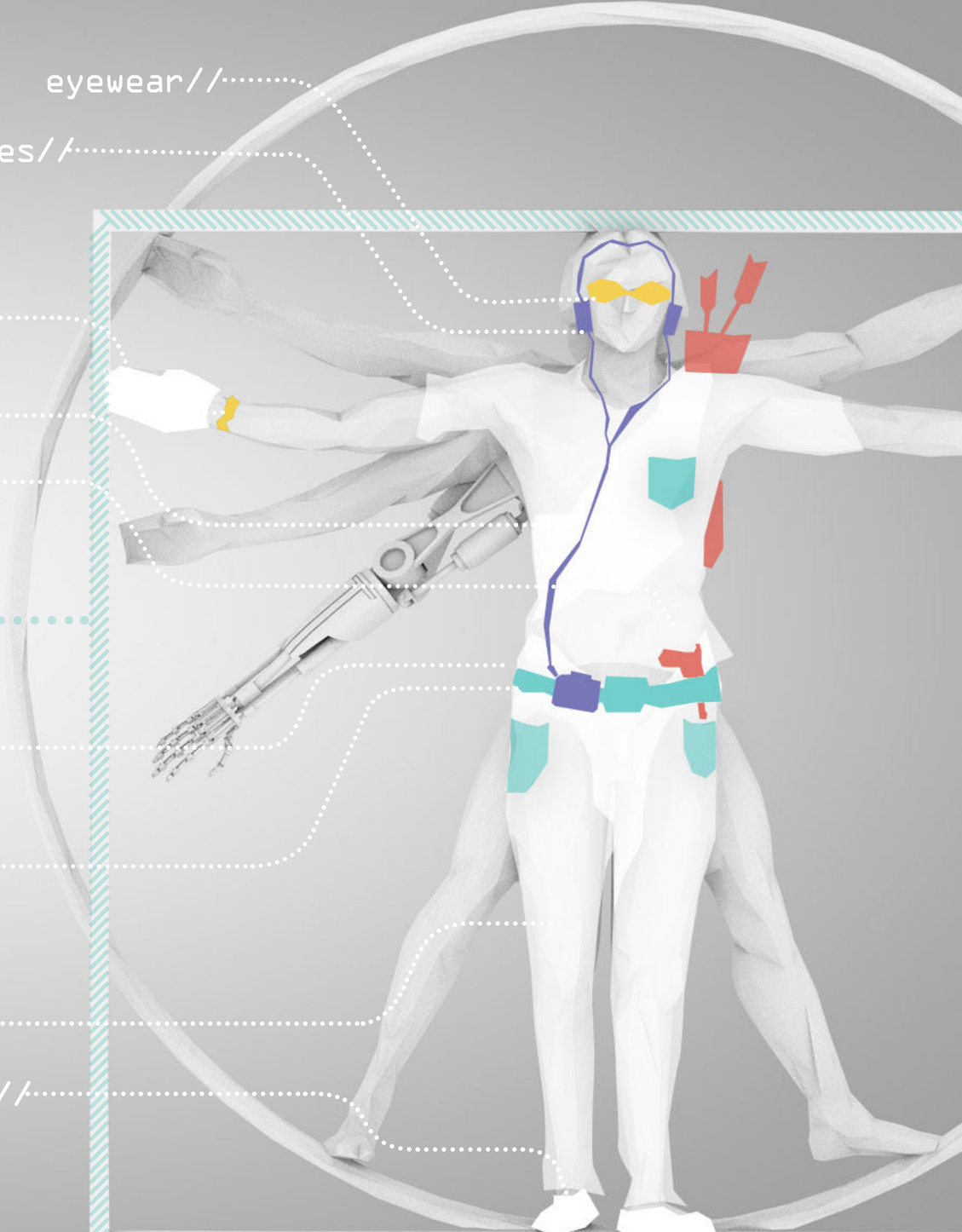
gun//

music player//

belt//

trouser//

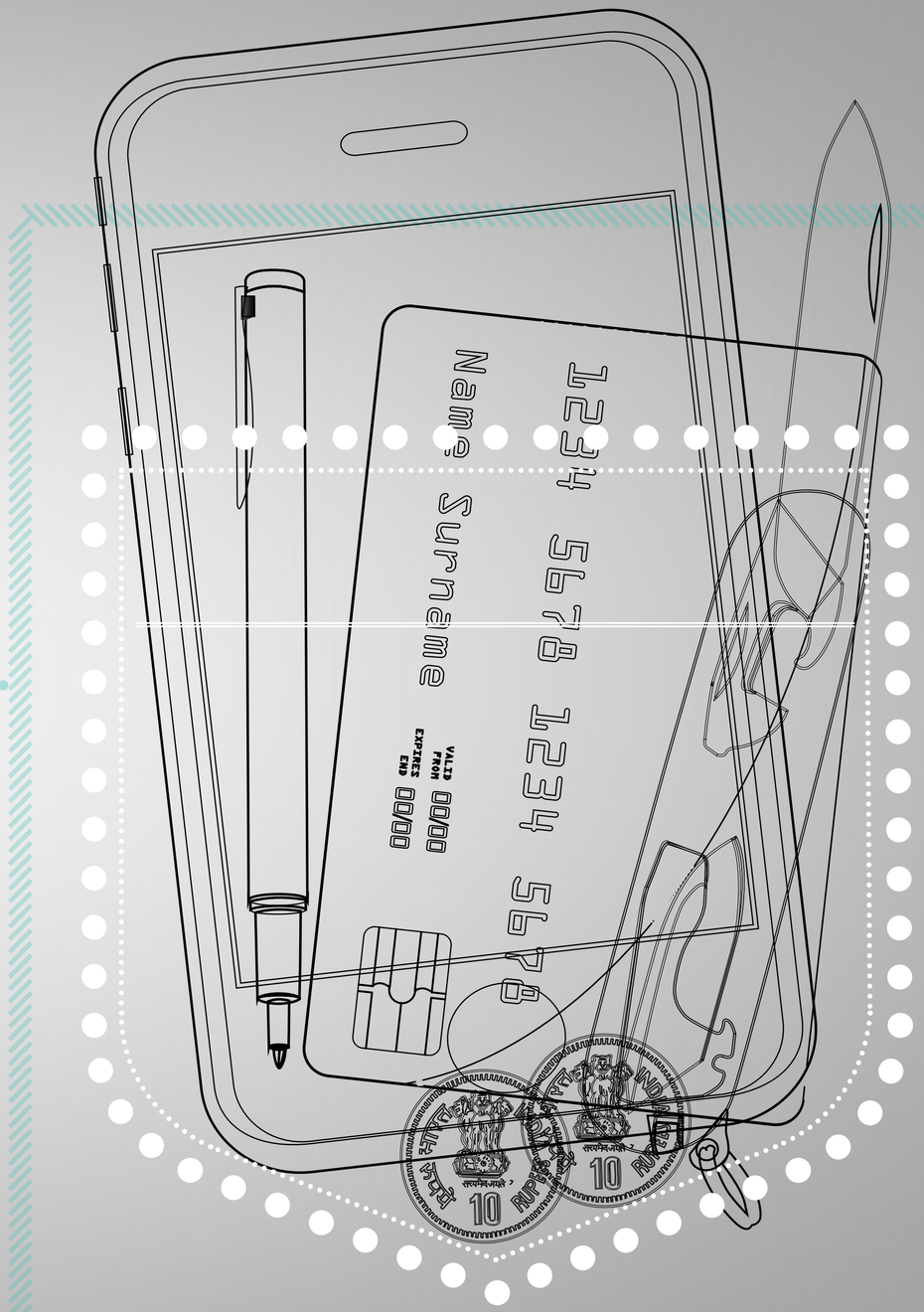
shoes//



pockets //


1234 5678 1234 5678
Name Surname
VALID FROM 00/00
EXPIRES END 00/00
10 RUPEES
10 RUPEES

pocketable //


1234 5678 1234 5678
Name Surname
VALID FROM 00/00
EXPIRES END 00/00

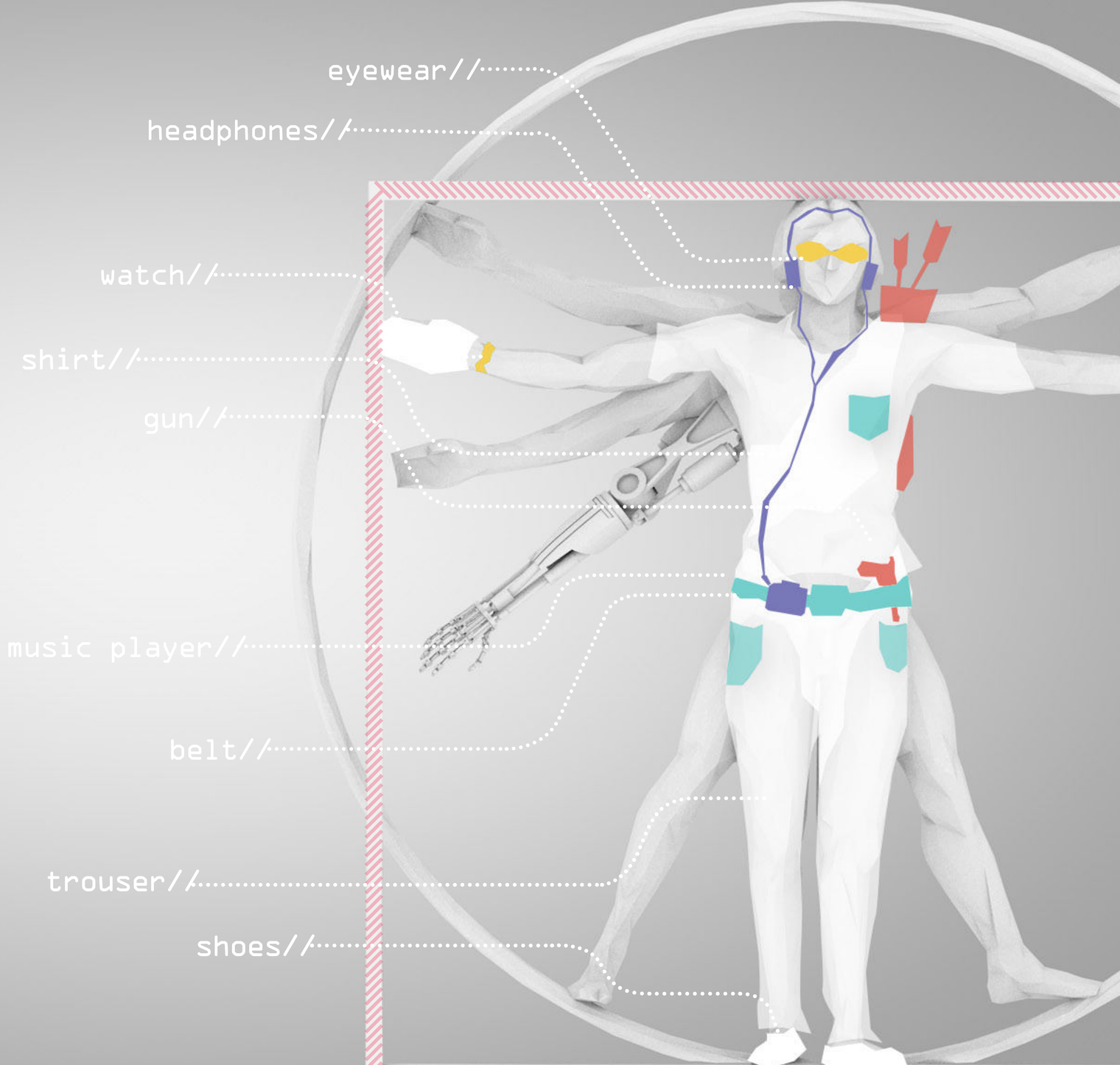
wear·able //

carry·able //

port·able //

pocket·able //

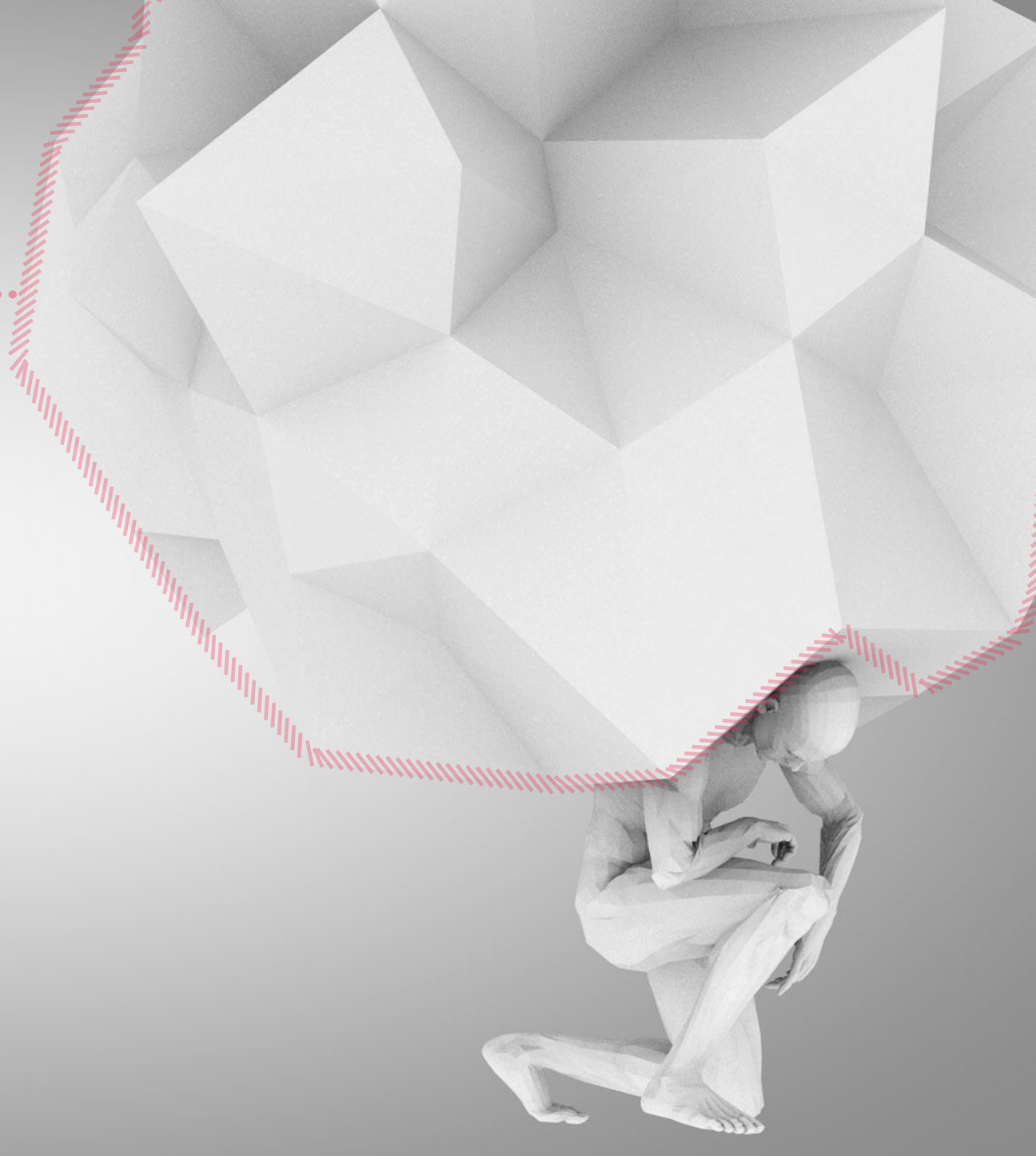
bear·able //



making things

bear.able //

has been difficult due to limitations of size, shape and weight.



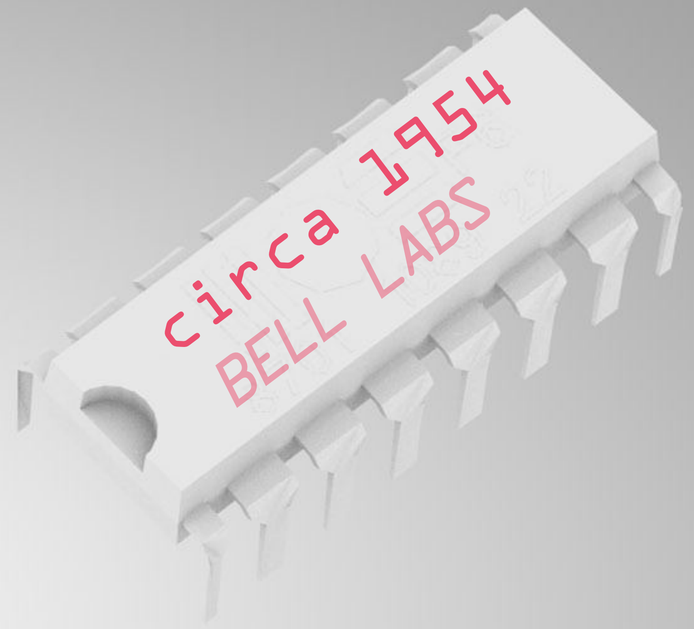
1950s

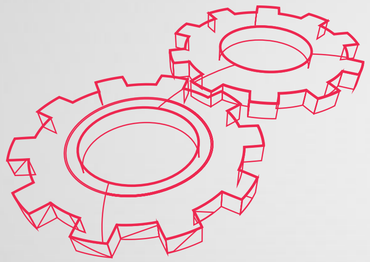
a new

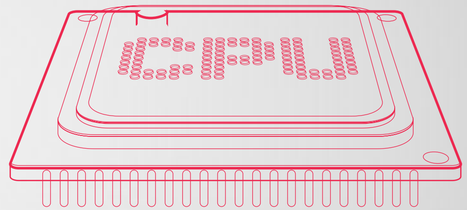
technological

revolution

silicon transistor







computing went electronic

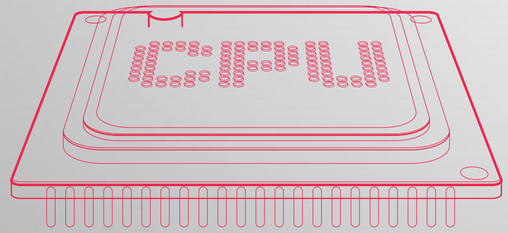
all solid state

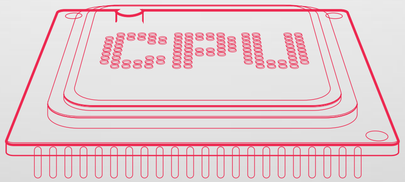
easier to miniaturise

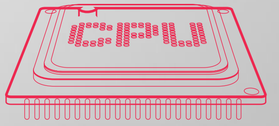
MOORE'S LAW

//is the observation that over the history of computing hardware, the number of transistors in a dense integrated circuit doubles approximately every 2 years.

// Gordon E. Moore, 1965
// co-founder Intel Corp.







HUGE

small

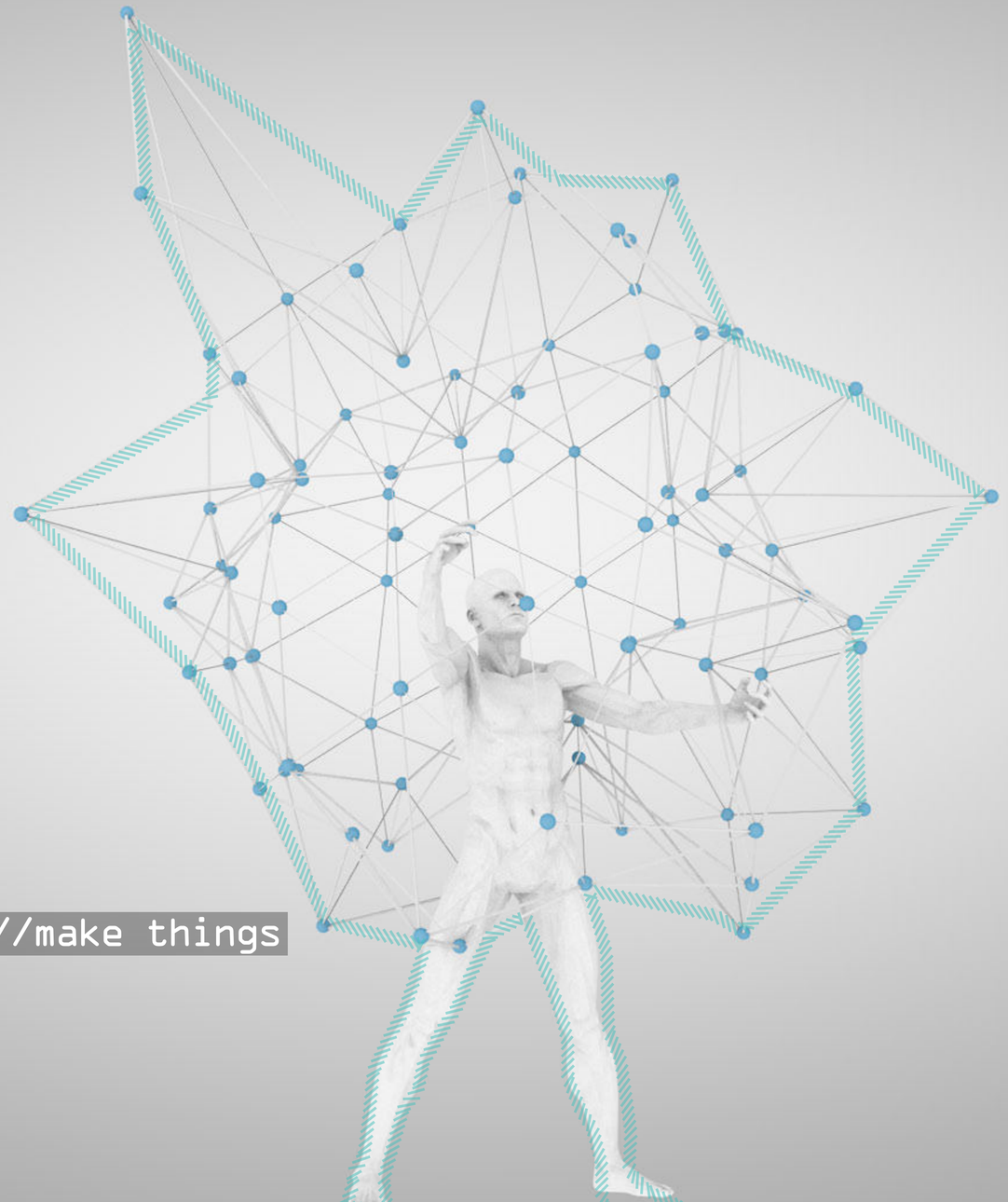
Computing Revolution

It lifted the physical barrier of size shape and form.

Over the course, we realised that a lot of tools around us can be assimilated into computing algorithms.

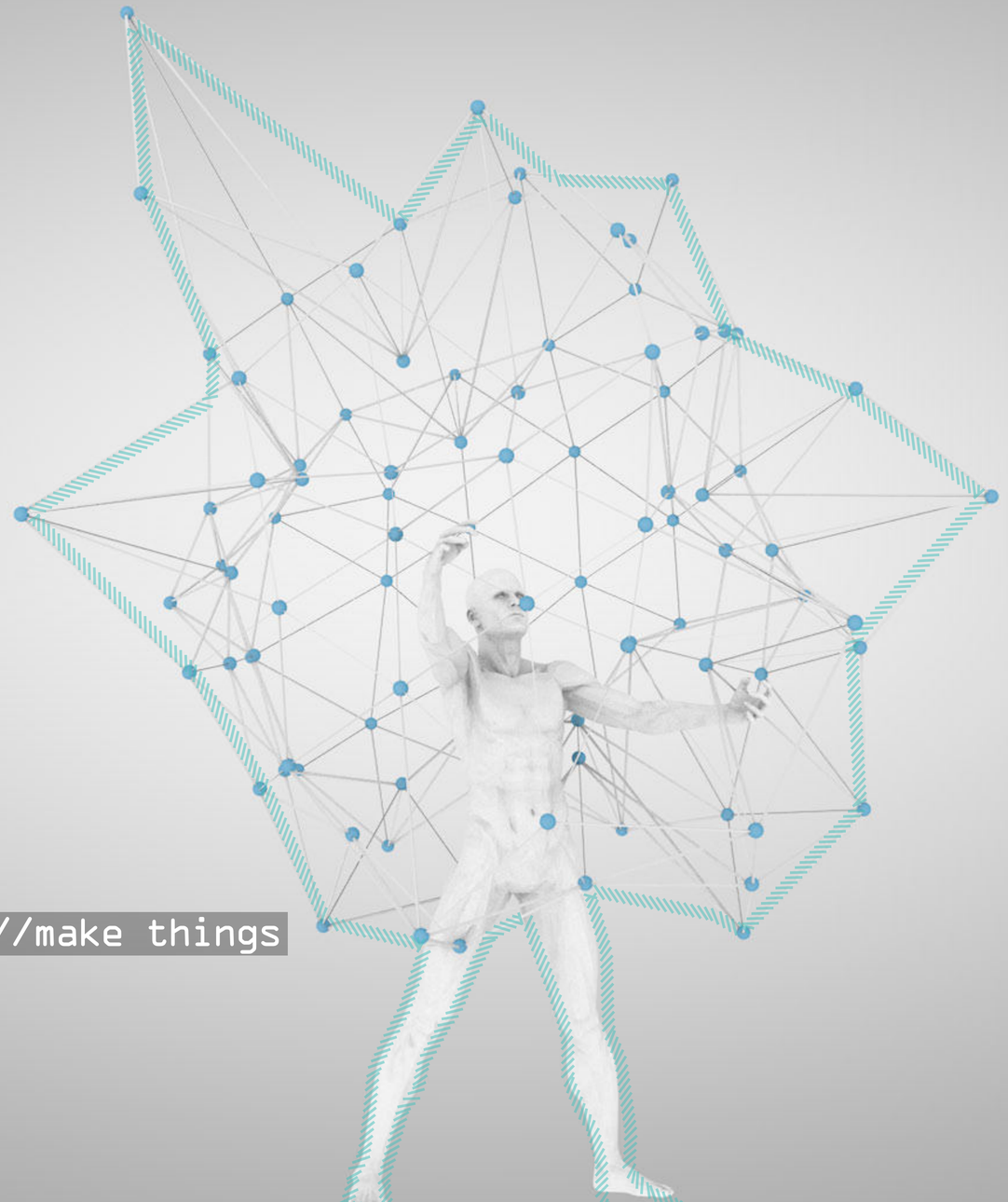
Since then, more and more physical artifacts/tools have been emulated through computers.

And that has caused the tools to exist without a need for physical existence. It unburdens us and gives way to a form, where computing starts happening in the cloud, light, fast and everywhere.



//make things

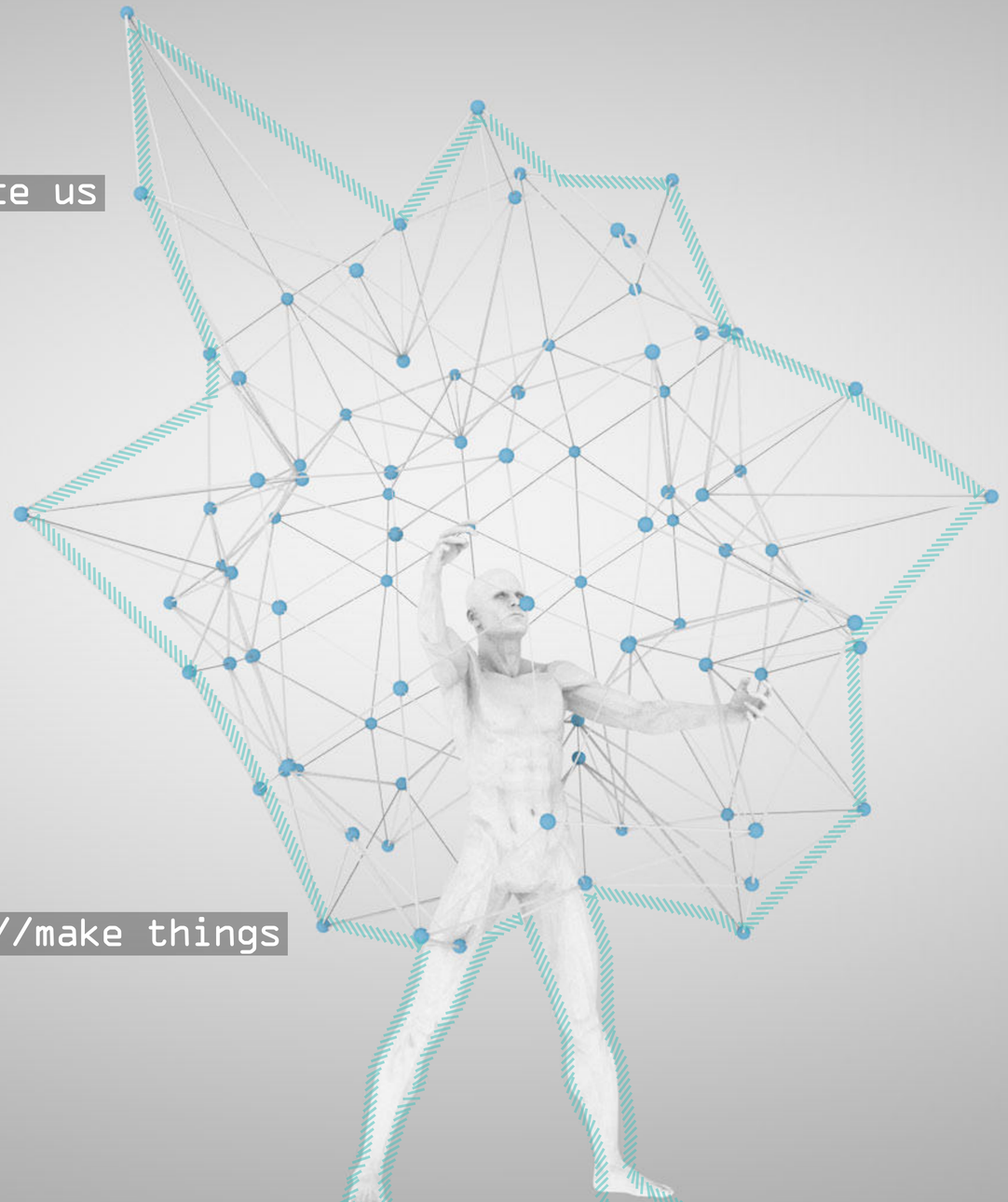
//make them better



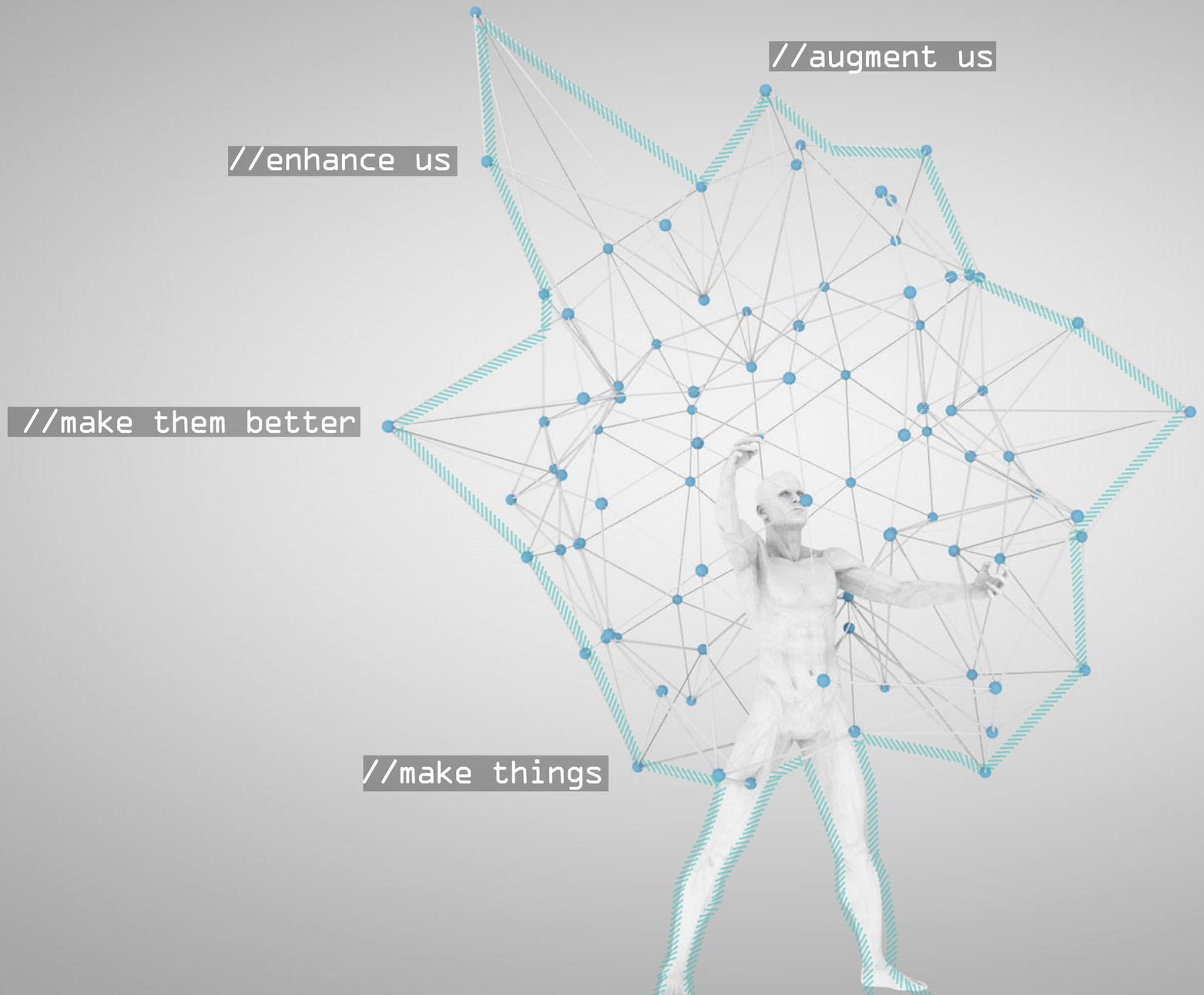
//make things

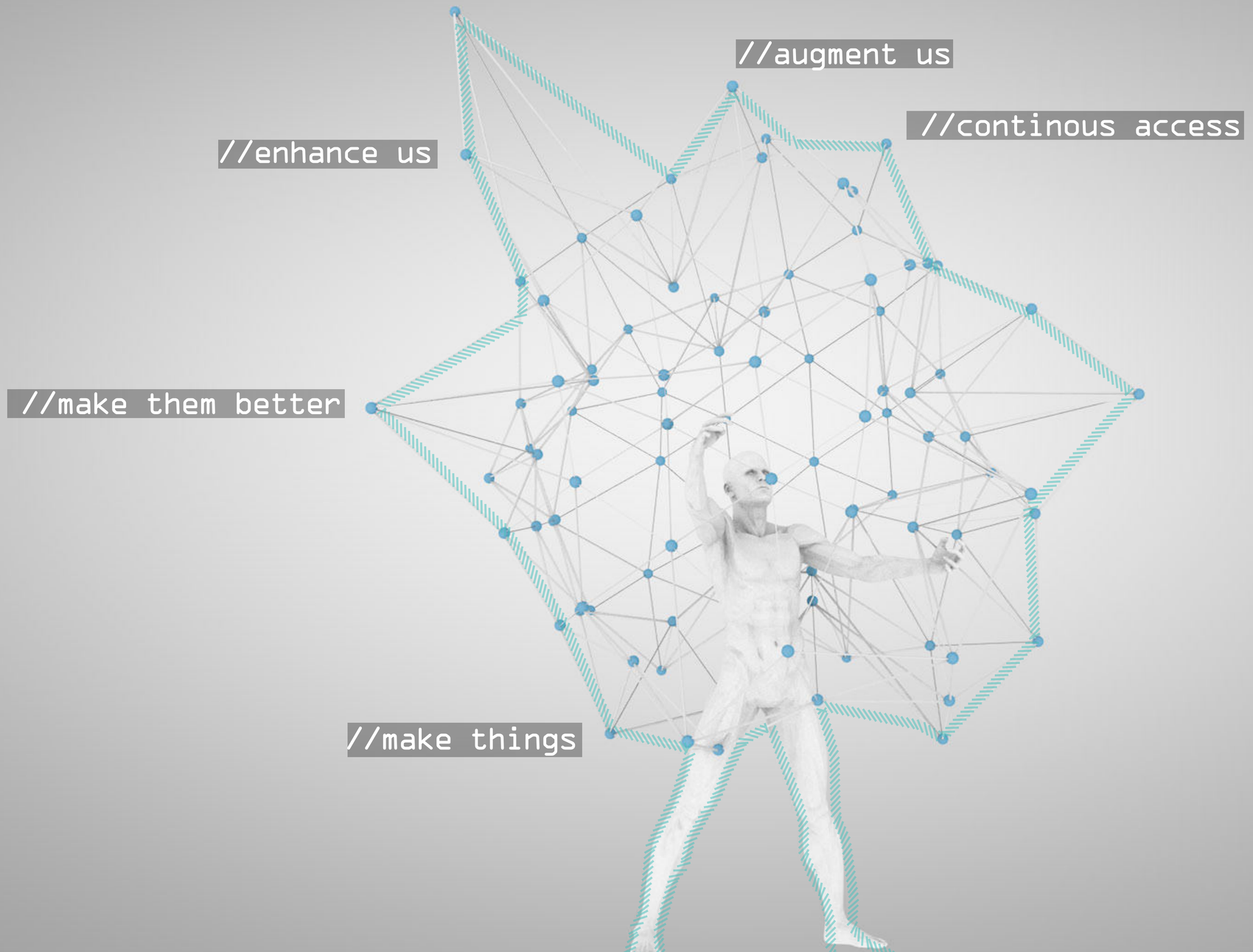
//enhance us

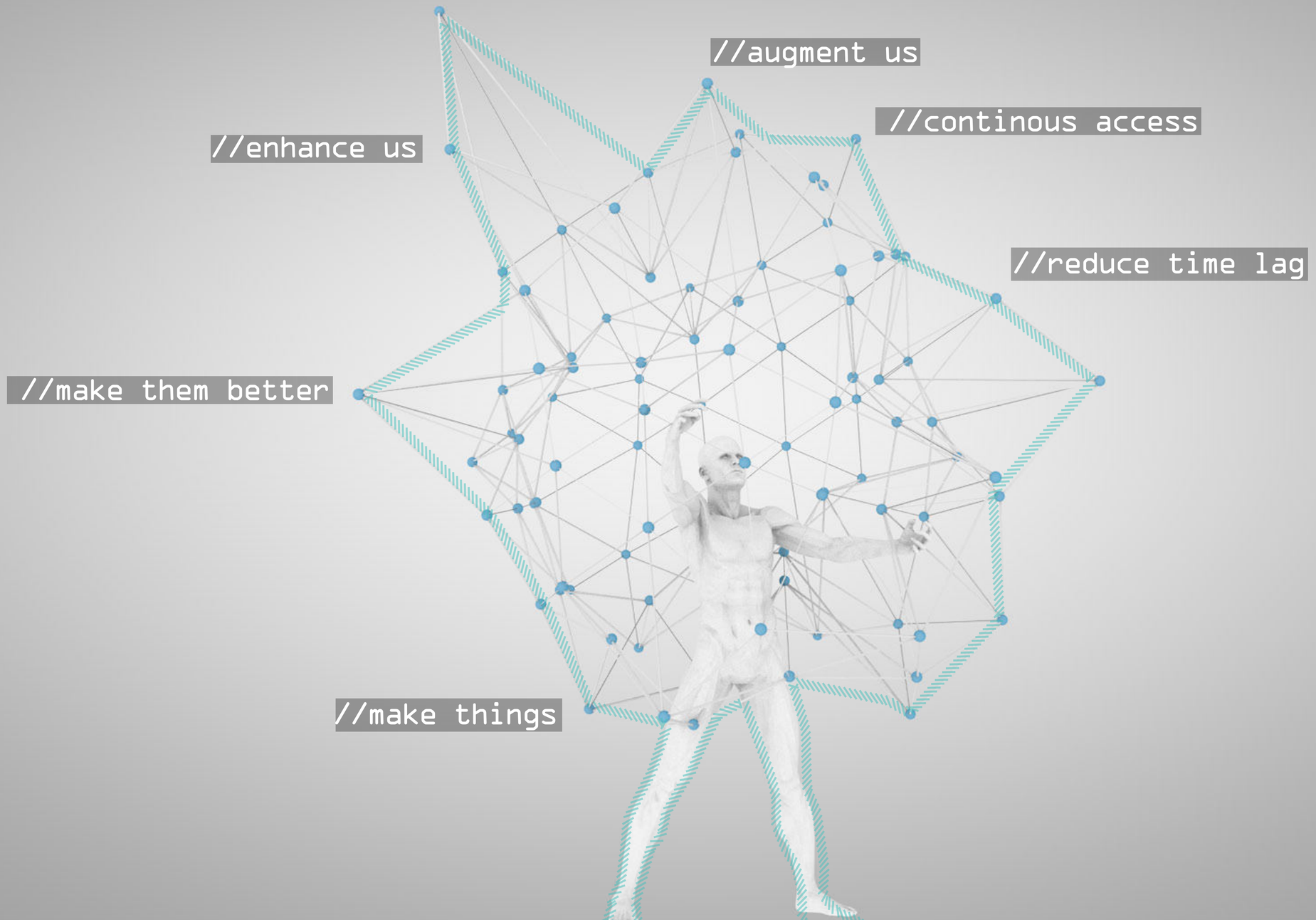
//make them better

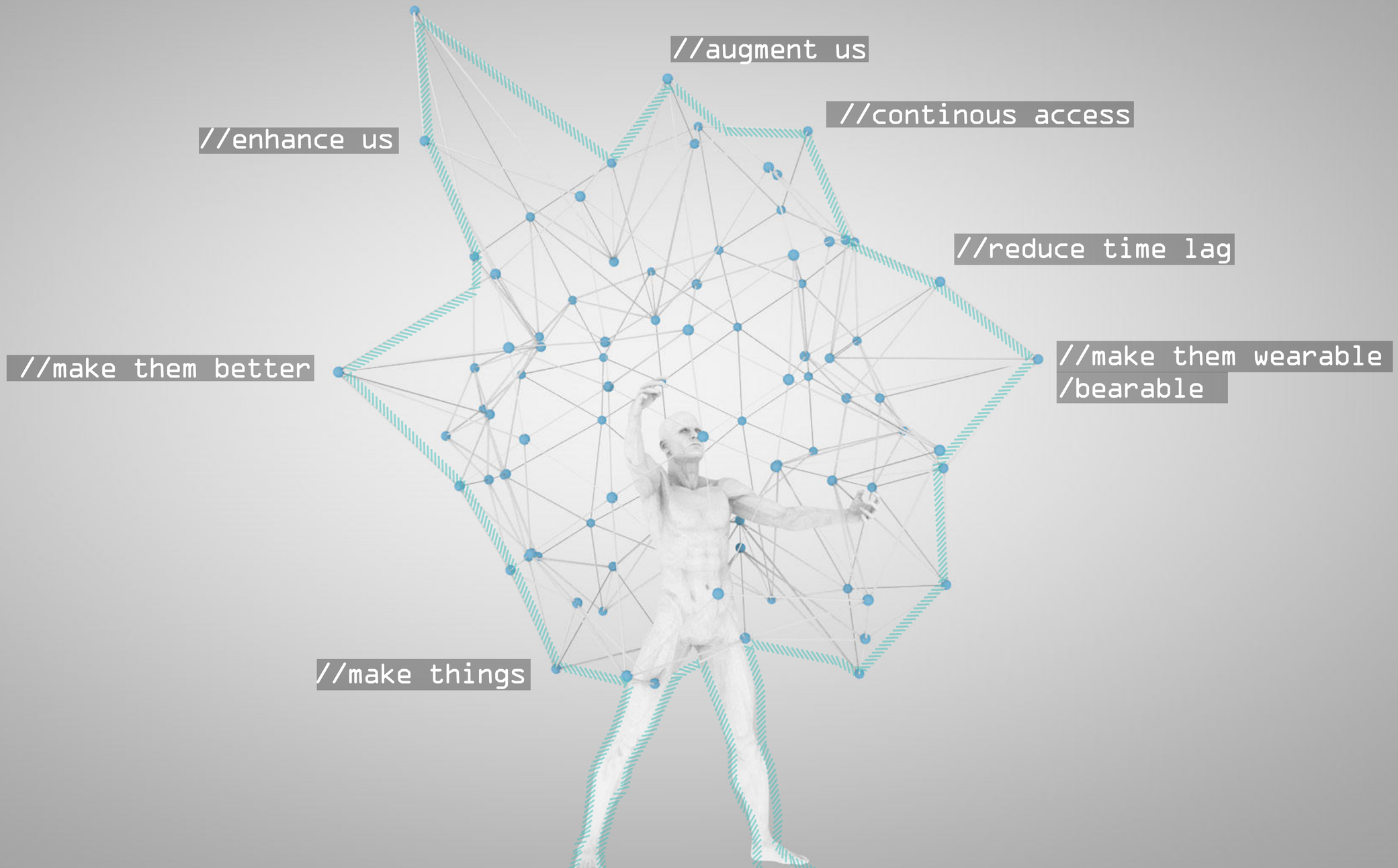


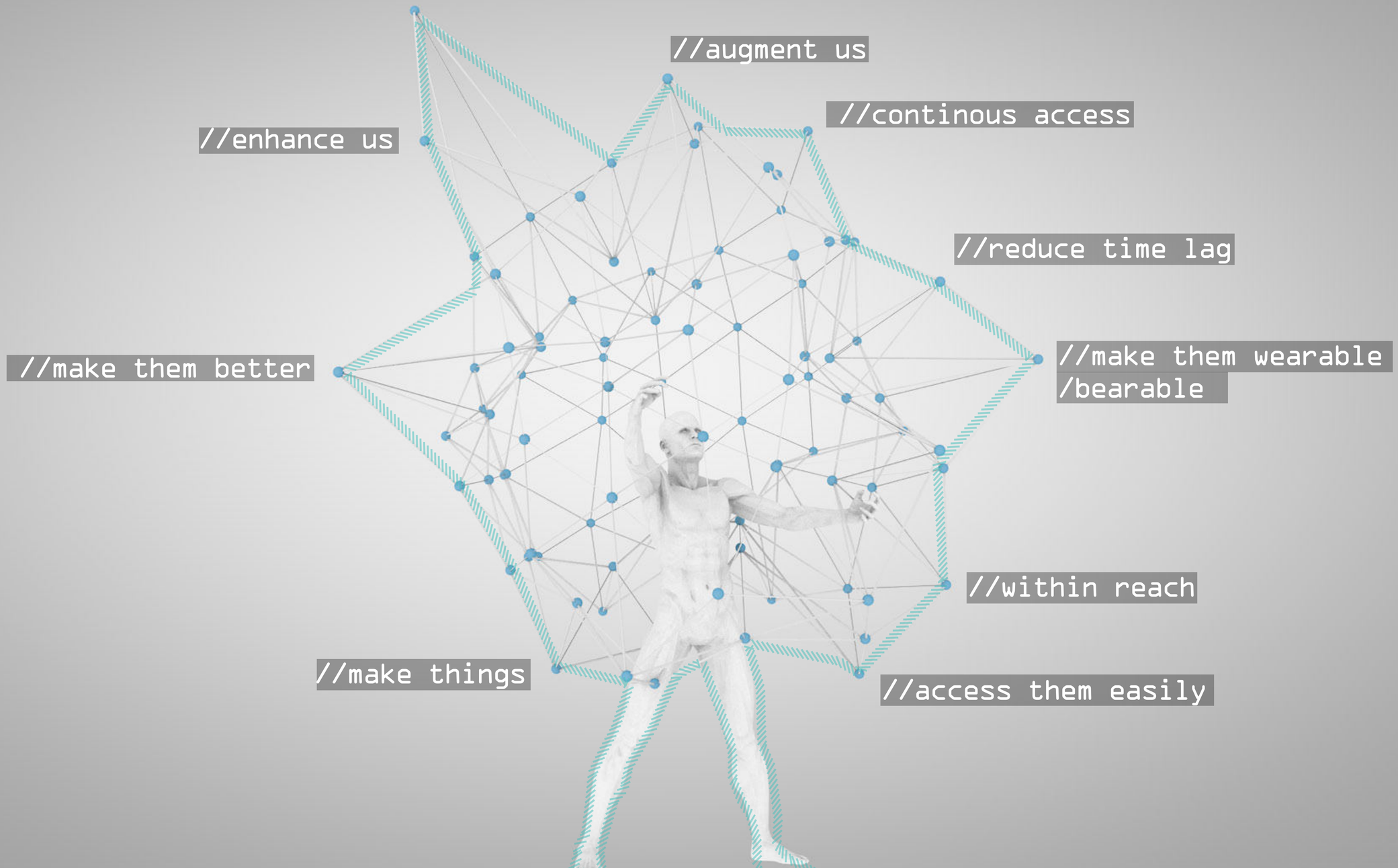
//make things

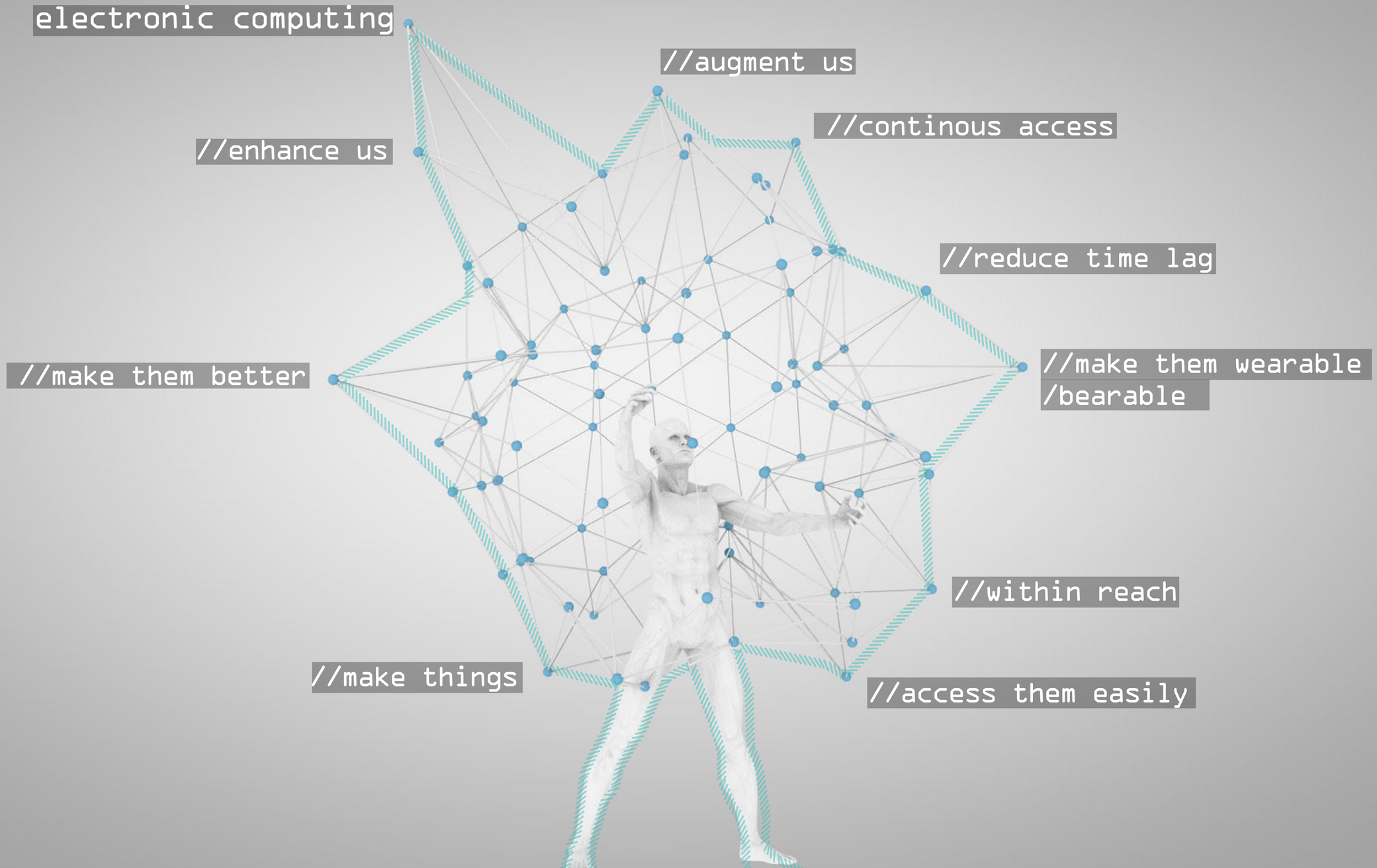

//augment us
//enhance us
//make them better
//make things

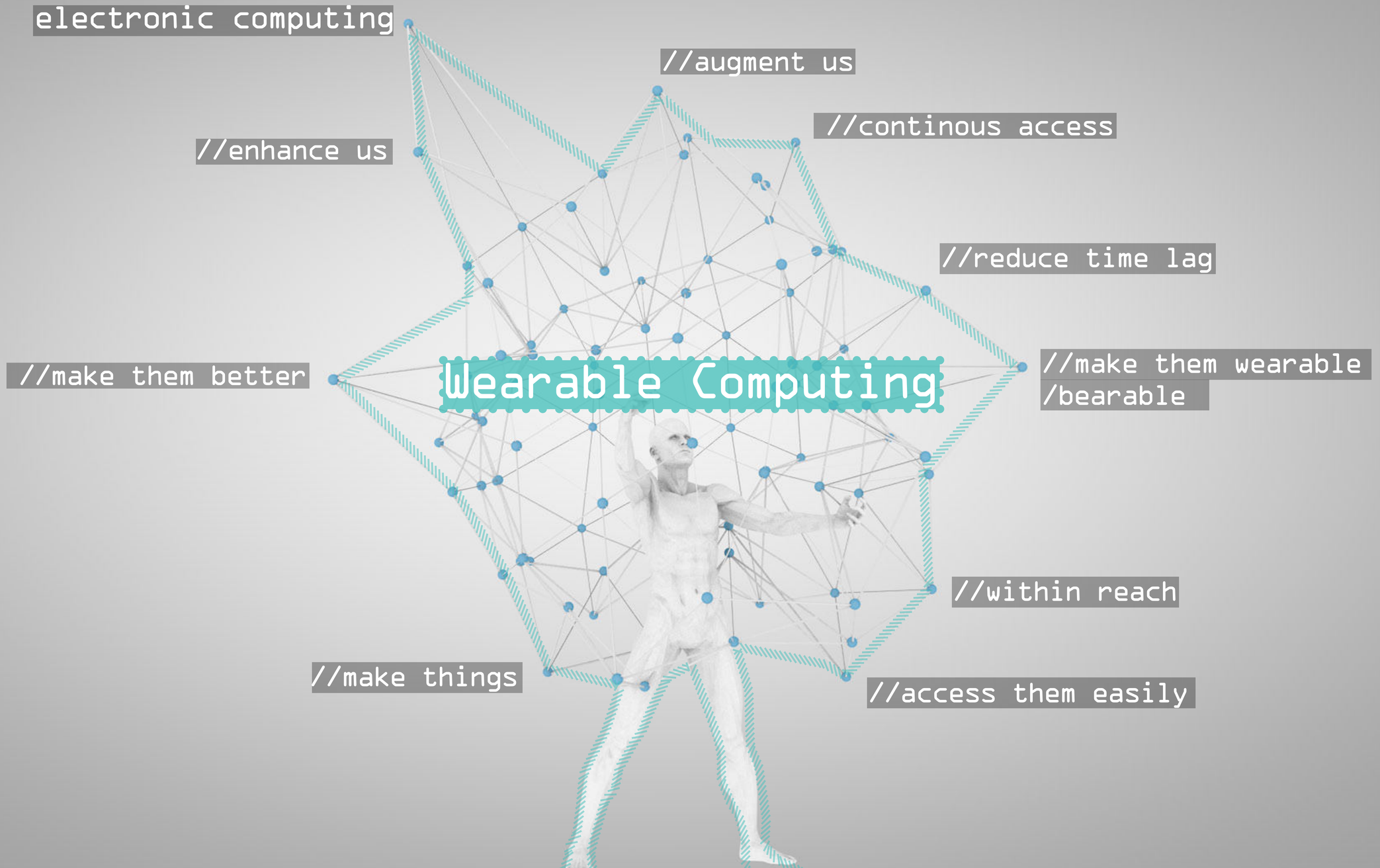

//augment us
//continous access
//enhance us
//make them better
//make things


//augment us
//continous access
//enhance us
//reduce time lag
//make them better
//make things

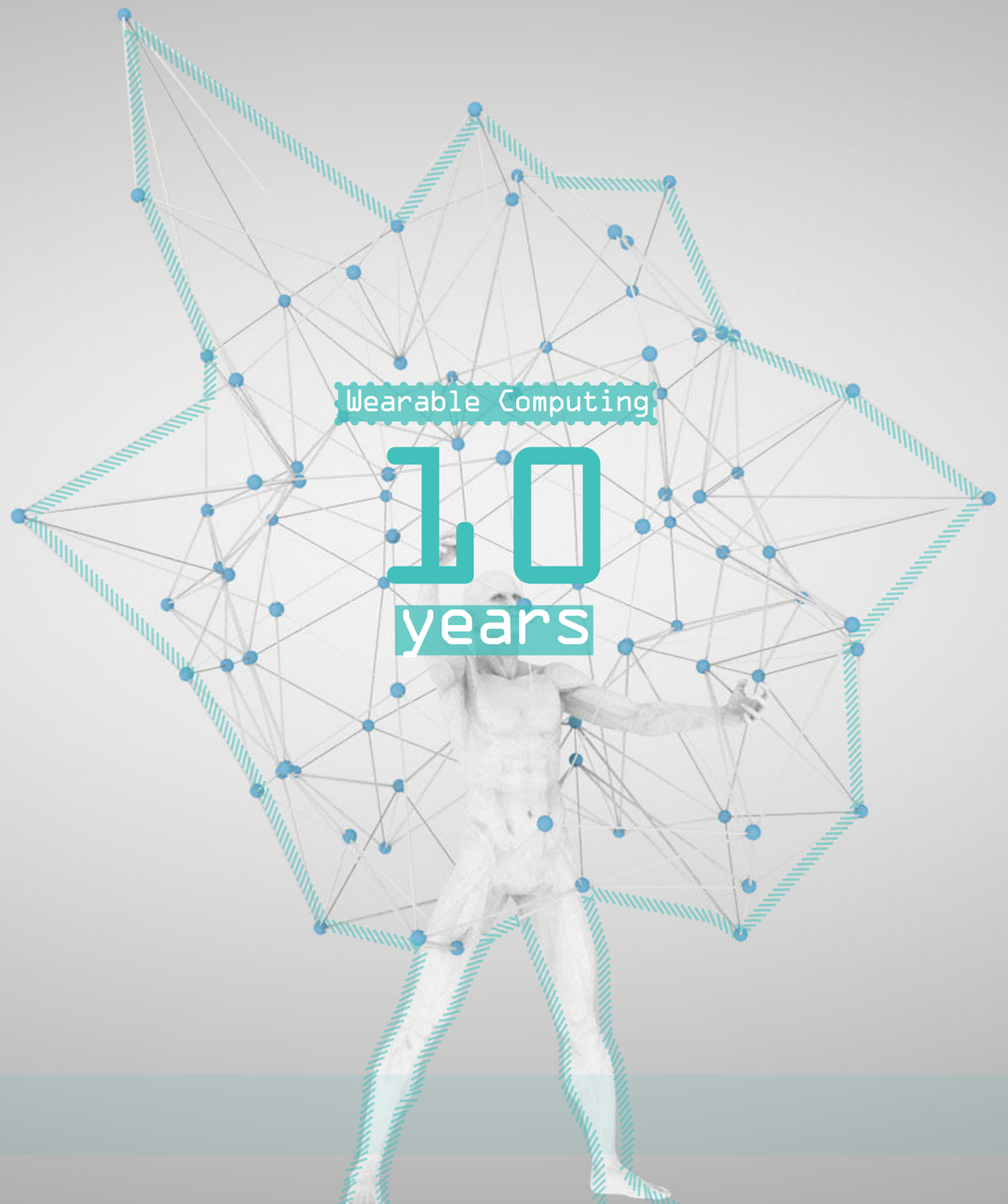

//augment us
//continous access
//enhance us
//reduce time lag
//make them better
//make them wearable
/bearable
//make things


//augment us
//continous access
//enhance us
//reduce time lag
//make them better
//make them wearable
/bearable
//within reach
//make things
//access them easily


electronic computing
//augment us
//continous access
//enhance us
//reduce time lag
//make them better
//make them wearable
/bearable
//within reach
//make things
//access them easily


electronic computing
//augment us
//continous access
//enhance us
//reduce time lag
Wearable Computing
//make them better
//make them wearable
/bearable
//within reach
//make things
//access them easily

// WHAT



electronic
transistor

1954

Envisions a future where computers will help/augment humans in their formulative thinking, in real time, and both will act as a combined organism, enhanced and evoluted.

// J.C.R. LICKLIDER 1960

MAN COMPUTER SYMBIOSIS

Summary

Man-computer symbiosis is an expected development in cooperative interaction between men and electronic computers. It will involve very close coupling between the human and the electronic members of the partnership.

The main aims are:

1) to let computers facilitate formulative thinking as they now facilitate the solution of formulated problems; and

2) to enable men and computers to cooperate in making [illegible] and controlling complex situations without inflexible dependence on predetermined programs.

In the anticipated symbiotic partnership, men will set the goals, formulate the hypotheses, determine the criteria, and perform the evaluations. Computing machines will do the routinizable work that must be done to prepare the way for insights and decisions in technical and scientific thinking. Preliminary analyses indicate that the symbiotic partnership will perform intellectual operations much more effectively than man alone can perform them. Prerequisites for the achievement include the effective, cooperative association, including developments in computer time sharing, in memory components, in memory organization, in programming languages, and in input and output equipment.

1 Introduction
1.1 Symbiosis

The fig tree is pollinated only by the insect Blastophaga grossorun. The larva of the insect lives in the ovary of the

// DOUGLAS ENGELBART 1962

AUGMENTING HUMAN INTELLECT

I. INTRODUCTION
A. GENERAL
By "augmenting human intellect" we mean increasing the capability of a man to approach a complex problem situation, to gain comprehension to suit his particular needs, and to derive solutions to problems.

Increased capability in this respect is taken to mean a mixture of the following: more-rapid comprehension, better comprehension, the possibility of gaining a useful degree of comprehension in a situation that previously was too complex, speedier solutions, better solutions, and the possibility of finding solutions to problems that before seemed insoluble. And by "complex situations" we include the professional problems of diplomats, executives, social scientists, life scientists, physical scientists, attorneys, designers--whether the problem situation exists for twenty minutes or twenty years. We do not speak of isolated clever tricks that help in particular situations. We refer to a way of life in an integrated domain where hunches, cut-and-try, intangibles, and the human "feel for a situation" usefully co-exist with powerful concepts, streamlined terminology and notation, sophisticated methods, and high-powered electronic aids.1a1

Man's population and gross product are increasing at a considerable rate, but the complexity of his problems grows still faster, and the urgency with which solutions must be found becomes steadily greater in response to the increased rate of activity and the increasingly global nature of that activity. Augmenting man's intellect, in the sense defined above, would warrant full pursuit by an enlightened society if there could be shown a reasonable approach and some plausible benefits.1a2

Lays down the conceptual framework for augmenting human mind, through elctronic computing. Describes means of augmentation and how man and computer can come together to solve the most complex problems.

Envisions a future where computers will act as a second brain/sensory network which will help takcle the world in new unprecedented ways.

ideas
imagination

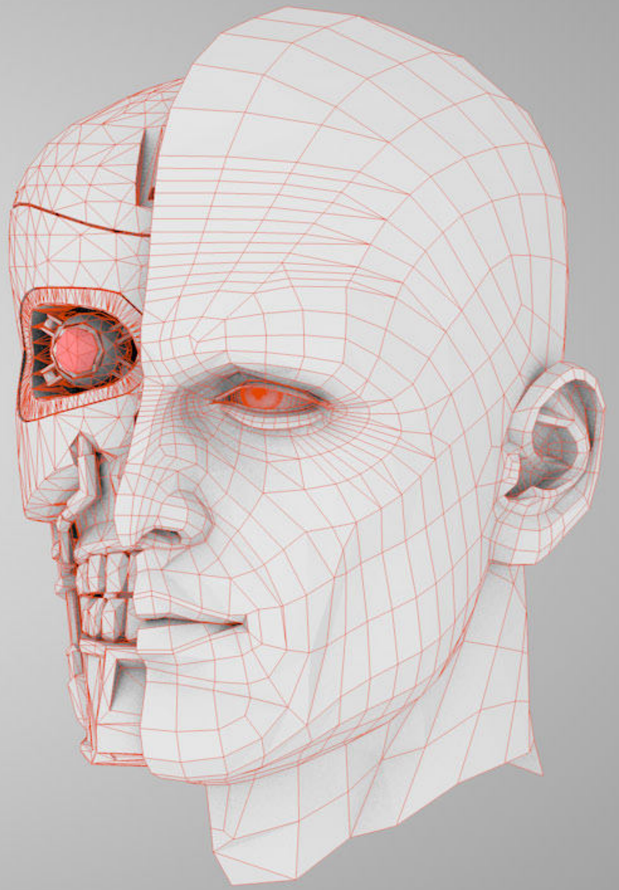
1954 1960

//1960

CYBORG

Manfred Clynes

Cyborgs & Space



ideas
imagination

1954

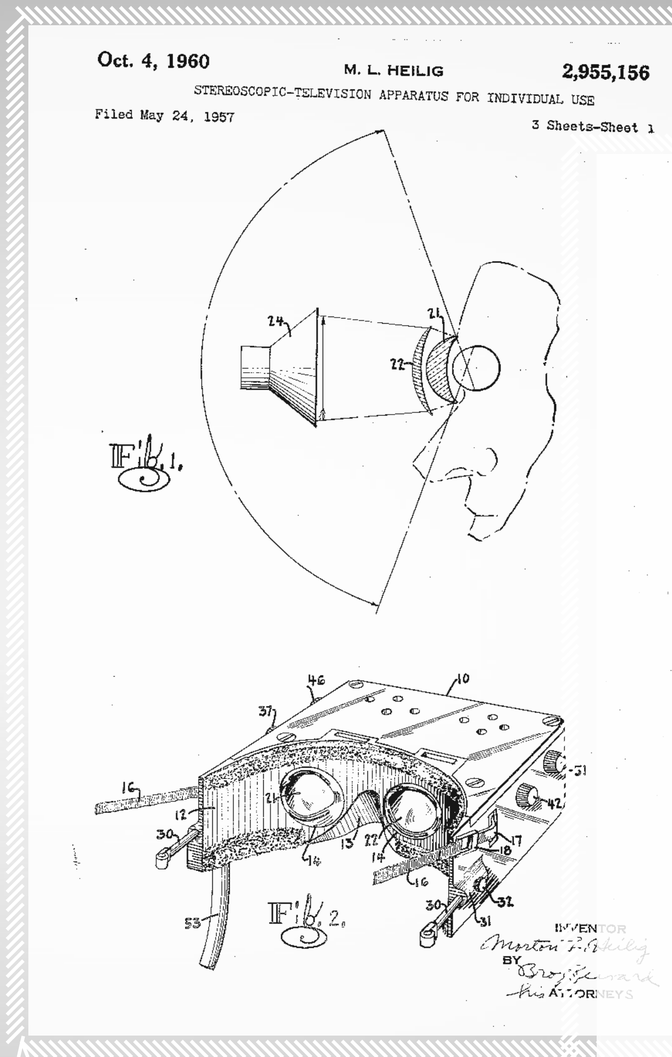
1960

//1960

3d Vision

Morton Heilig

First Ever Patent



Oct. 4, 1960 M. L. HEILIG 2,955,156

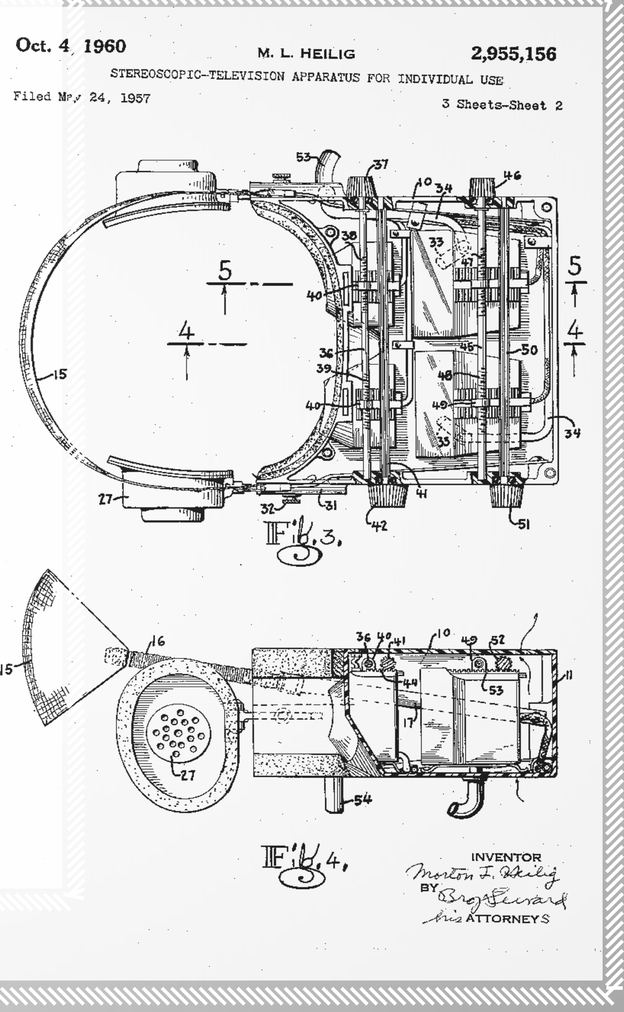
STEREOSCOPIC-TELEVISION APPARATUS FOR INDIVIDUAL USE

Filed May 24, 1957 3 Sheets-Sheet 1

Fig. 1.

Fig. 2.

INVENTOR
Morton L. Heilig
BY Brogan & Bernard
his ATTORNEYS



Oct. 4, 1960 M. L. HEILIG 2,955,156

STEREOSCOPIC-TELEVISION APPARATUS FOR INDIVIDUAL USE

Filed May 24, 1957 3 Sheets-Sheet 2

Fig. 3.

Fig. 4.

INVENTOR
Morton L. Heilig
BY Brogan & Bernard
his ATTORNEYS

ideas
imagination

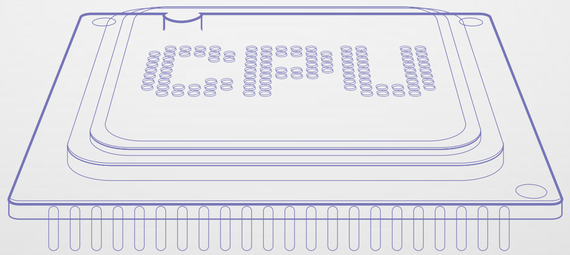
1954

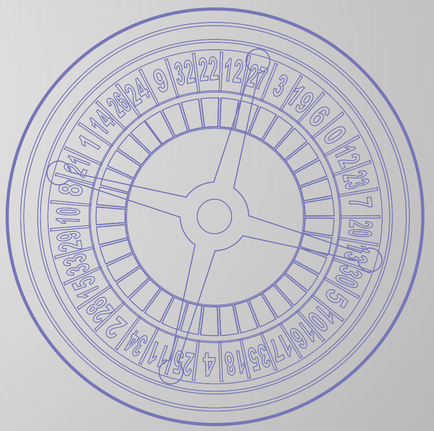
1960

//1961

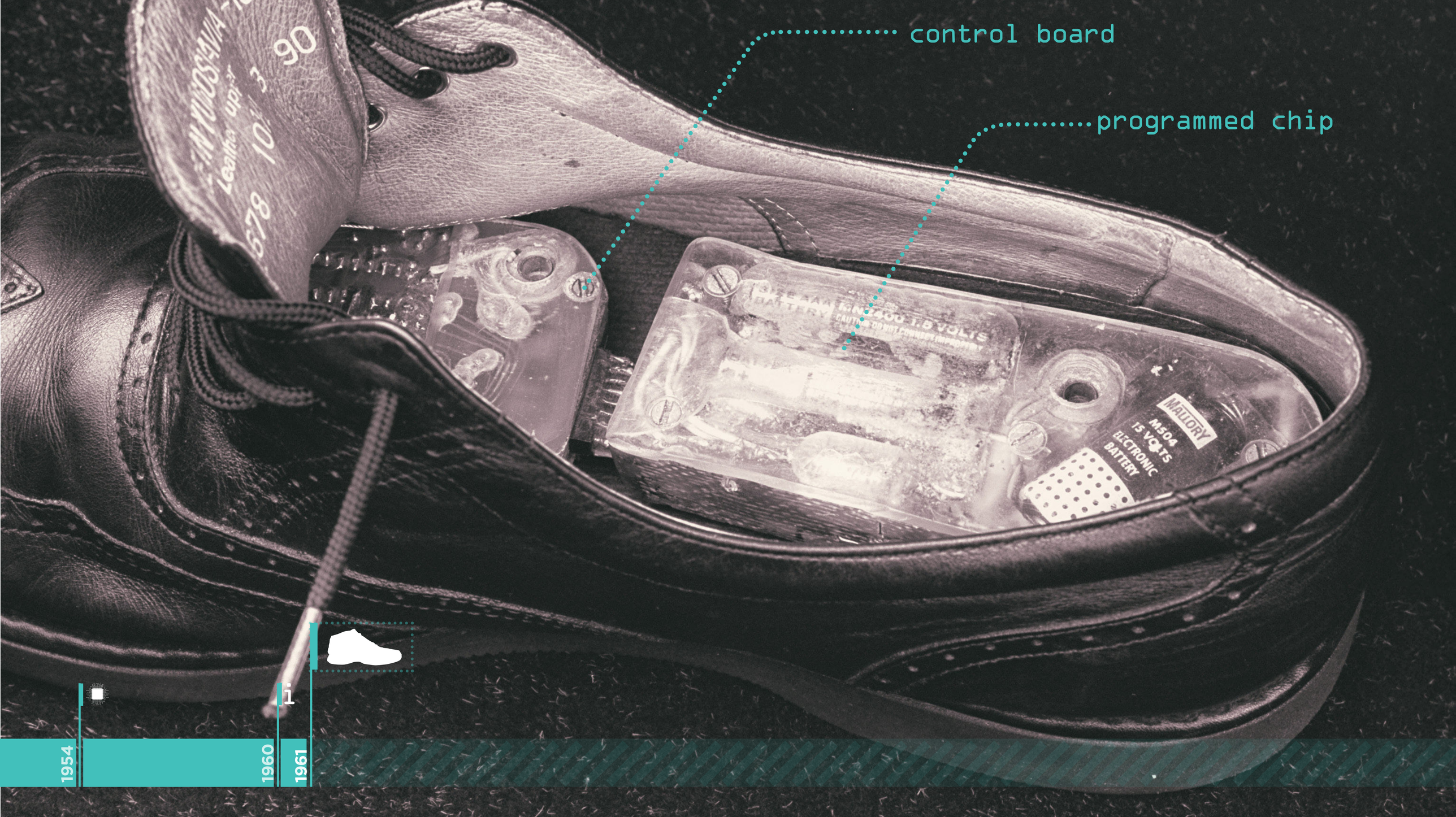
first wearable computer was born

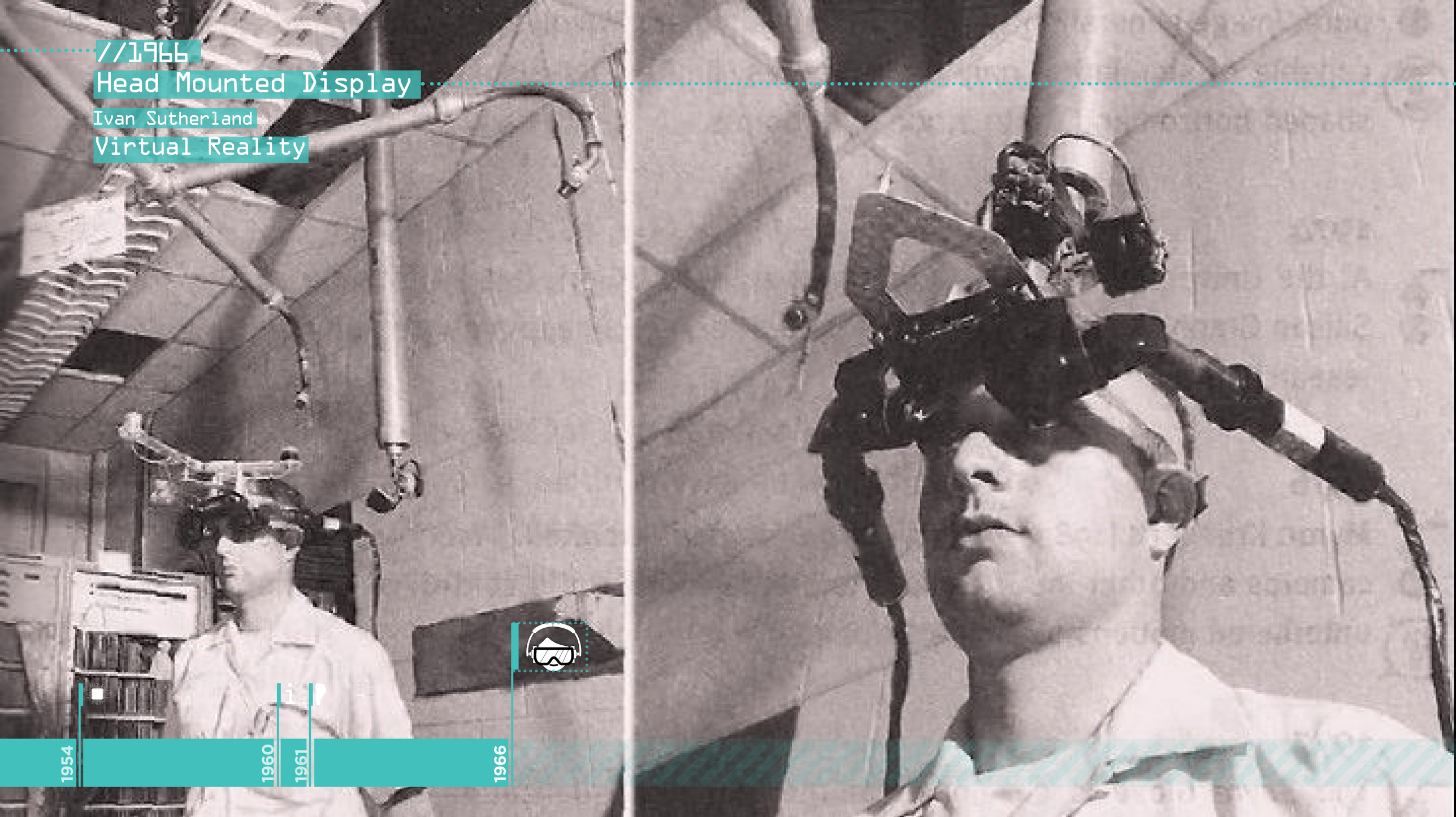
//Edward Thorpe
+ Claude Shannon





1954 1960 1961


control board
programmed chip
MALLORY
M504
15 VOLTS
ELECTRONIC
BATTERY
1954
1960
1961



//1966

Head Mounted Display

Ivan Sutherland

Virtual Reality

1954 1960 1961 1966

//1975

Calculator Watch Pulsar

1954 1960 1961 1966 1975

//1979

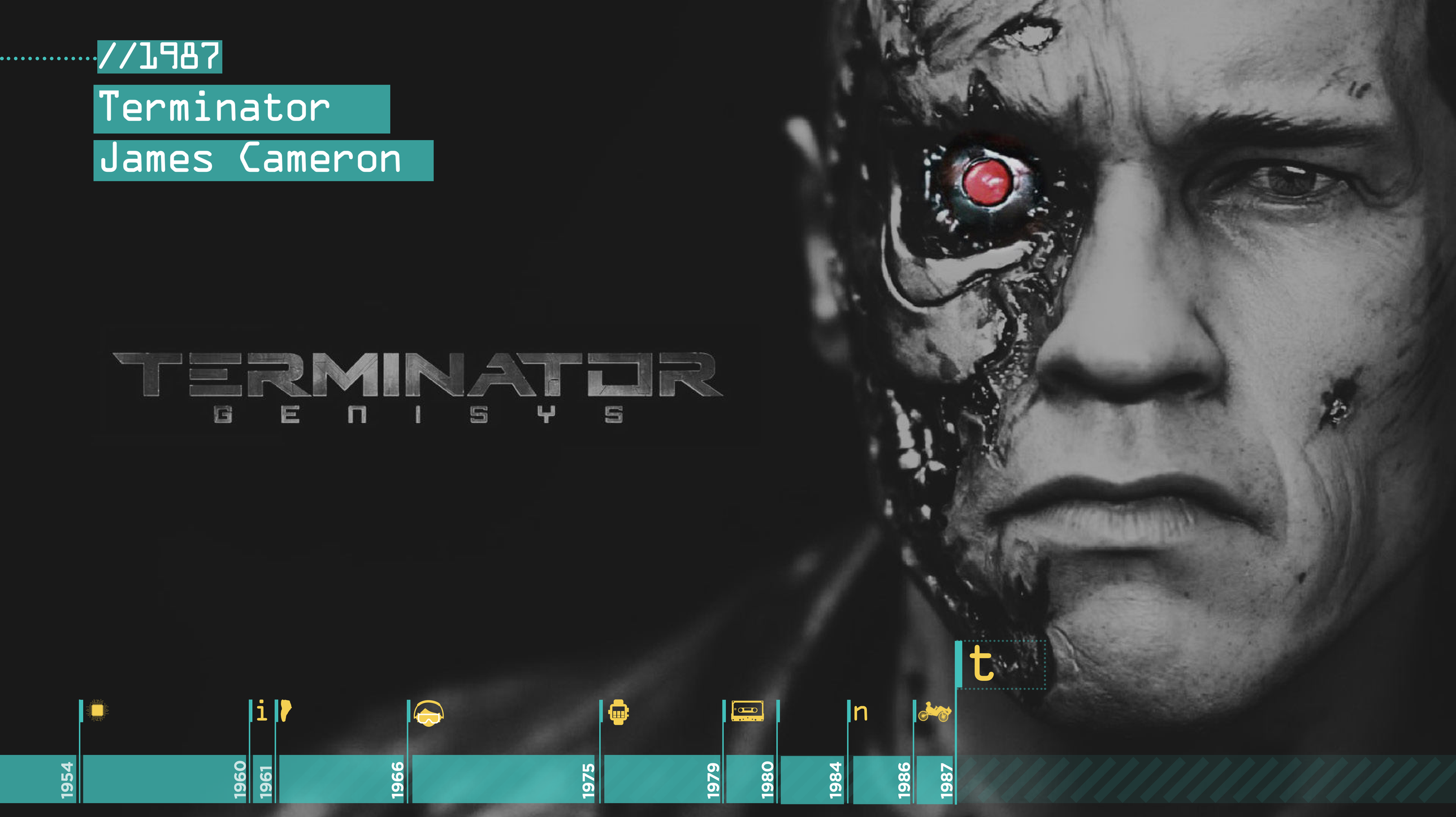
Walkman Music Sony

1954 1960 1961 1966 1975 1979

//1980

Wearable Computer
Steve Mann

1954 1960 1961 1966 1975 1979


//1987
Terminator
James Cameron
TERMINATOR
GENISYS
t
i
n
1954
1960
1961
1966
1975
1979
1980
1984
1986
1987

//1987

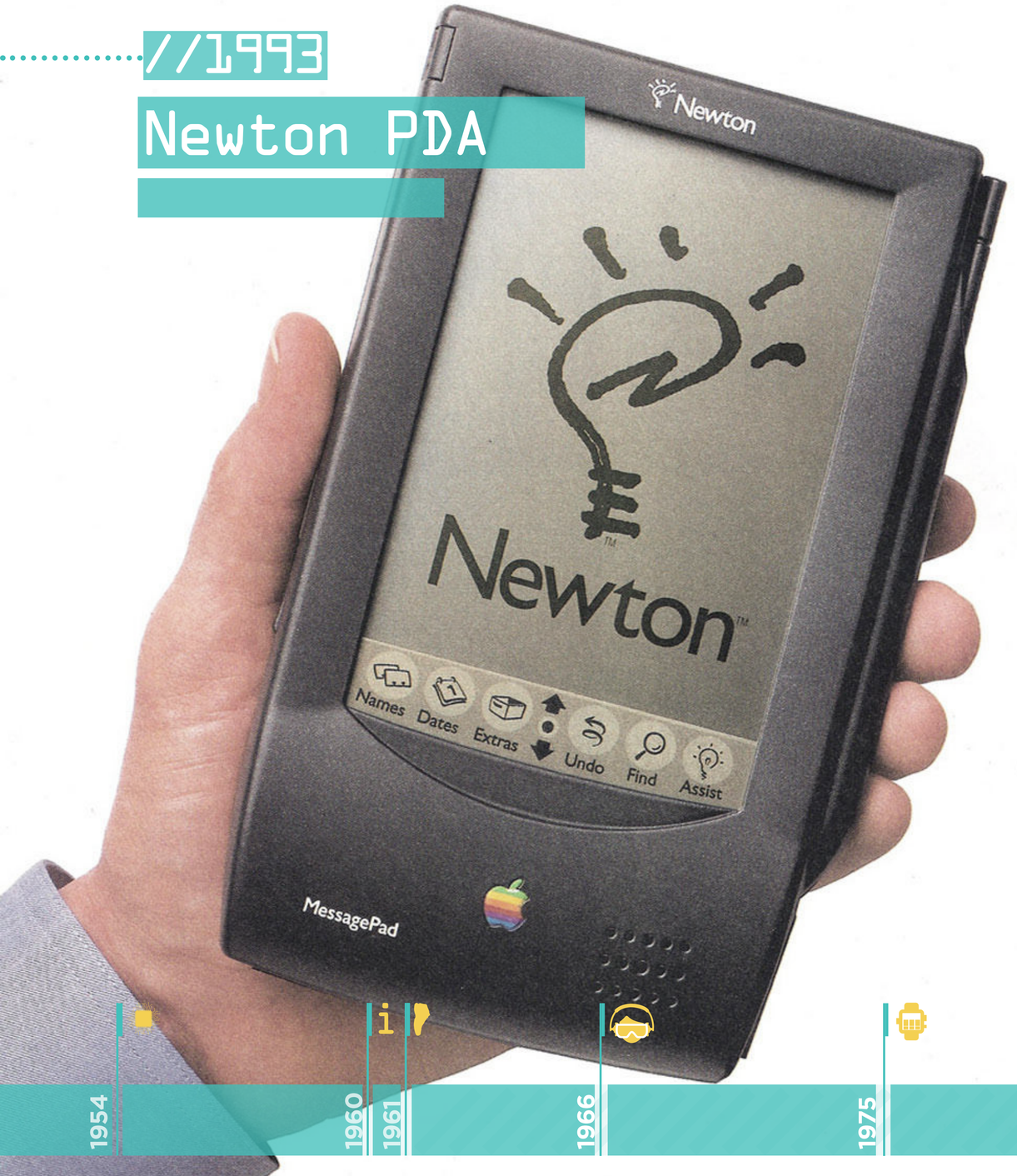
Private Eye

Reflection Tech

1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989

//1993

Newton PDA



Your World.

The astonishing new invention that has room for your whole world but fits in your pocket.

It manages your days, your names, and your numbers.

- Scheduling lunch? Tell your Newton™ MessagePad™ communications assistant what day–it will put lunch on your calendar for noon, and warn of any conflict. How? With a new concept called intelligent assistance.
- Tracks appointments by day, by week, by month–for over one hundred years.
- Automatically accesses names, numbers and addresses–when you print, fax or phone.
- And since it's also a notepad, it stores all the little personal notes you jot in your day.

It sends faxes and replaces your pager.

- As your communications assistant, the Newton MessagePad sends faxes you create with it–anywhere–and makes a cover sheet automatically.*

- Exchanges electronic mail with Macintosh® computers, PCs and other NewtonMail* subscribers.

- Receives wireless messages of approximately 50 words—just like a pager.*
- Beams information a short distance to another Newton MessagePad–business cards, comments, anything you want.

It makes writing readable.

- Your Newton MessagePad can turn what you write into print, store it, and find it for you later.
- Formats letters, memos, weekly summaries–automatically.
- Uses intelligent assistance to recognize key words and act on them–"call," "send," "schedule," and, of course, "lunch."

It can draw even if you can't.

- Your Newton MessagePad knows you wanted that circle round, and makes sure it is.
- Makes lines straight, angles exact, and polishes it all.

It talks to computers and printers.

- Your sketch, your memo, your notes–it can print them all out on a PC-or Macintosh-based printer.*

- Shares information with Macintosh computers and PCs running Microsoft® Windows®–so you can back it up.* And in one more way, access your world.

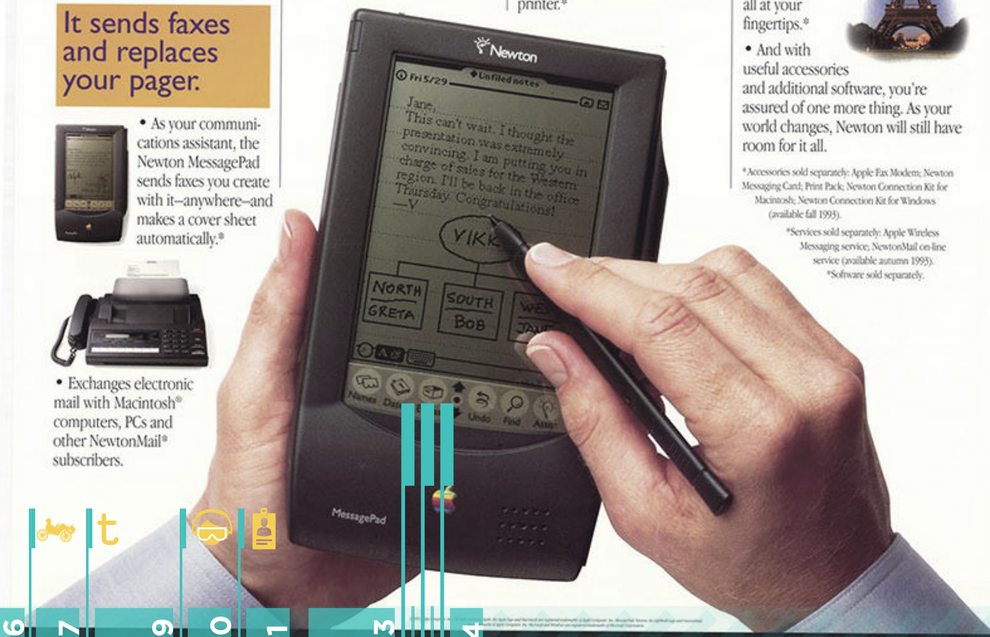
And what you don't know, there's a good chance it does.

- The time in Paris? Newton knows.
- Who has the best brisket in Brooklyn? It will tell you.*
- Hotels, airlines, restaurants–all at your fingertips.*
- And with useful accessories and additional software, you're assured of one more thing. As your world changes, Newton will still have room for it all.

*Accessories sold separately: Apple Fax Modem; Newton Messaging Card; Print Pack; Newton Connection Kit for Macintosh; Newton Connection Kit for Windows (available fall 1993).

*Services sold separately: Apple Wireless Messaging service; NewtonMail on-line service (available autumn 1993).

*Software sold separately.



1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994

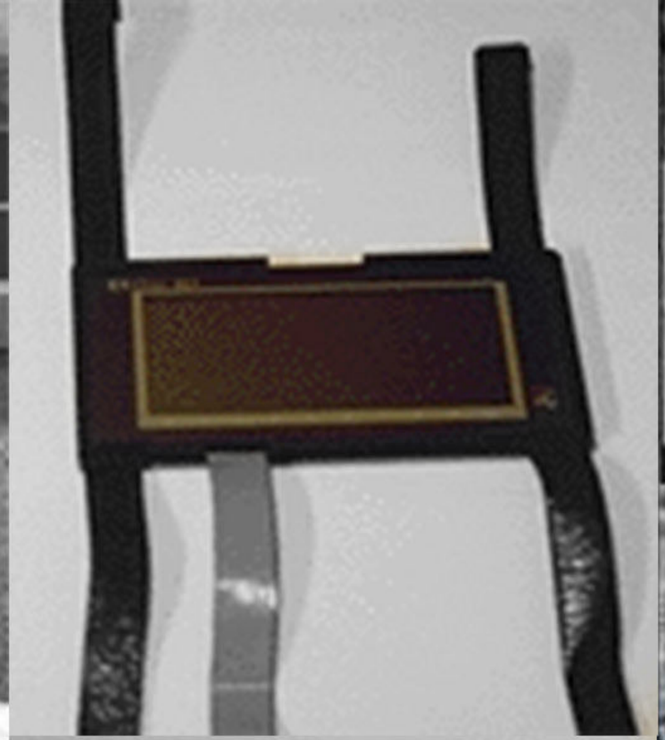
Your Newton.

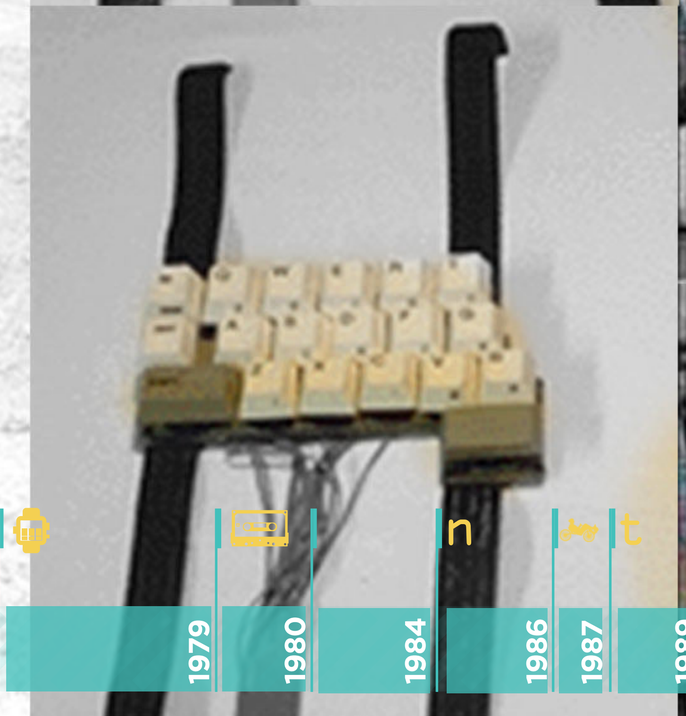
//1993

Continous Computing

Thad Starner

1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993





//1994

Wrist Computer

Edgar Matias

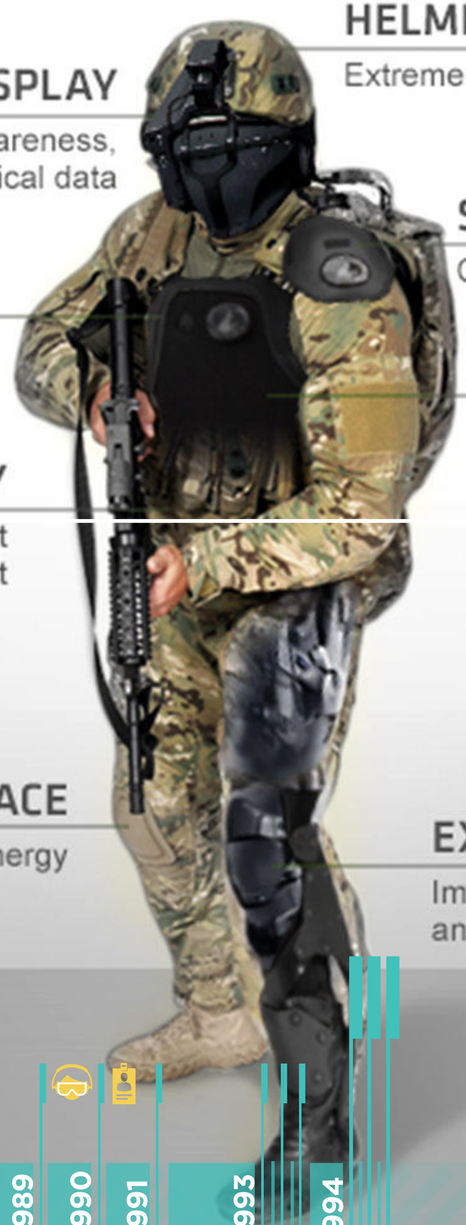
1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994

//1994

Life Blog

Steve Mann

Darpa Smart Module



HELMET
Extreme head protection

HEADS-UP DISPLAY
Enhances situational awareness, provides critical data

SOLAR PANELS
Captures solar energy

BIOSENSORS
Sensors in fabric measuring vitals

ARMOR
Complete ballistic protection

BODY
Nanoparticles protect against impact

LEG BRACE
Captures kinetic energy

EXOSKELETON
Improves performance and endurance

1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994

//2000

Bluetooth

M1000

QUICK START AND INFORMATION GUIDE

Bluetooth™

i n t

1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994 1997 2000


//2001
iPOD
Apple
1954
1960
1961
1966
1975
1979
1980
1984
1986
1987
1989
1990
1991
1993
1994
1997
2000
2001

//2001

Xybernaut

1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994 1997 2000 2001

//2003

Vitatron

1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994 1997 2000 2001 2003

//2006

Nike+iPod

//2007

iPhone

Apple

Introducing iPhone

iPhone combines three products — a revolutionary mobile phone, a widescreen iPod with touch controls, and a breakthrough Internet communications device with desktop-class email, web browsing, maps, and searching — into one small and lightweight handheld device. iPhone also introduces an entirely new user interface based on a large multi-touch display and pioneering new software, letting you control everything with just your fingers. So it ushers in an era of software power and sophistication never before seen in a mobile device, completely redefining what you can do on a mobile phone.

- Widescreen iPod
- Revolutionary Phone
- Breakthrough Internet Device
- High Technology

1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994 1997 2000 2001 2003 2004 2006 2007

//2009

W200

1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994 1997 2000 2001 2003 2004 2006 2007 2009

//2011

Fitbit Ultra

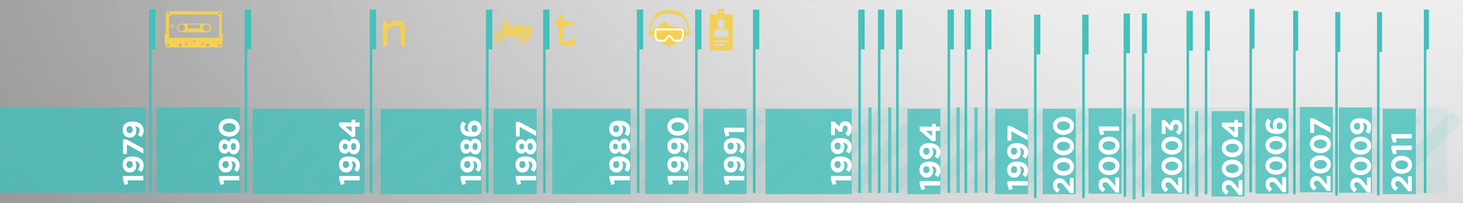
- accelerometer
- Altimeter
- clock
- stopwatch

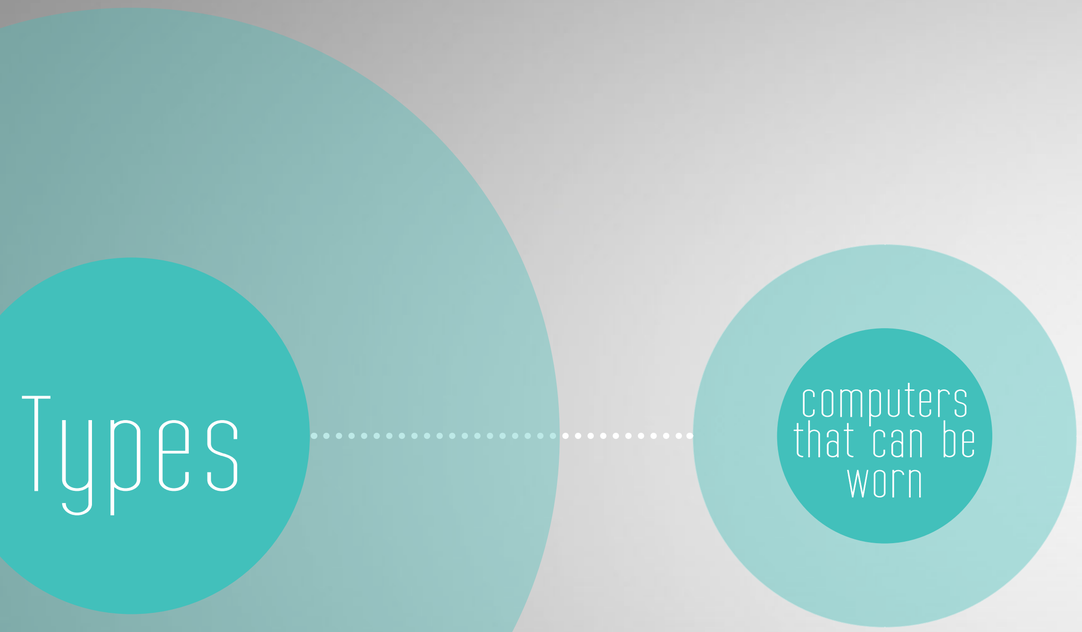
1954 1960 1961 1966 1975 1979 1980 1984 1986 1987 1989 1990 1991 1993 1994 1997 2000 2001 2003 2004 2006 2007 2009 2011

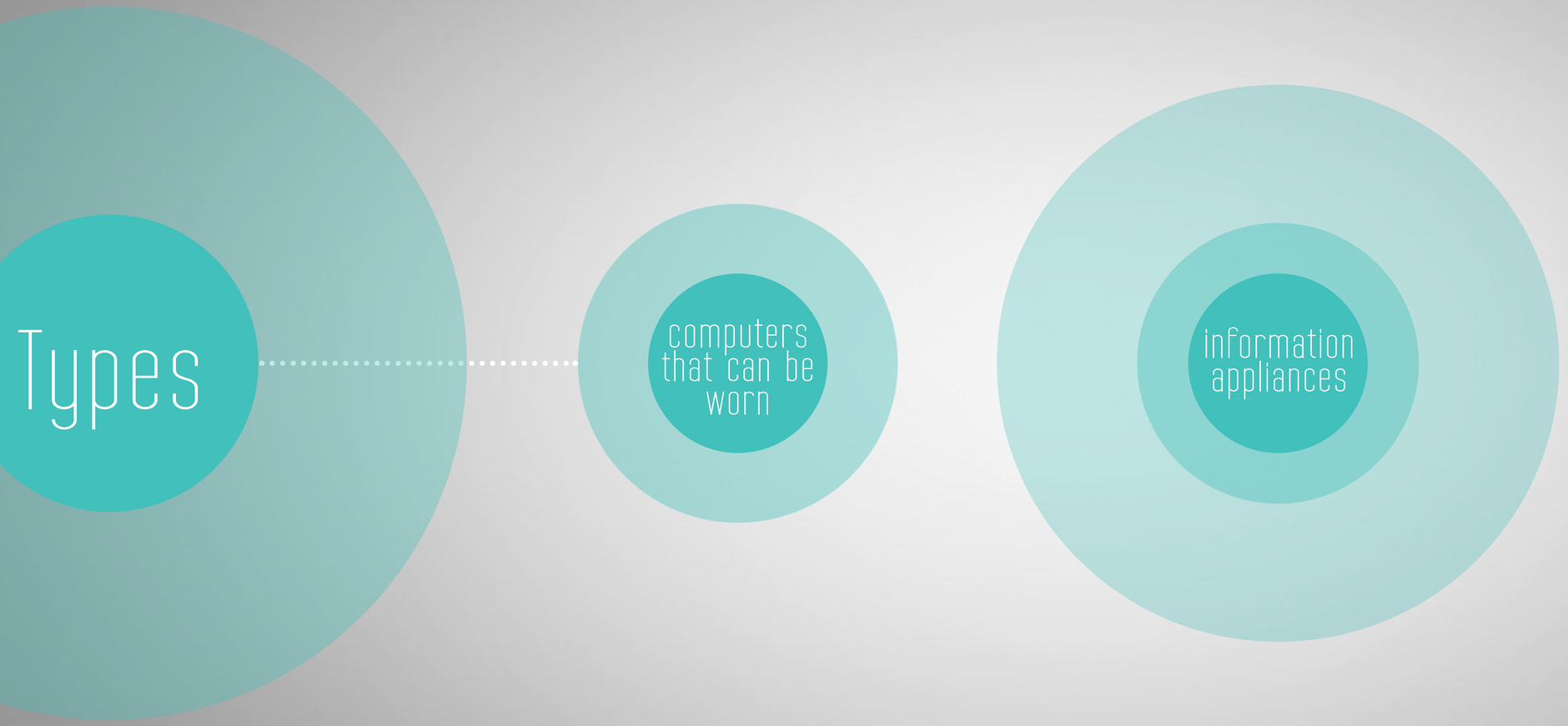
SINCE THEN THE WEARABLES HAVE GAINED MOMENTUM, AND EXPLODED

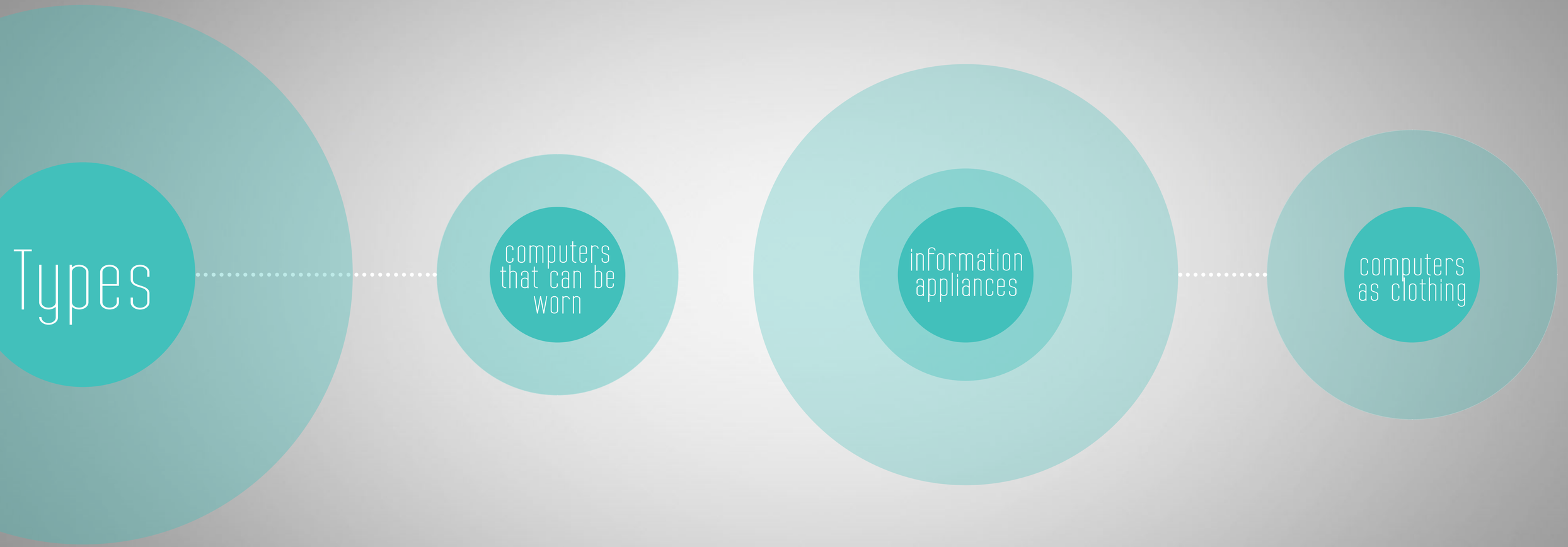
The TIME for Wearables is NOW!

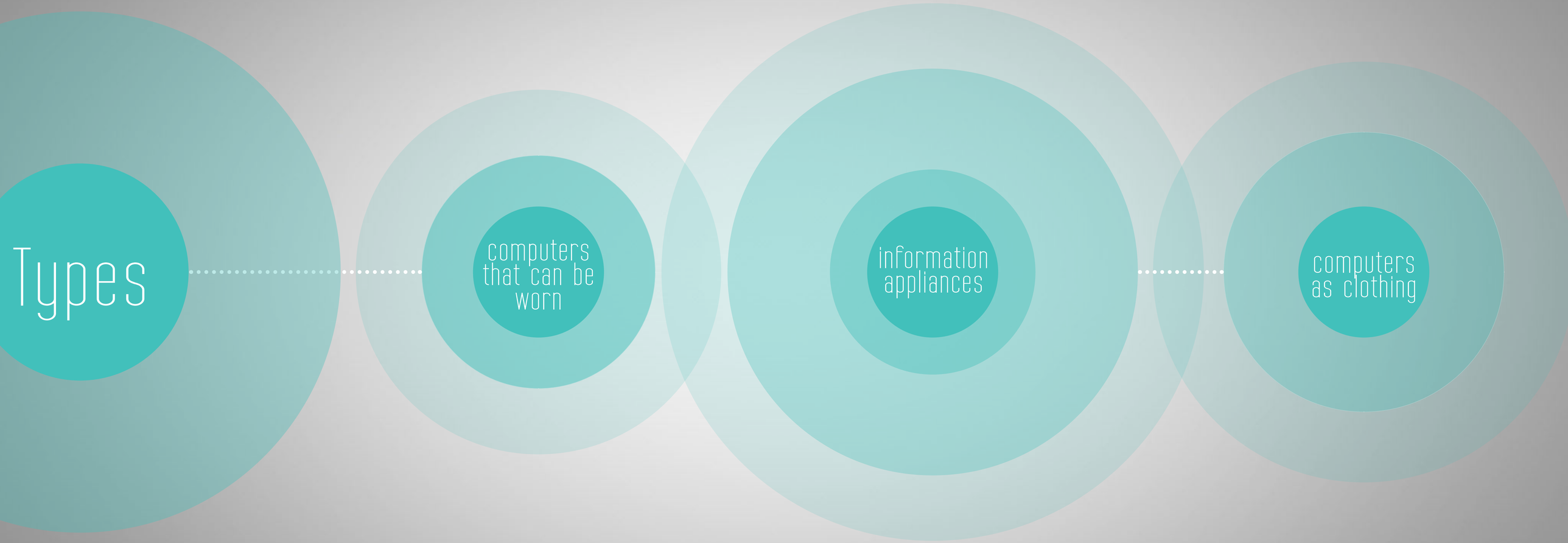
-Tim Cook, (CEO Apple)

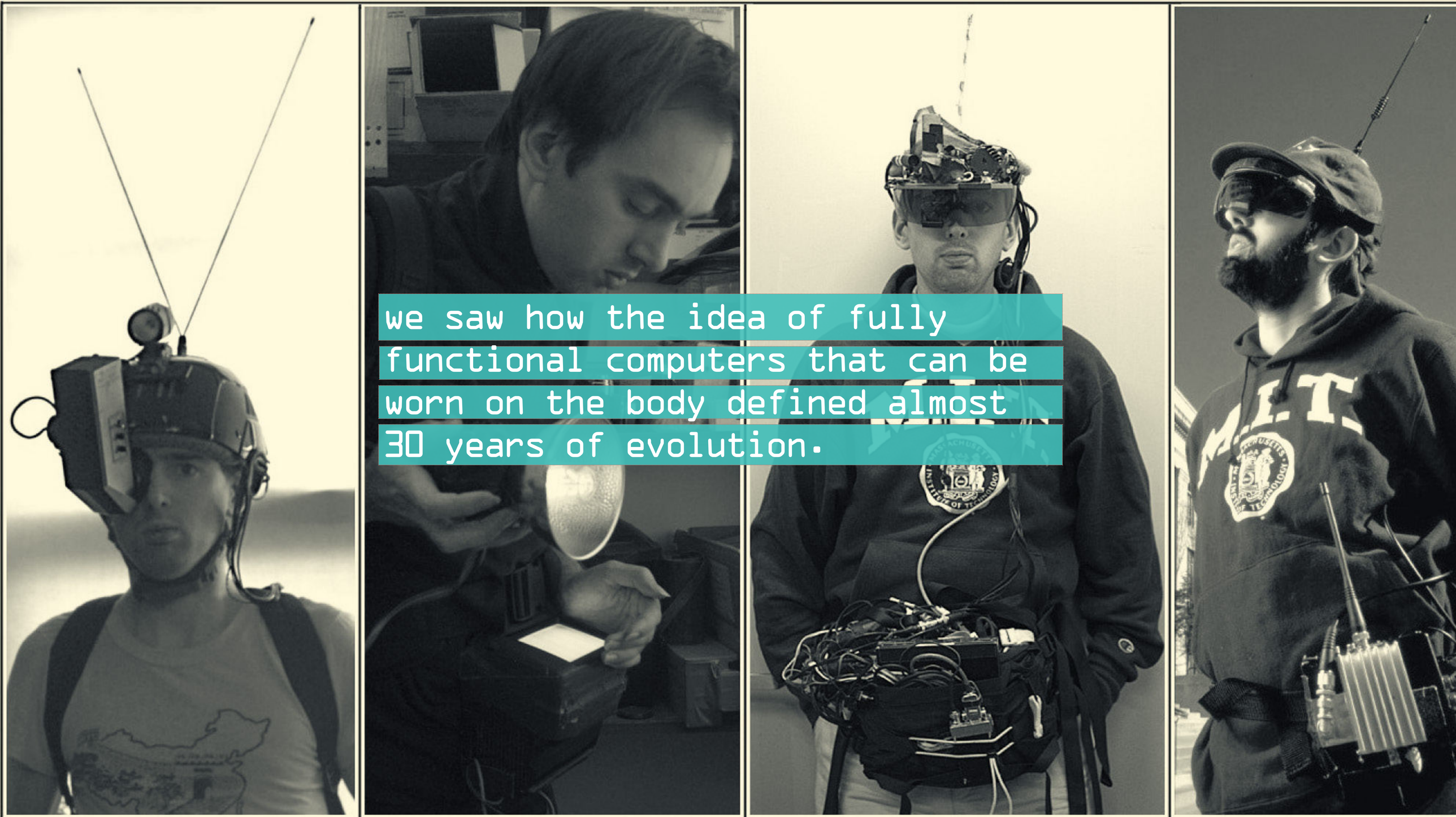



Types
computers that can be worn


Types
computers that can be worn
information appliances


Types
computers that can be worn
information appliances
computers as clothing


Types
computers that can be worn
information appliances
computers as clothing


we saw how the idea of fully
functional computers that can be
worn on the body defined almost
30 years of evolution.

as of now

we have a wearable computer

right in our pockets

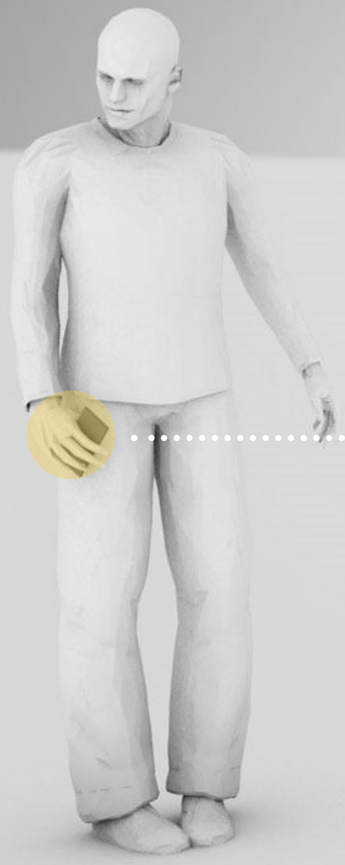
smartphone


TUE
11
1+1=2

// TWO SECONDS

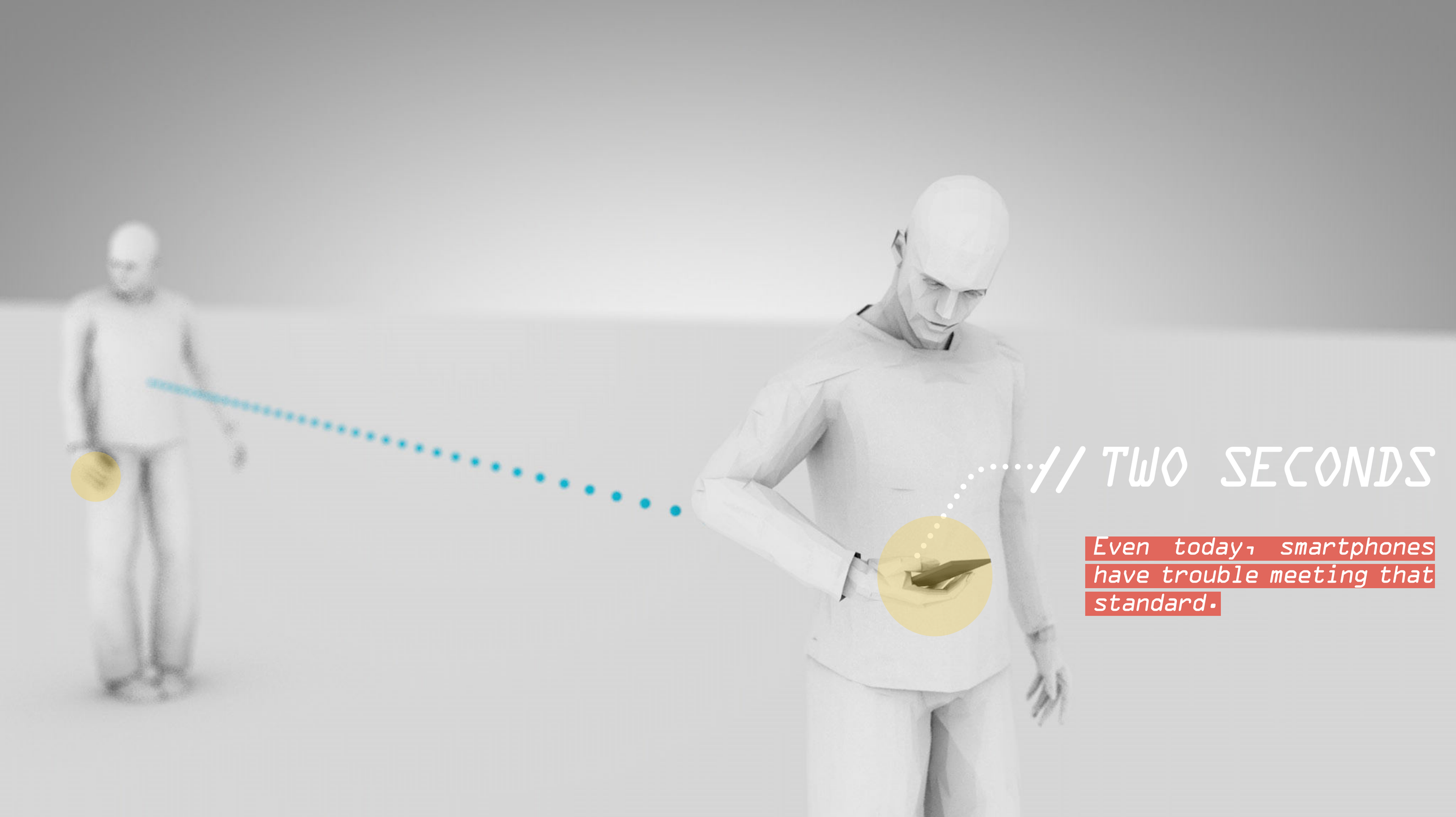
"If you can't get to a tool within two seconds, your use of it goes down exponentially"

-Thad Starner
Technical lead:Google Glass

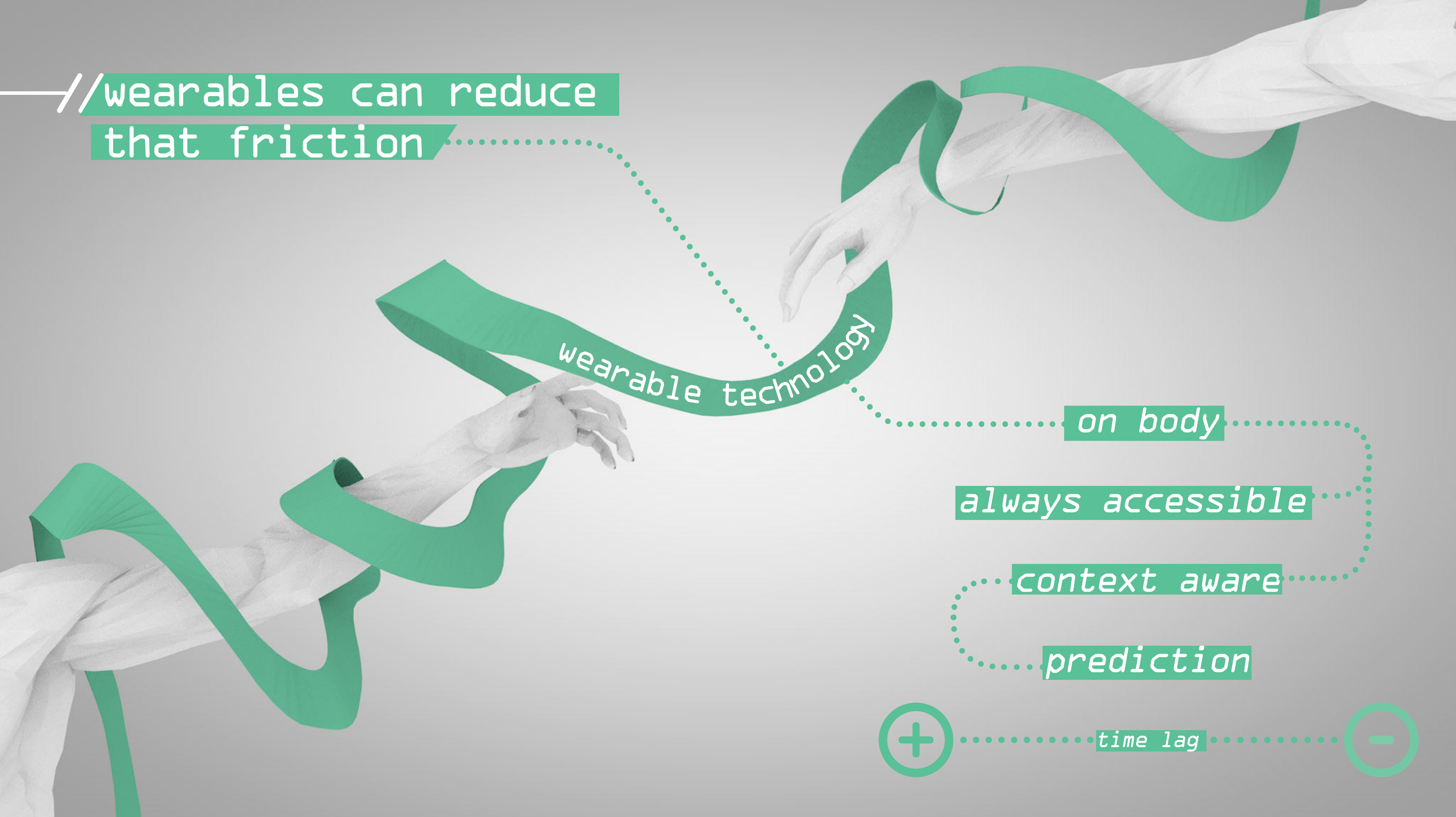


// TWO SECONDS

Even today, smartphones have trouble meeting that standard.


// TWO SECONDS
Even today, smartphones have trouble meeting that standard.

//wearables can reduce that friction



on body

always accessible

context aware

prediction

time lag


00:00

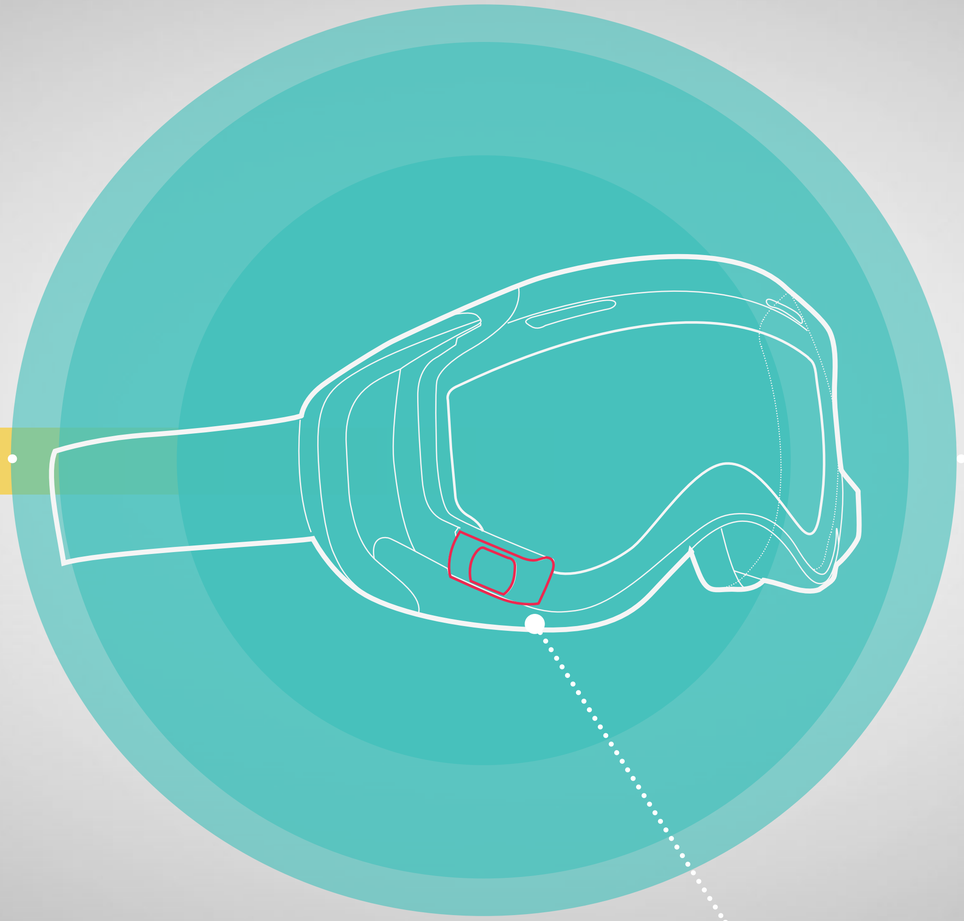

JET
JET


00:00

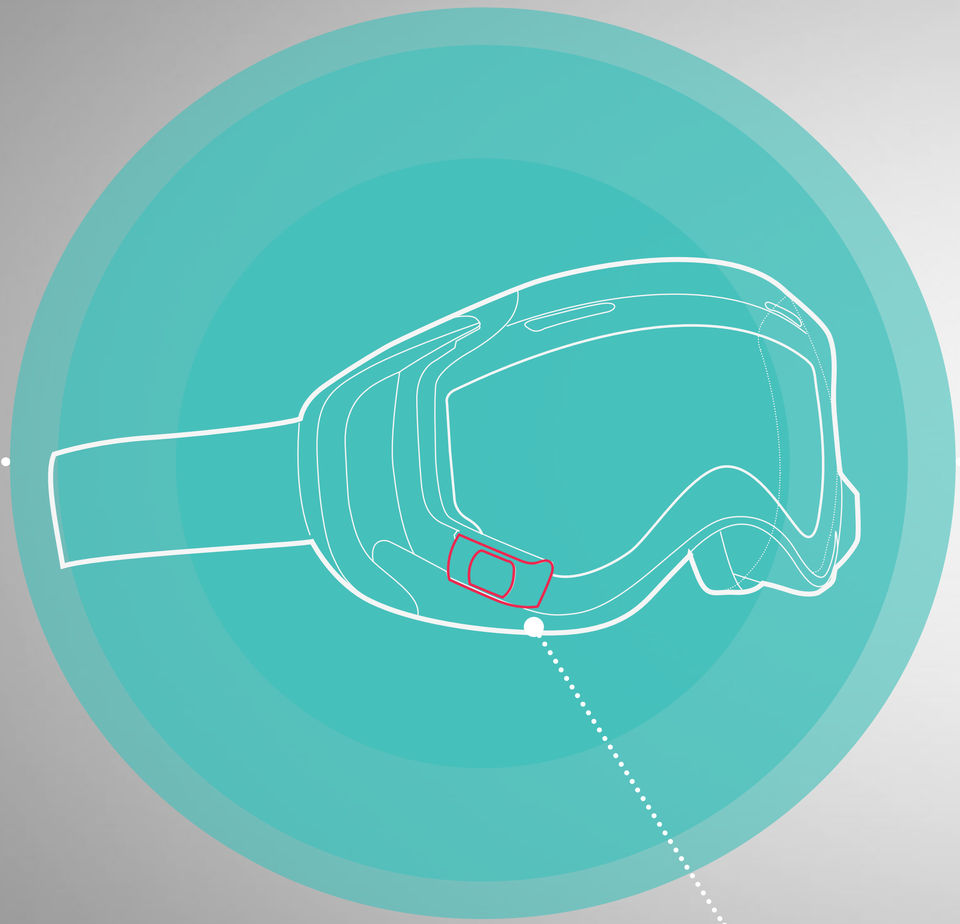

vision

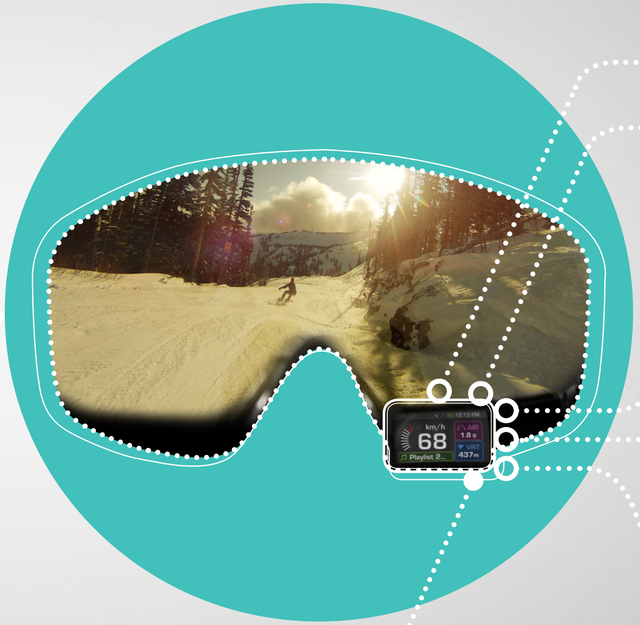

recon snow

recon snow



// HUD





speed

altitude

jump analytics

buddy tracking

music

// HUD

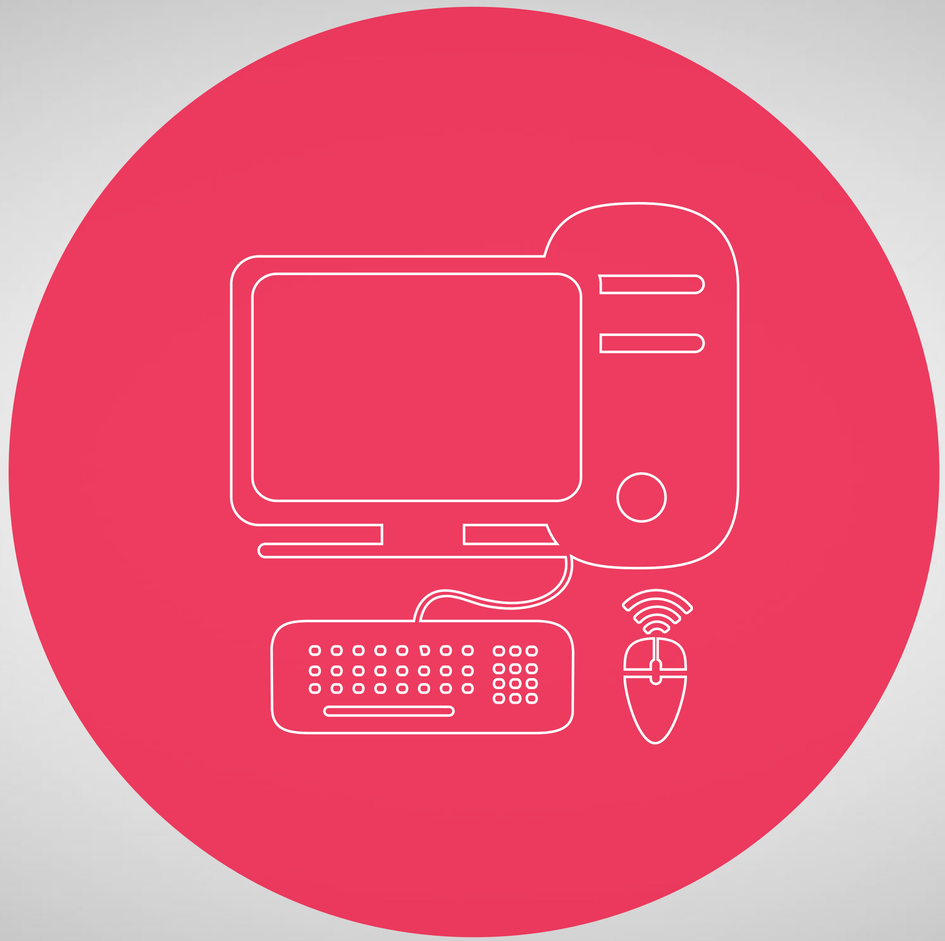
all the relevant information
only the relevant information
and relevant times.
which otherwise would have
remained locked on a screen
in your pocket.

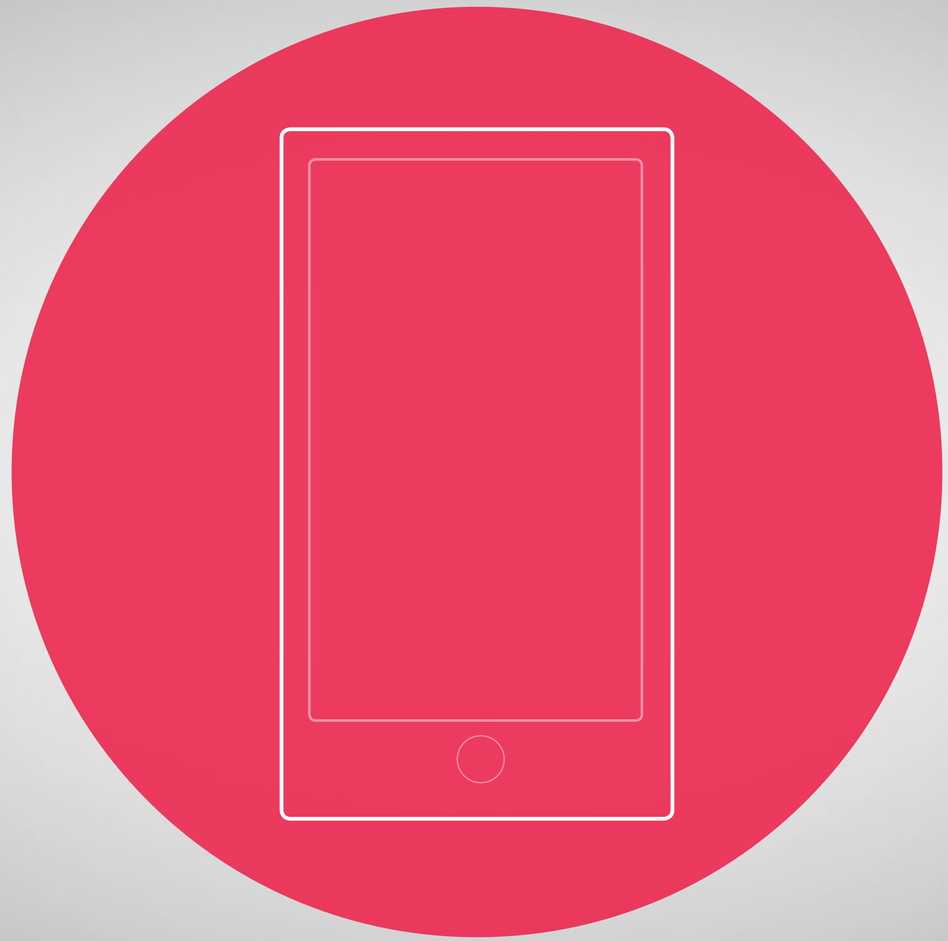
all the relevant information
only the relevant information
and relevant times.
which otherwise would have
remained locked on a screen
in your pocket.

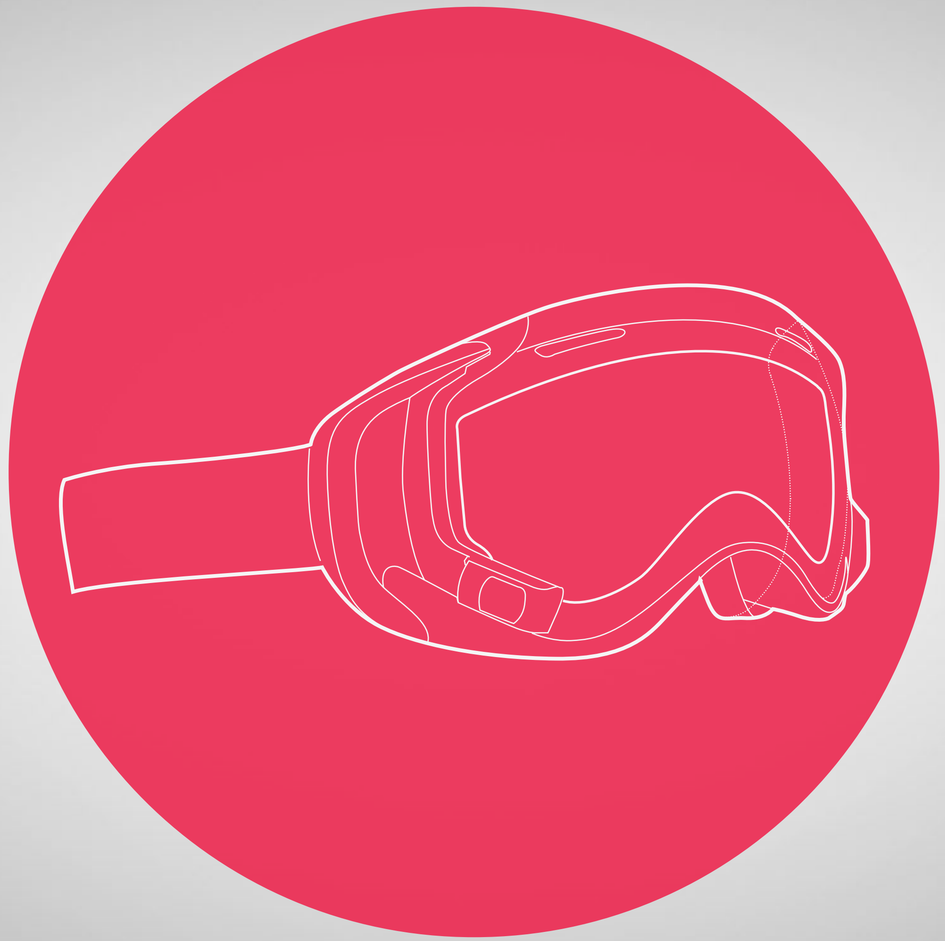
&

this is why wearables matter

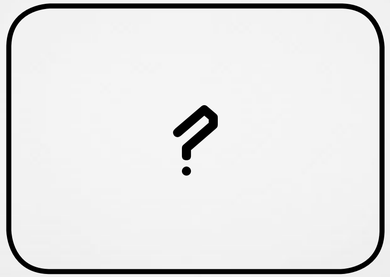
a
new device revolution
is at hand

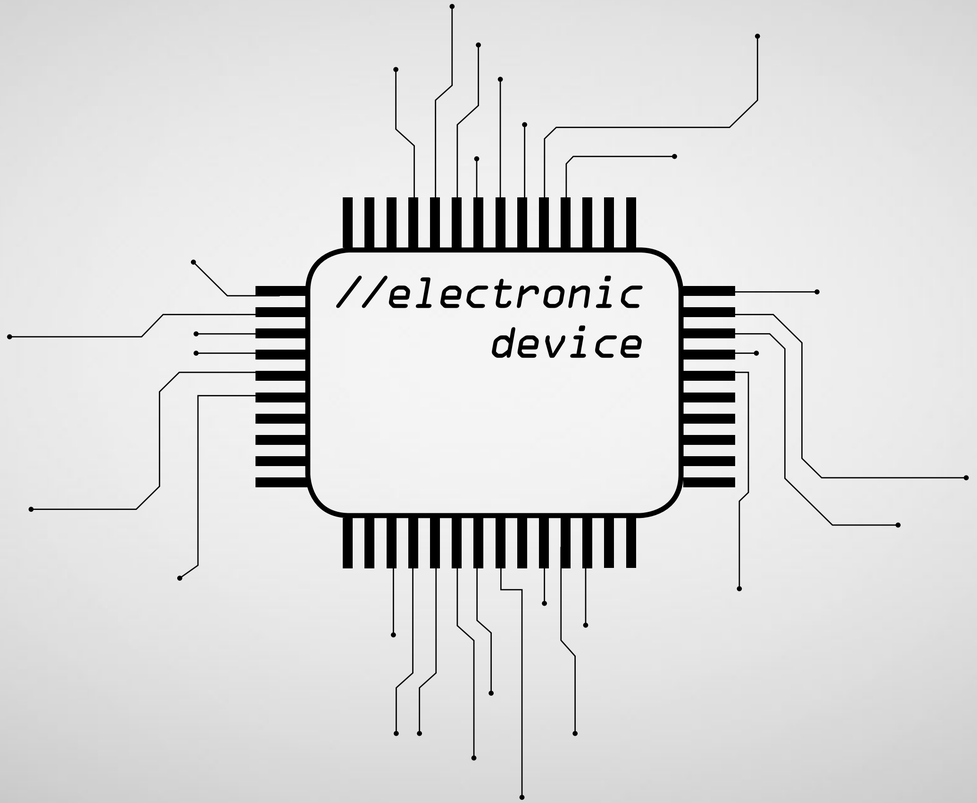


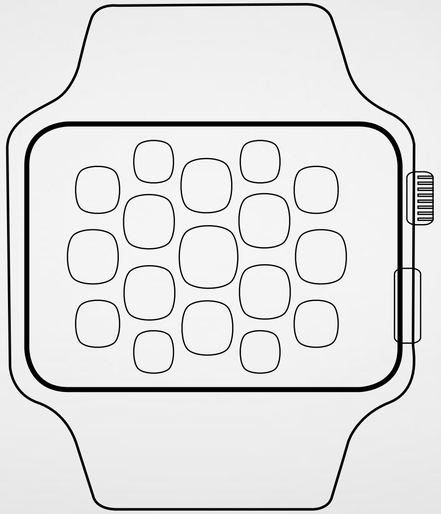


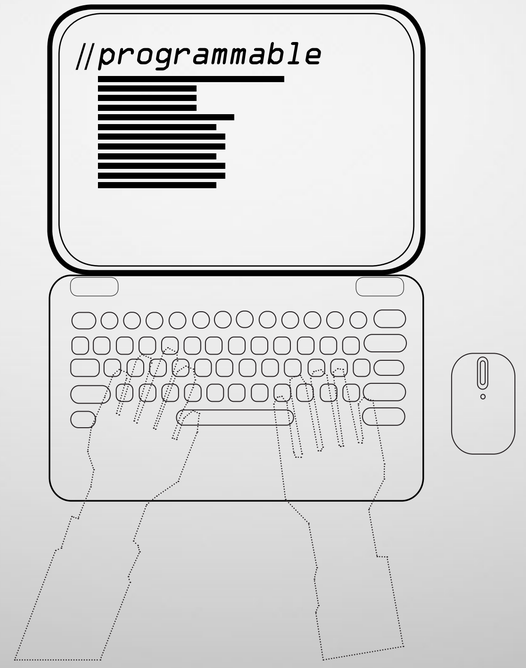


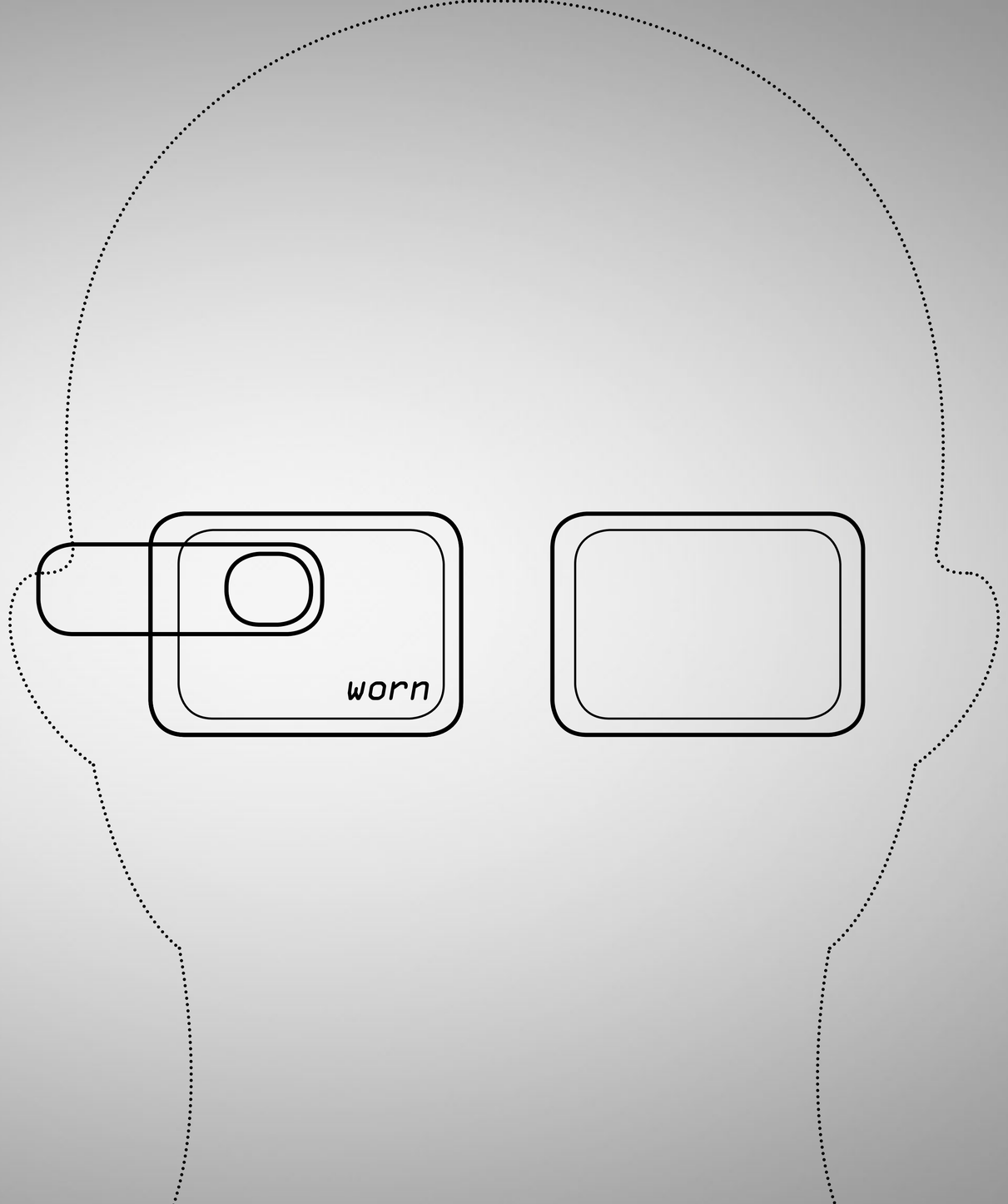
// WHAT

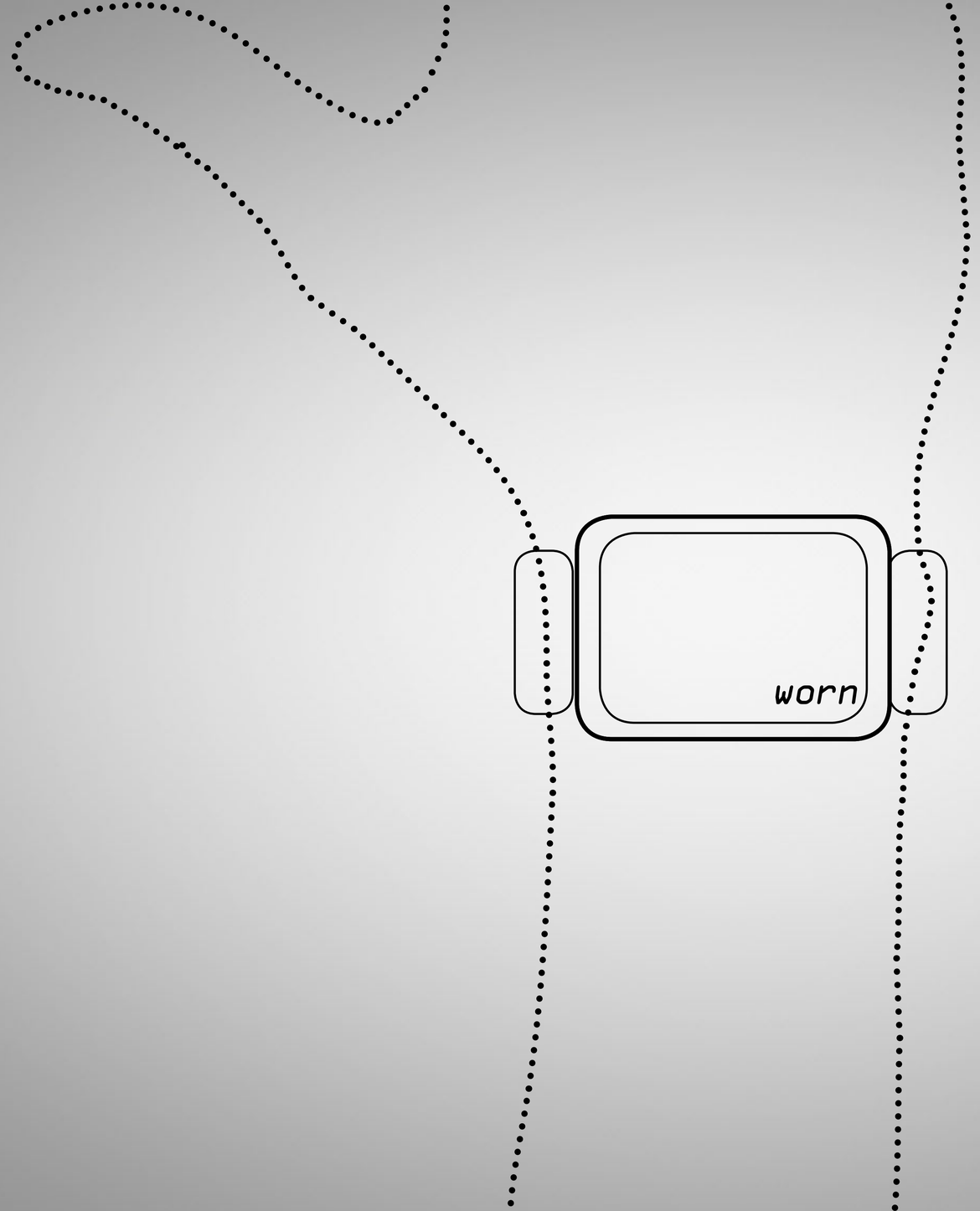


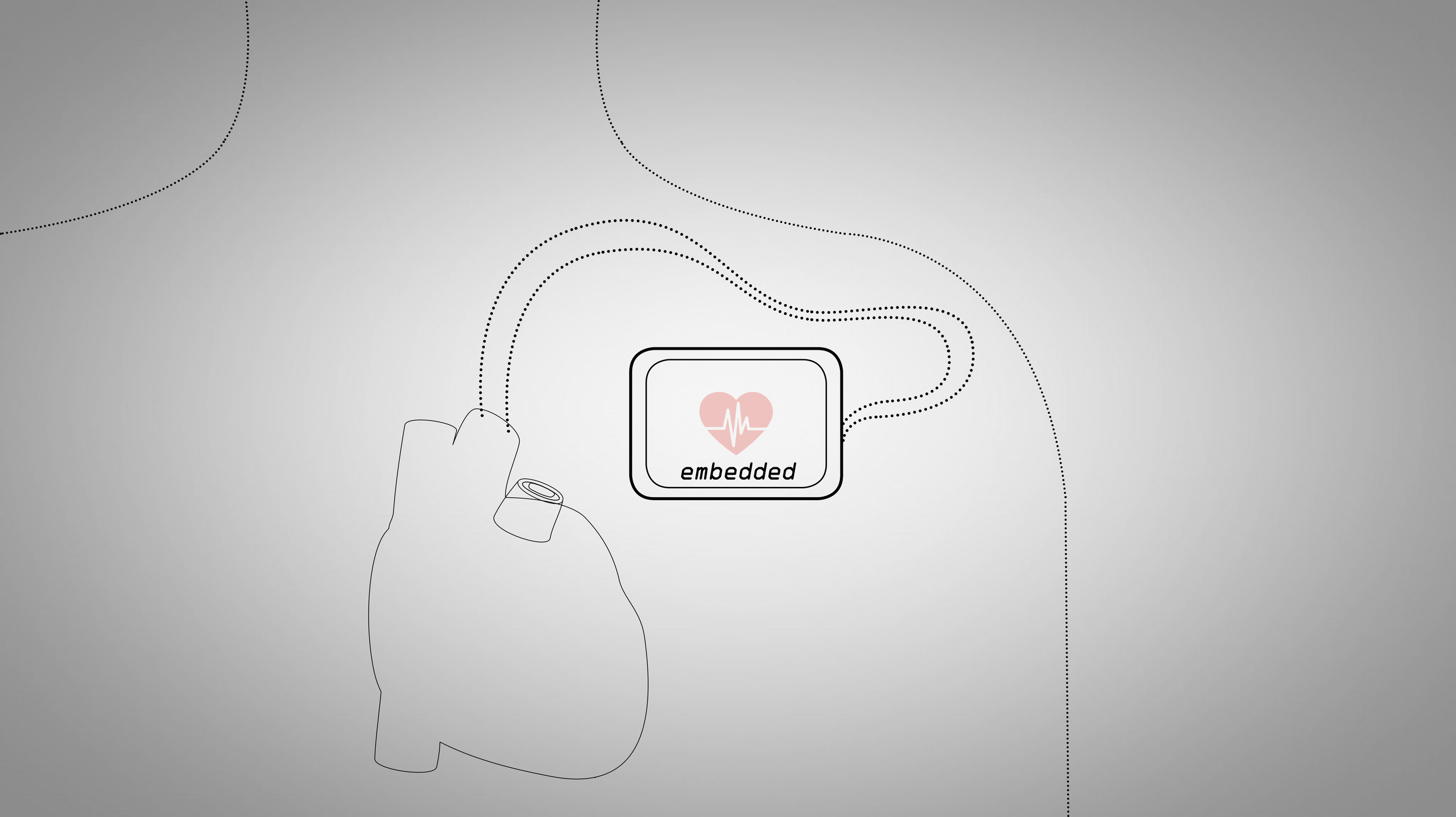

//electronic
device

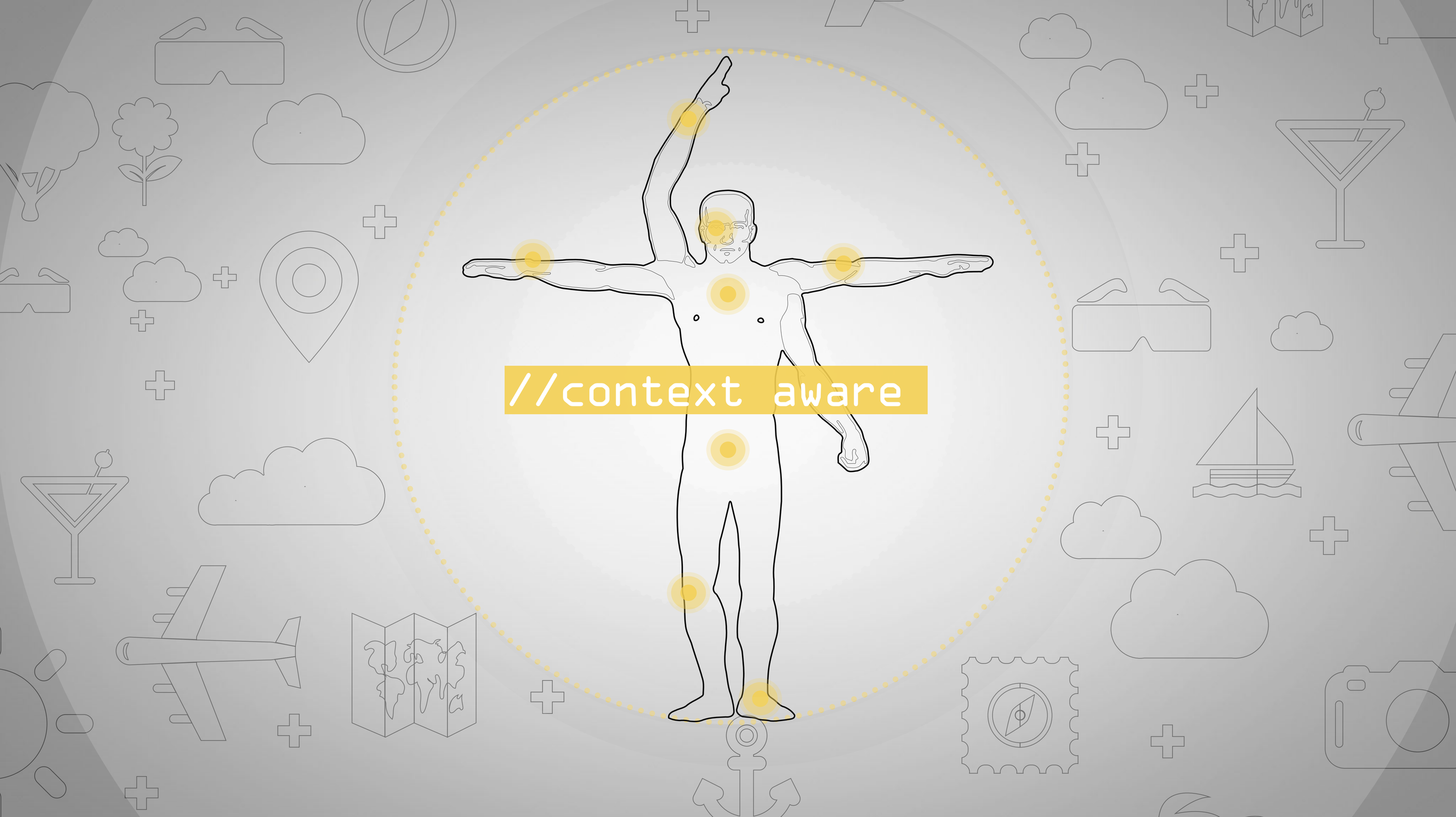


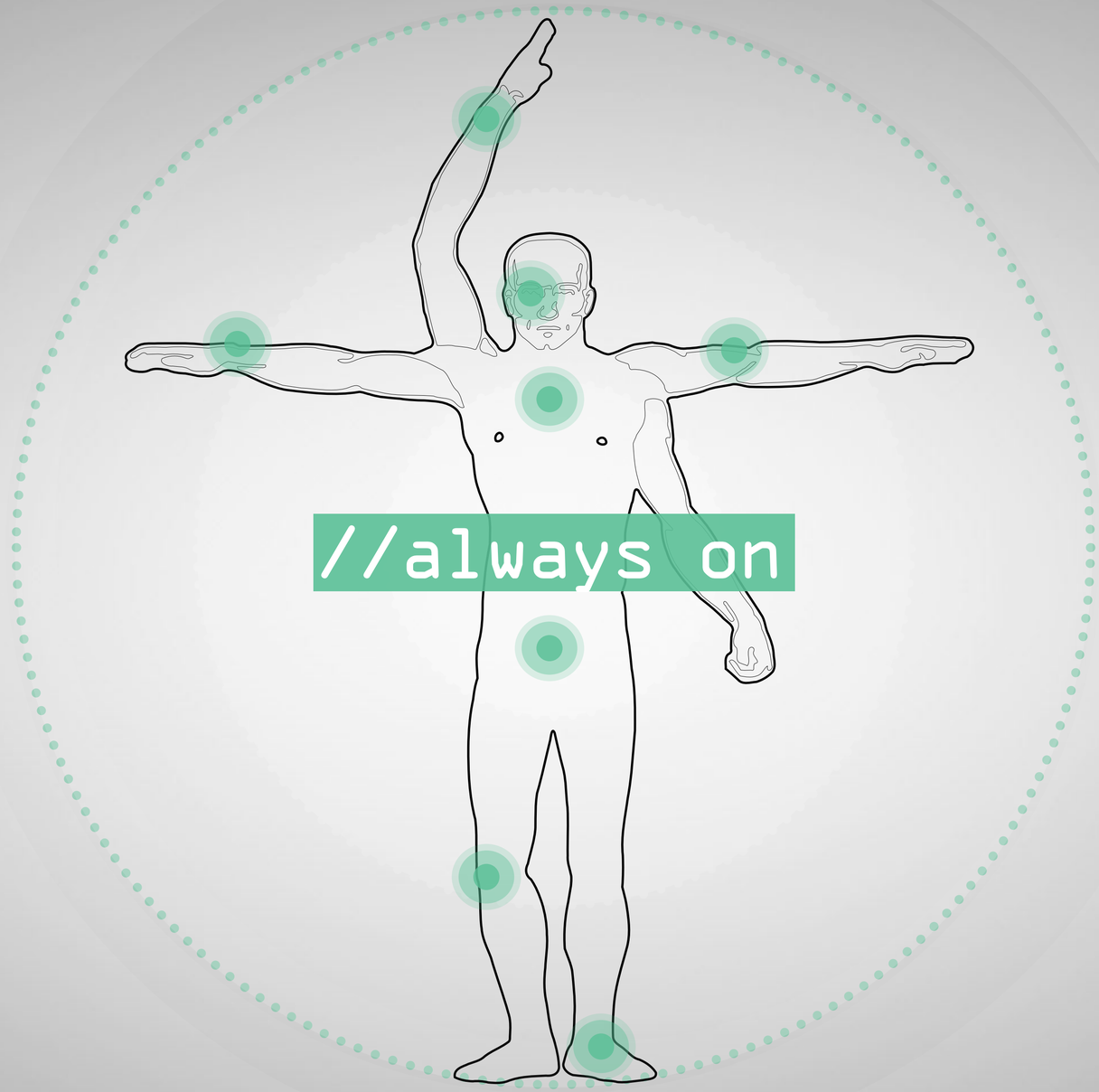

//programmable

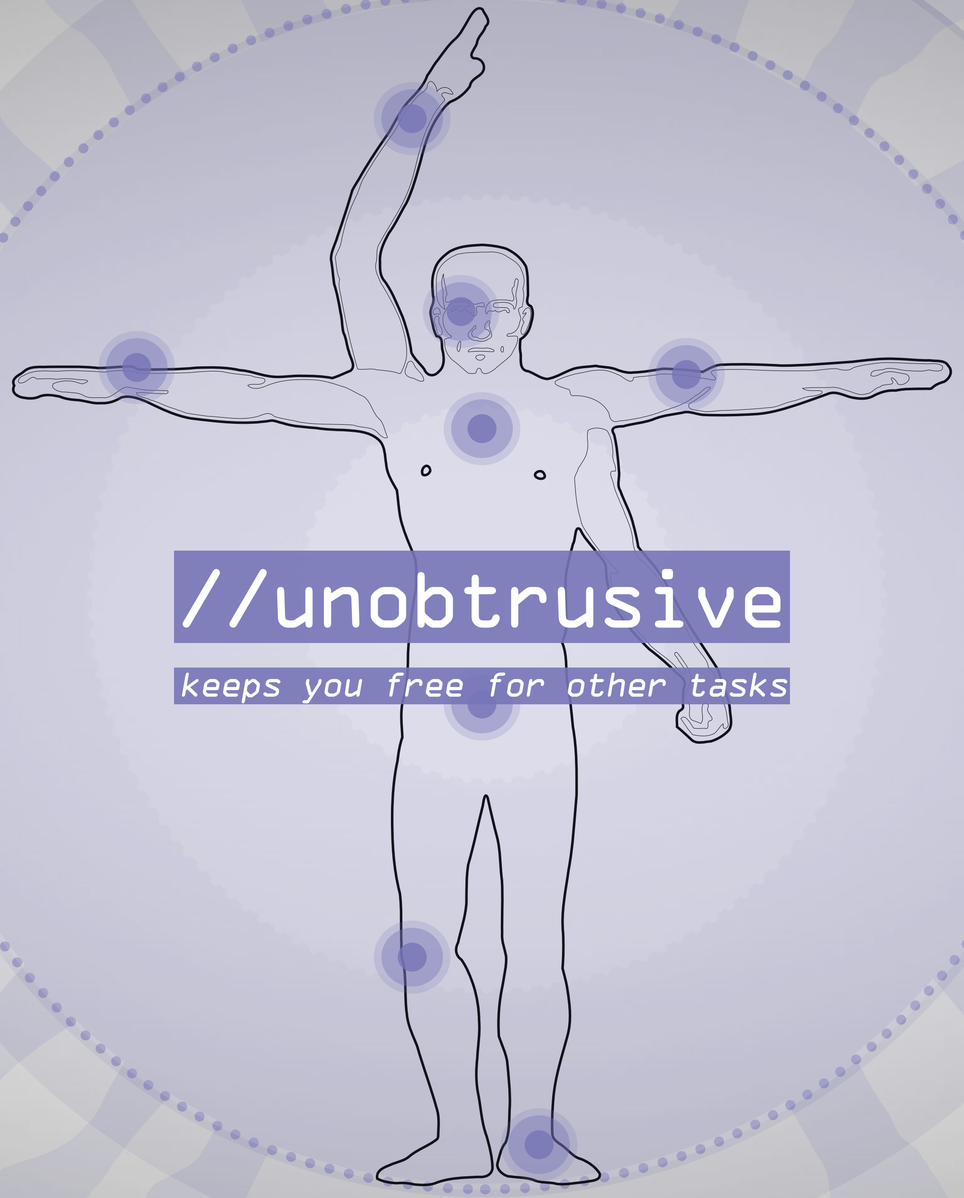

worn


worn


embedded

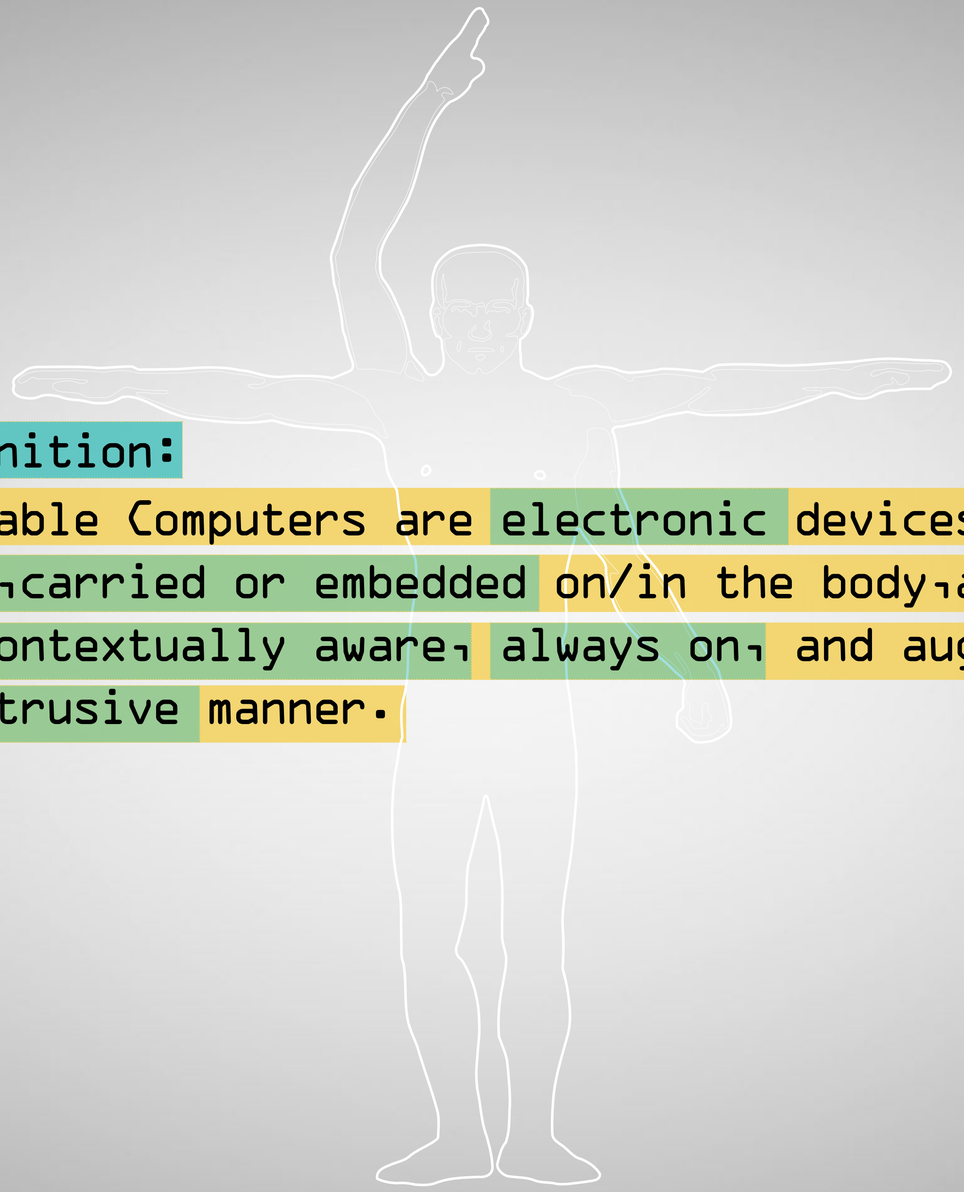

//context aware


//always on



//unobtrusive

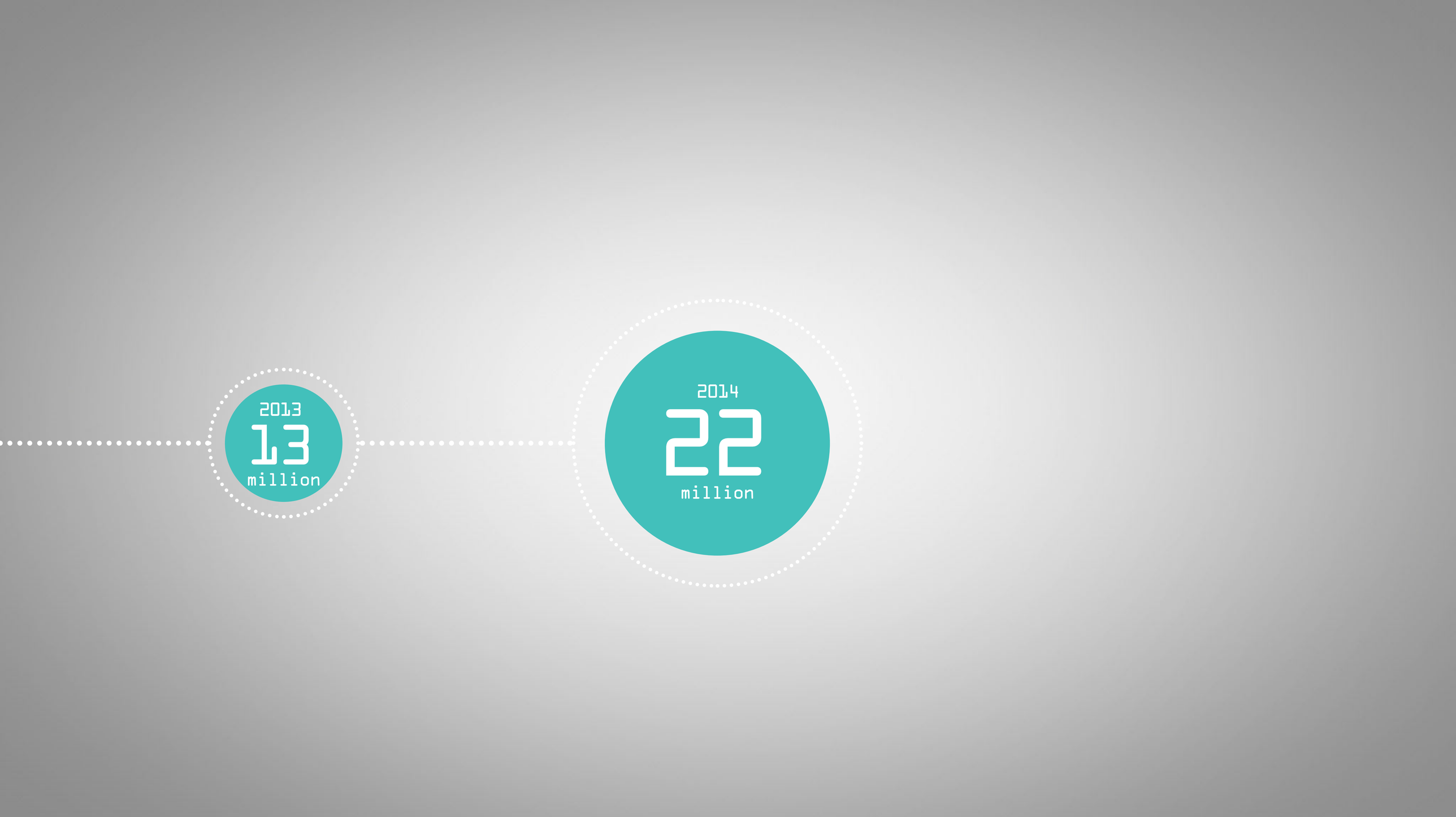
keeps you free for other tasks

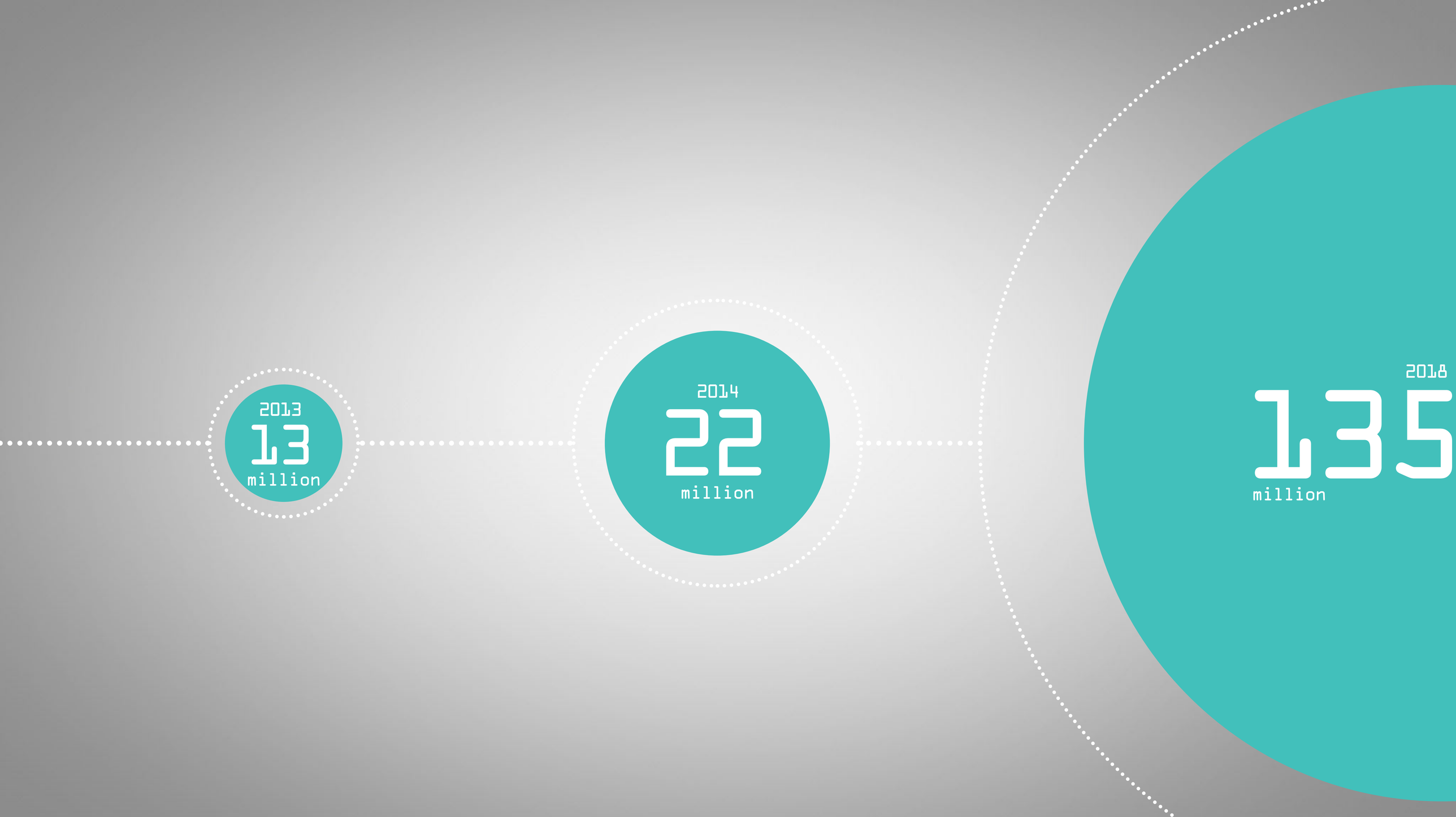


Definition:

Wearable Computers are electronic devices that are worn,carried or embedded on/in the body,are designed to be contextually aware, always on, and augment us in unobtrusive manner.


2013
13
million

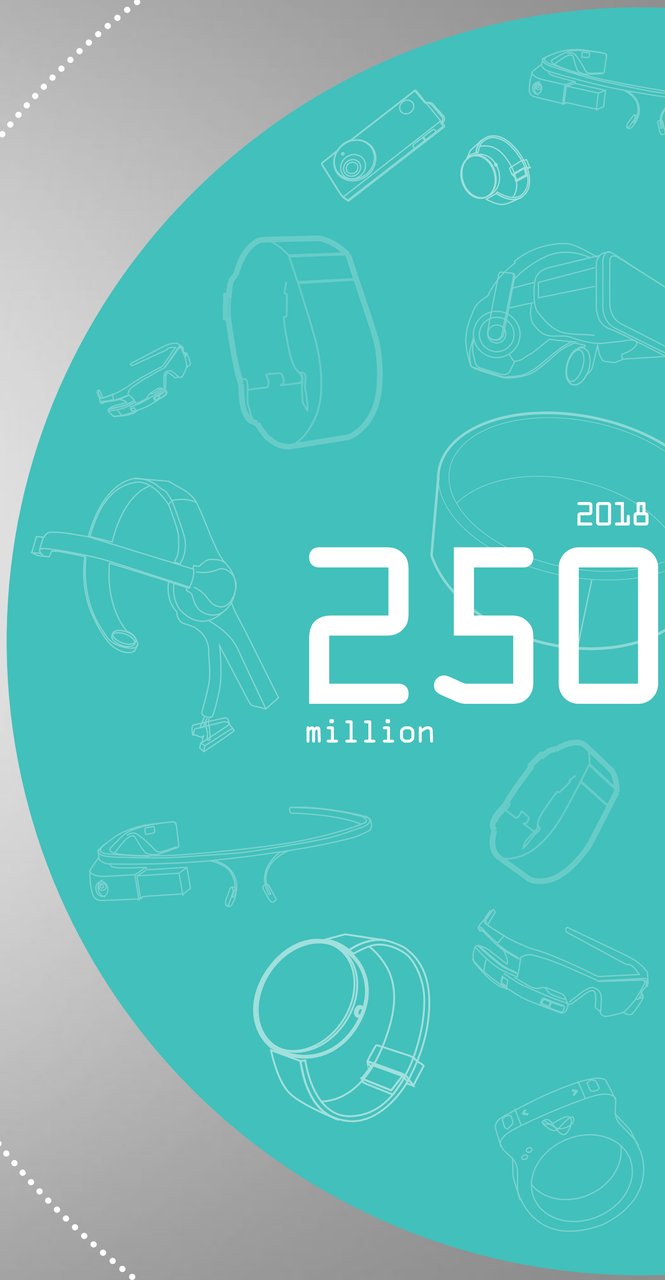

2013
13
million
2014
22
million

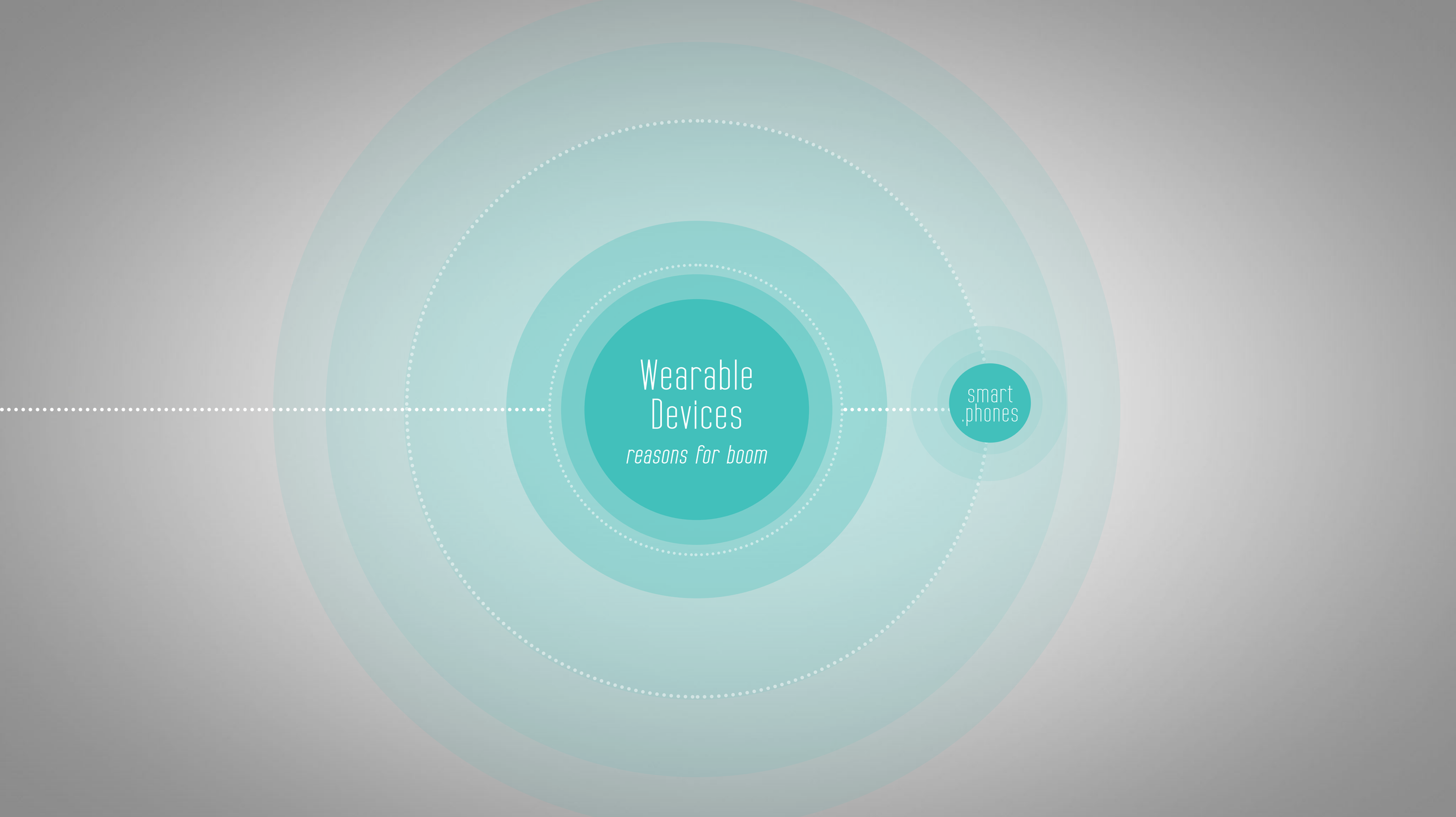

2013
13
million
2014
22
million
2018
135
million

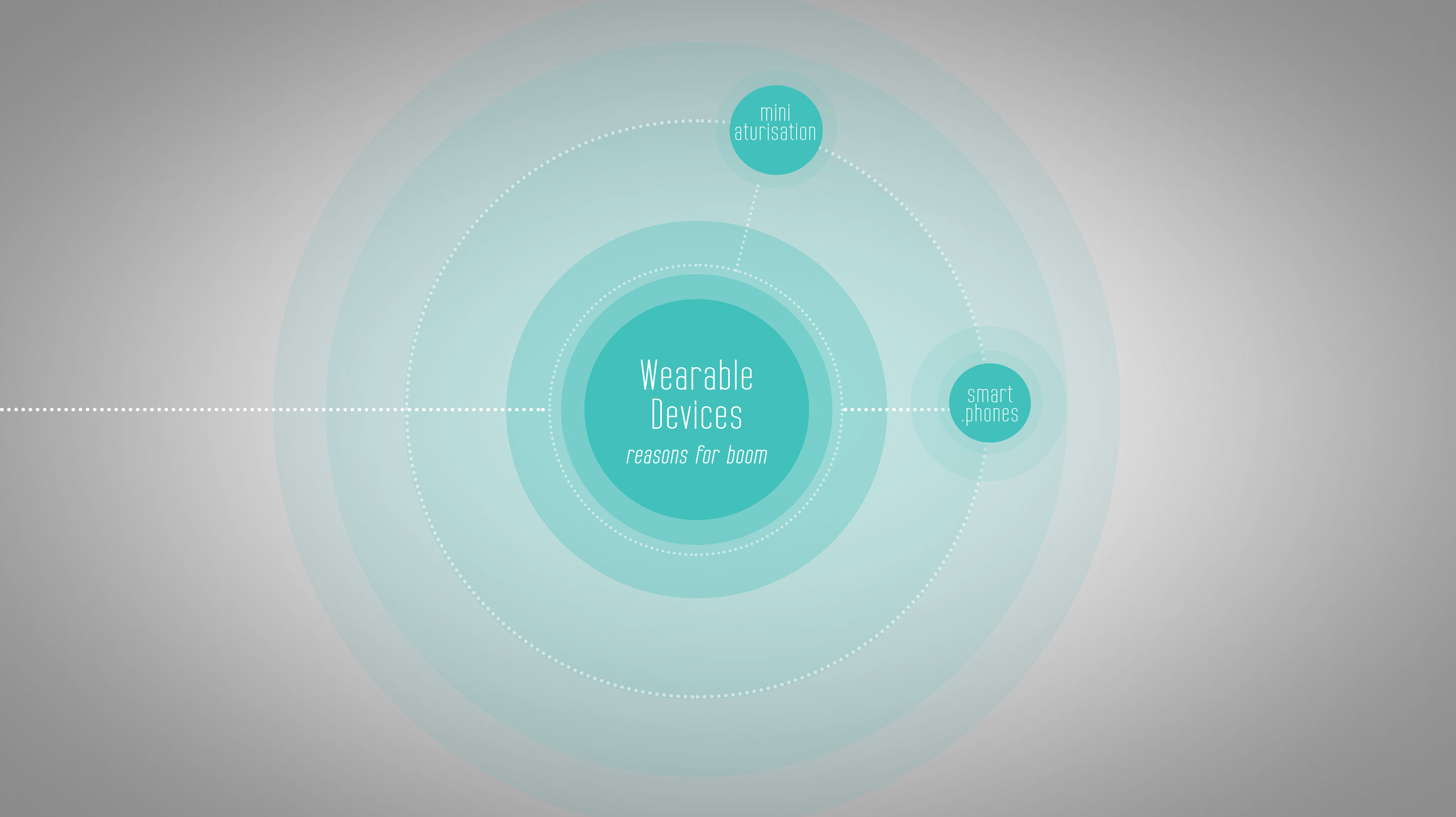
2013
13
million

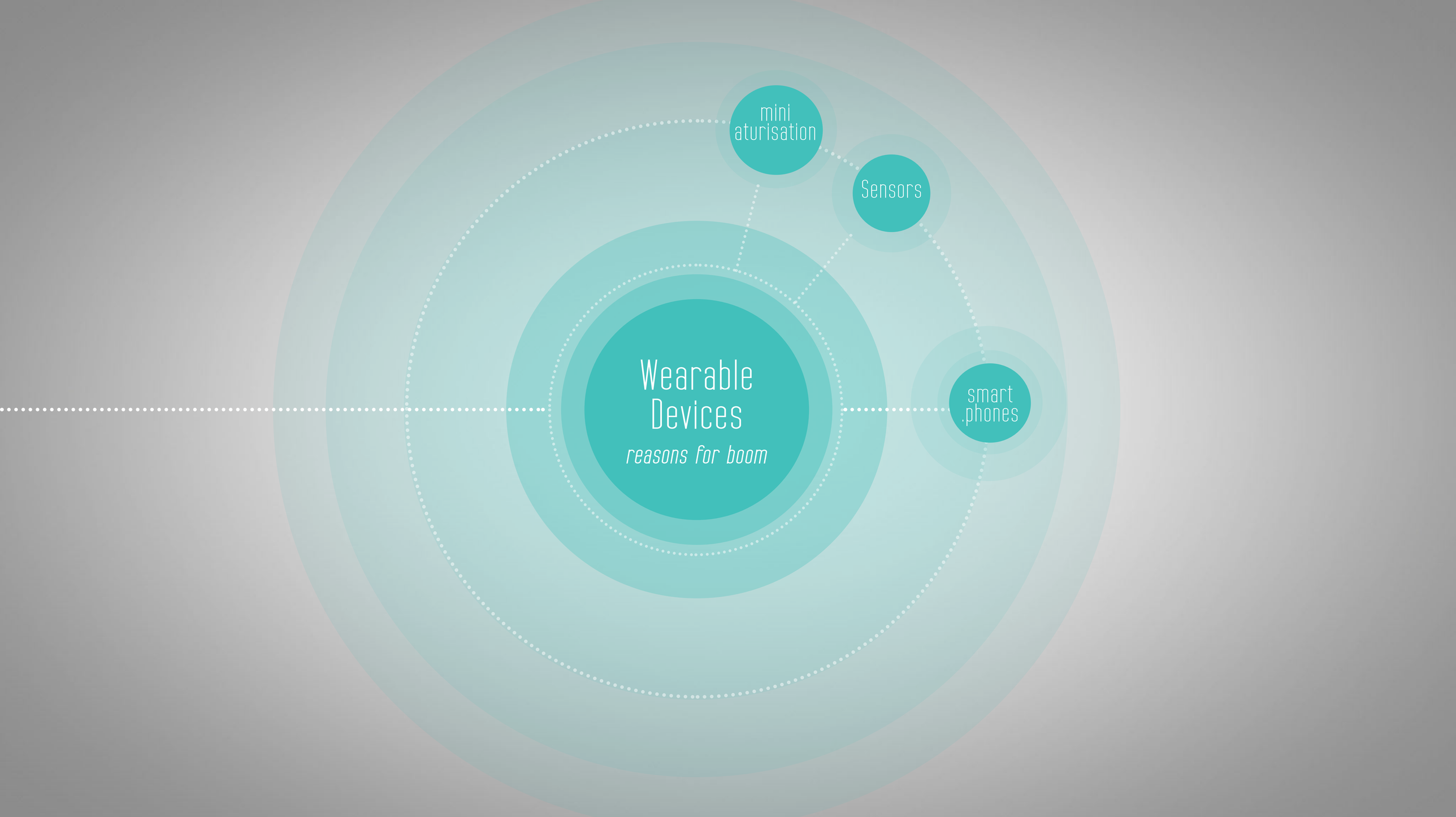
2014
22
million

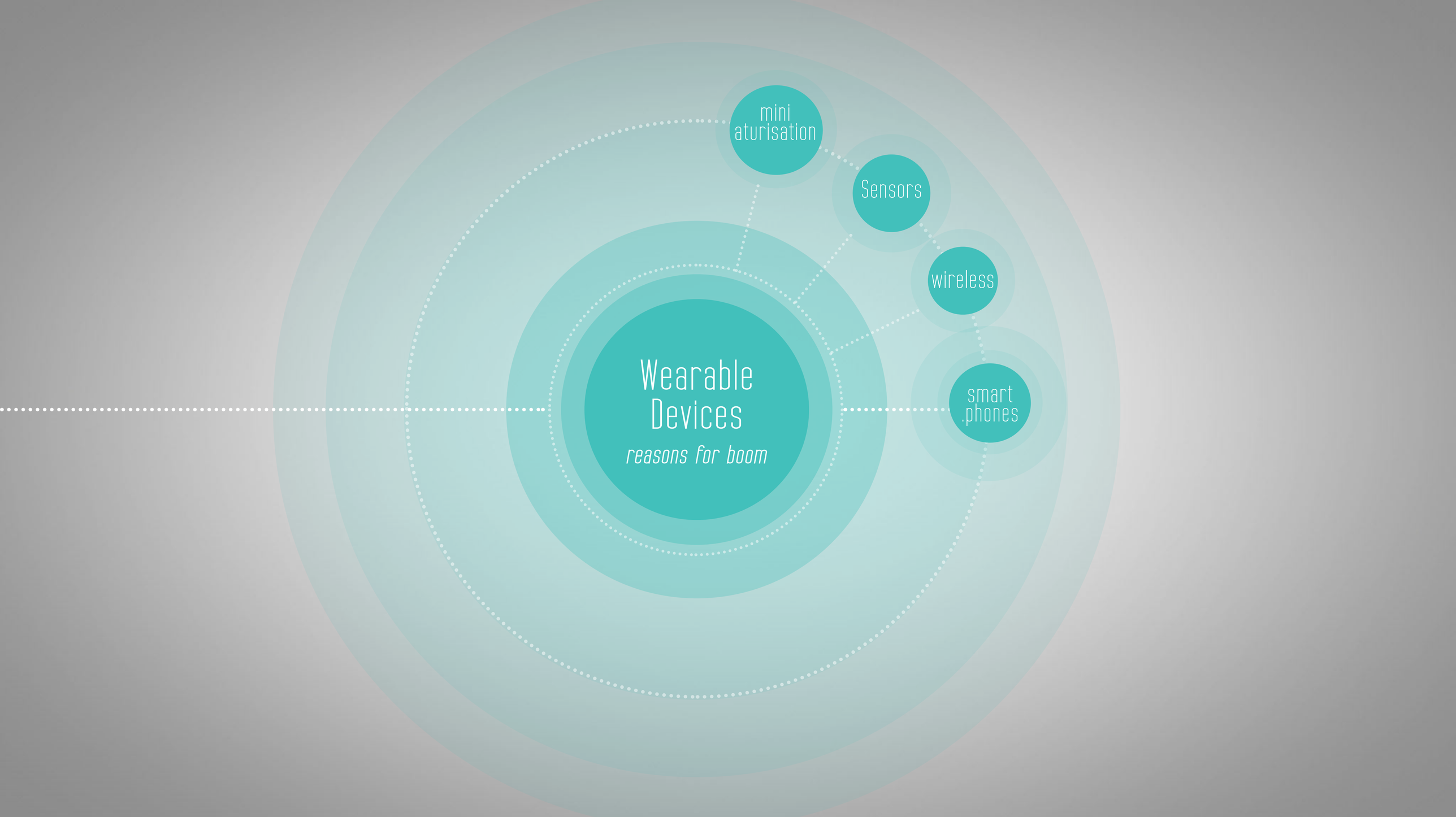
2018
250
million

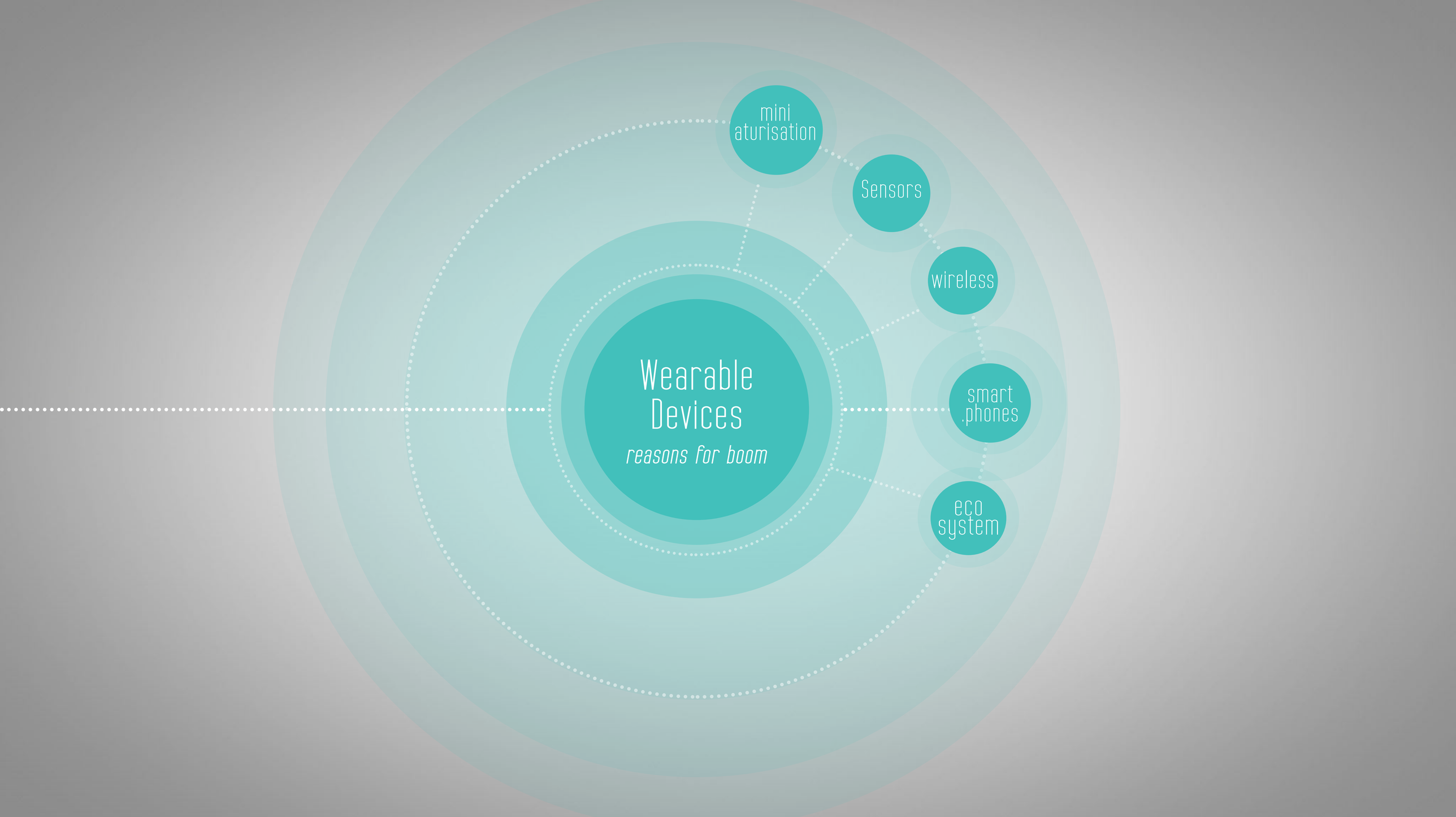


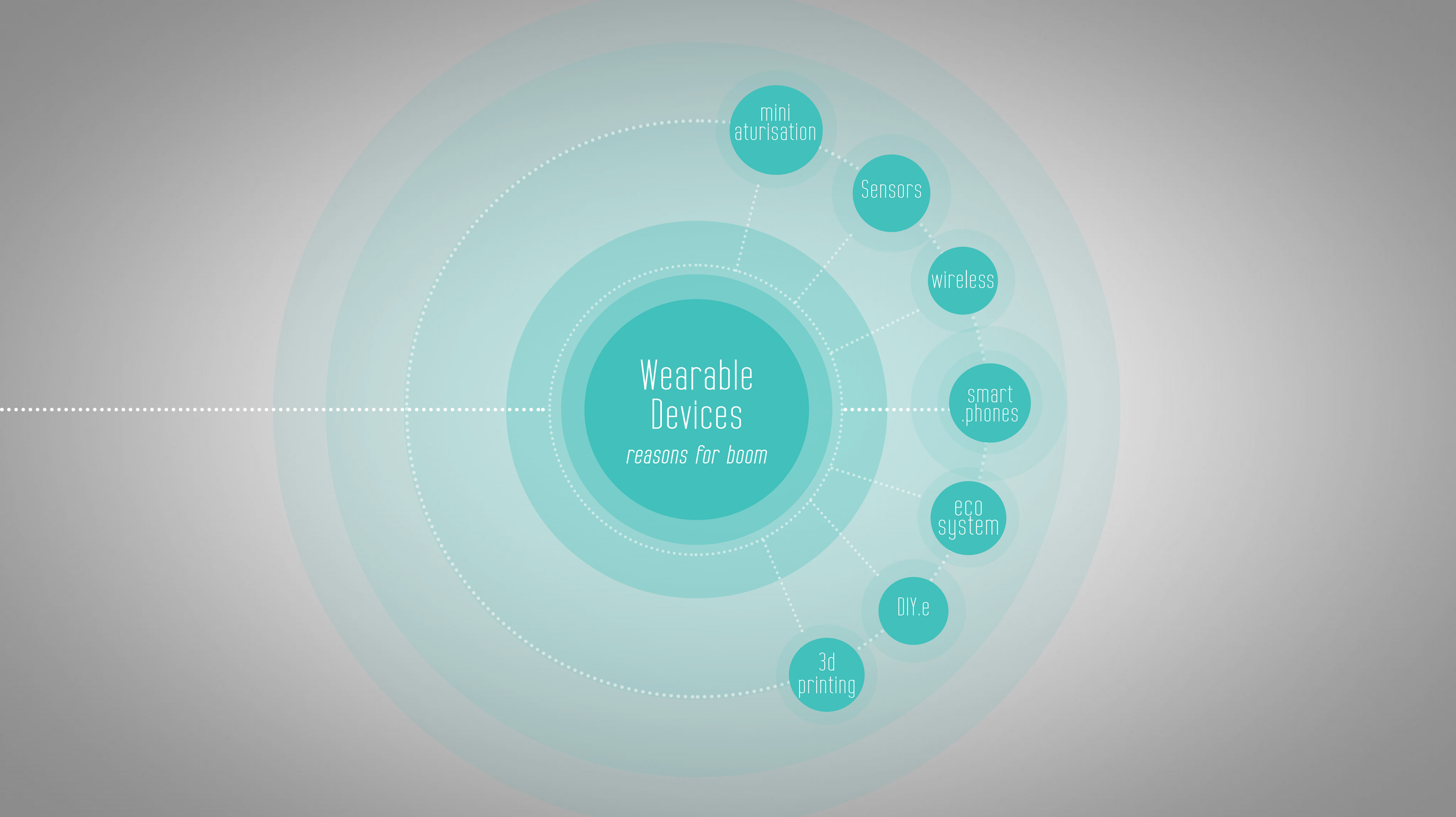

Wearable
Devices
reasons for boom
smart
.phones

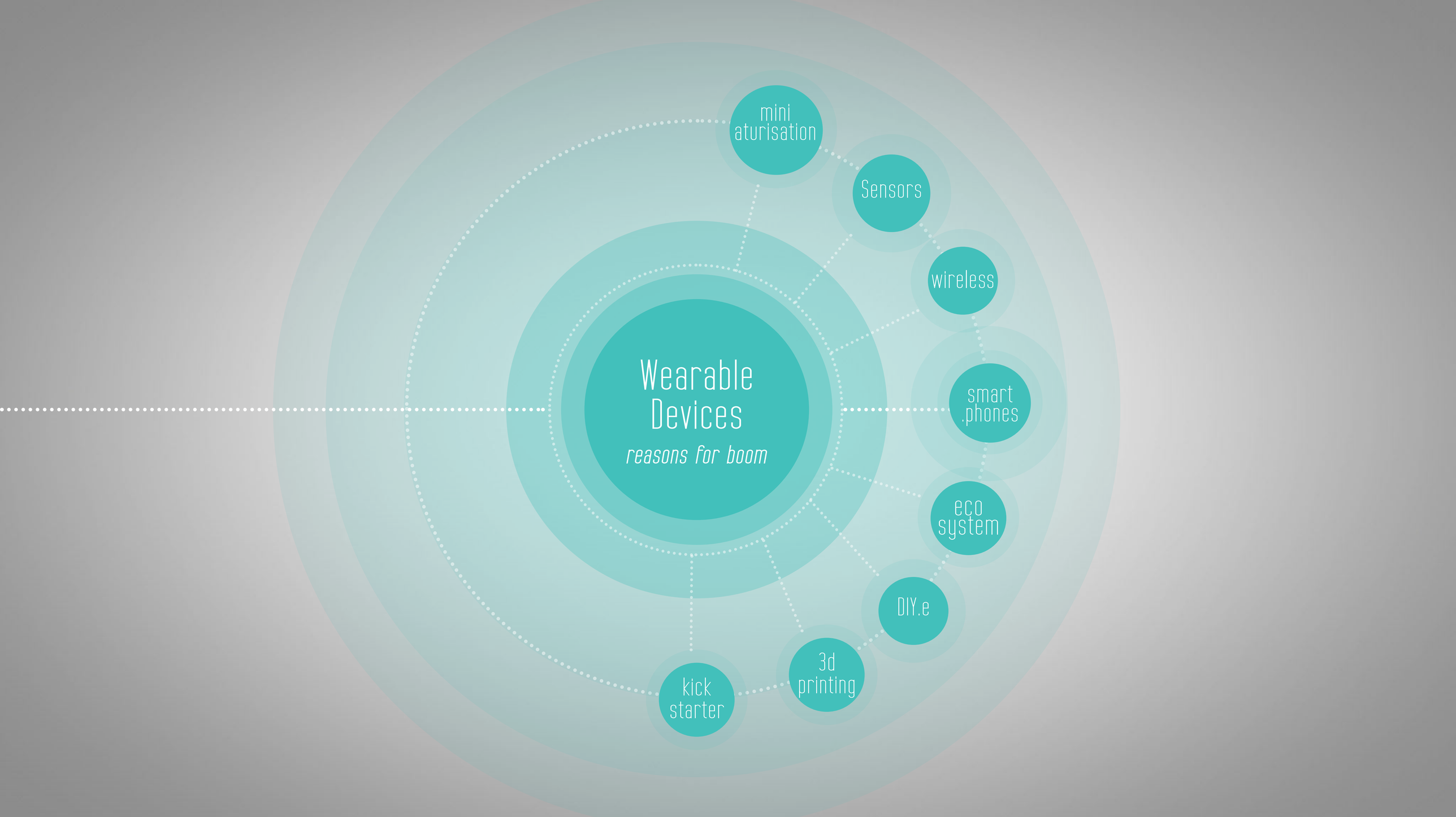

mini
aturisation
Wearable
Devices
reasons for boom
smart
.phones

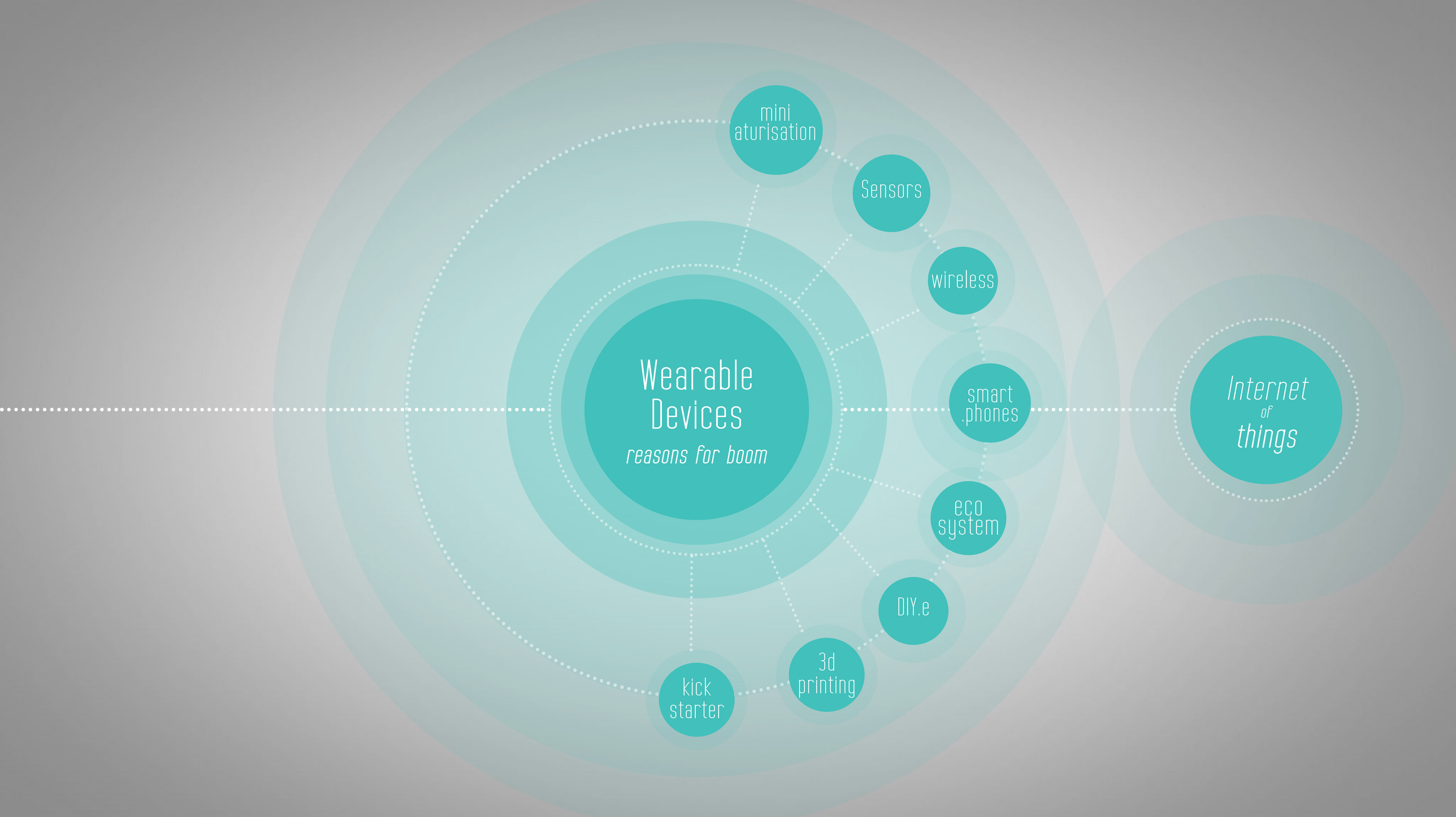

mini
aturisation
Sensors
Wearable
Devices
reasons for boom
smart
.phones

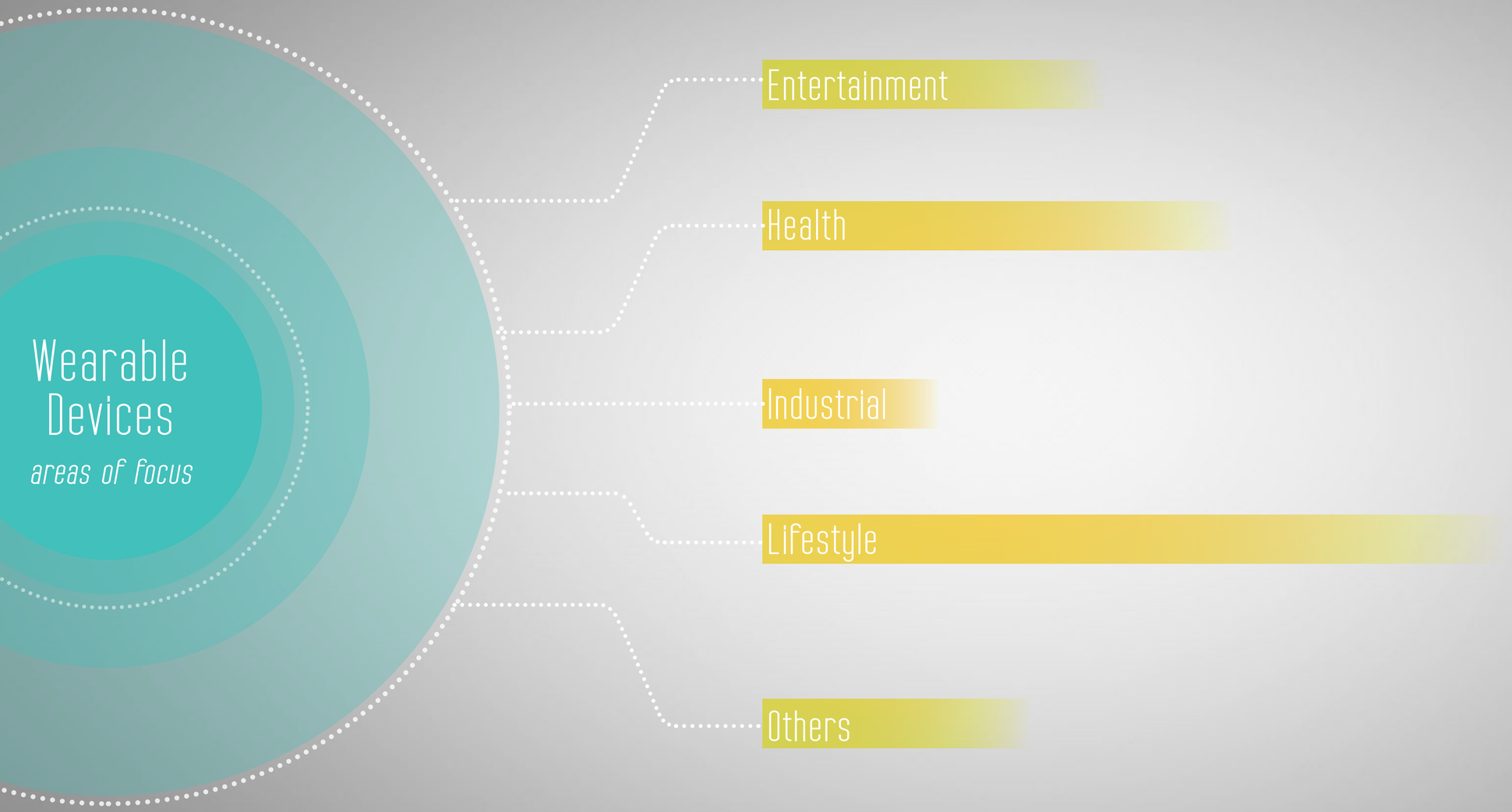

mini
aturisation
Sensors
wireless
smart
.phones
Wearable
Devices
reasons for boom


mini
aturisation
Sensors
wireless
smart
.phones
eco
system
Wearable
Devices
reasons for boom


Wearable
Devices
reasons for boom
mini
aturisation
Sensors
wireless
smart
.phones
eco
system
DIY.e
3d
printing


Wearable
Devices
reasons for boom
mini
aturisation
Sensors
wireless
smart
.phones
eco
system
DIY.e
3d
printing
kick
starter


mini
aturisation
Sensors
wireless
Wearable
Devices
reasons for boom
smart
.phones
Internet
of
things
eco
system
DIY.e
3d
printing
kick
starter


Wearable Devices
areas of focus
Entertainment
Health
Industrial
Lifestyle
Others

Entertainment

Health

Industrial

Lifestyle

Others

in pursuit of these functions, these devices have taken all kinds of shapes and form throughout the human body

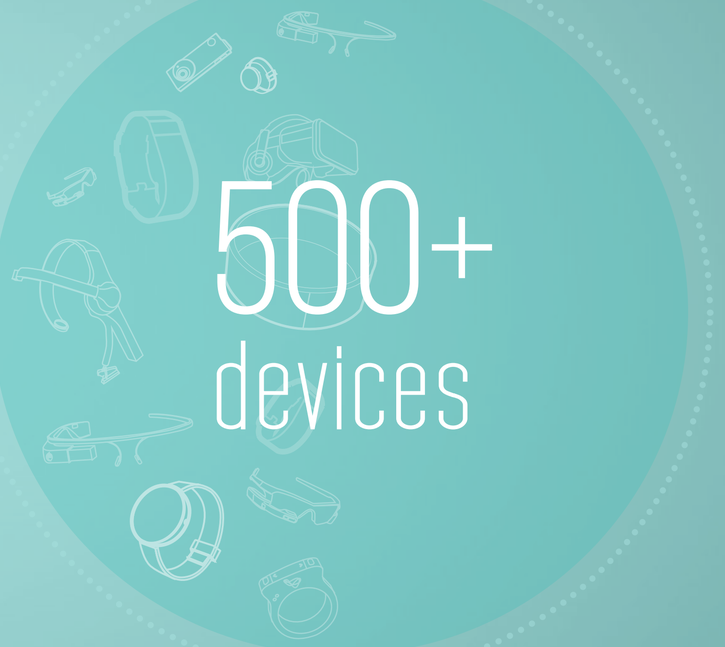
Entertainment

Health

Industrial

Lifestyle

Others



500+
devices

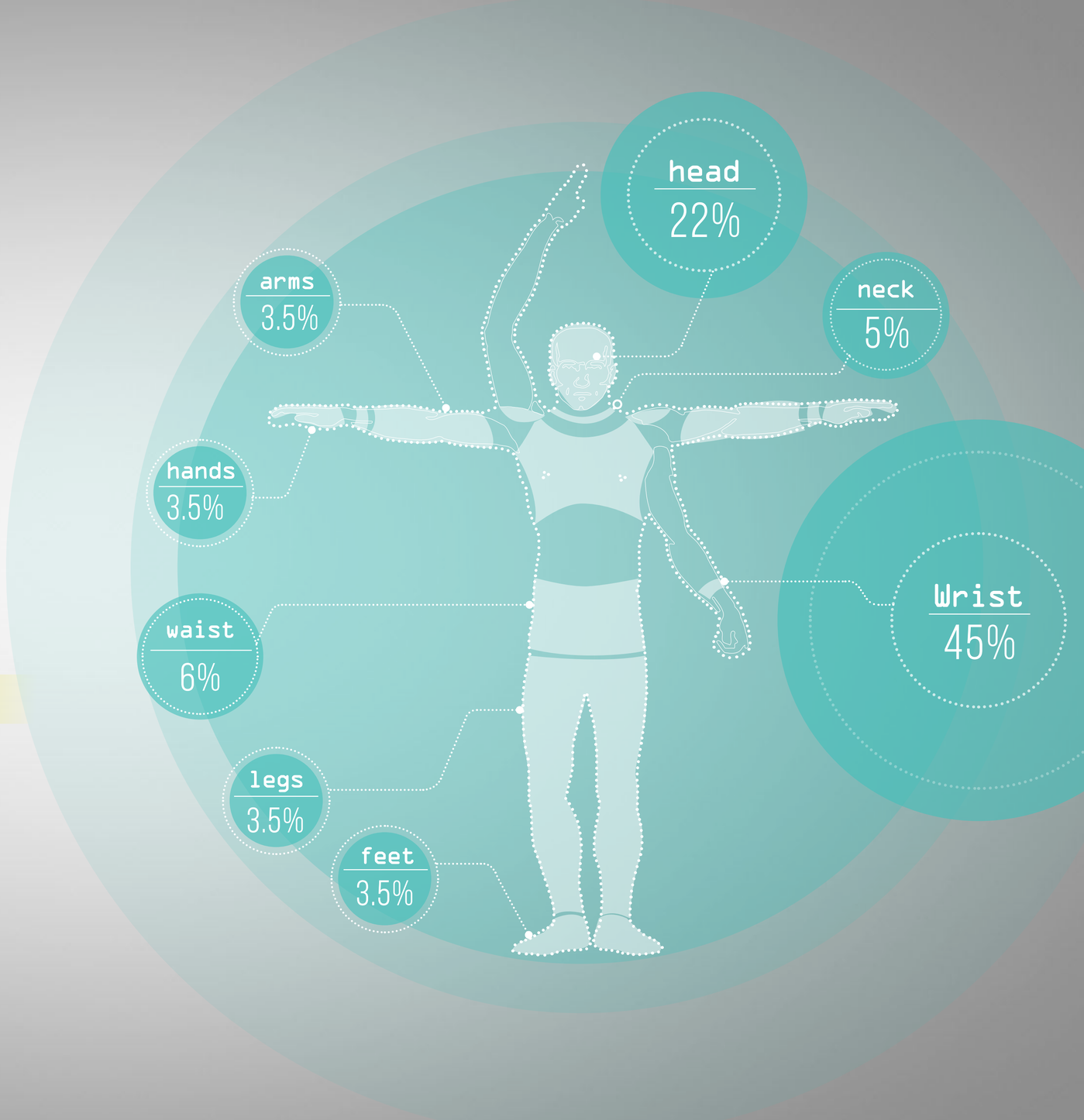
Entertainment

Health

Industrial

Lifestyle

Others



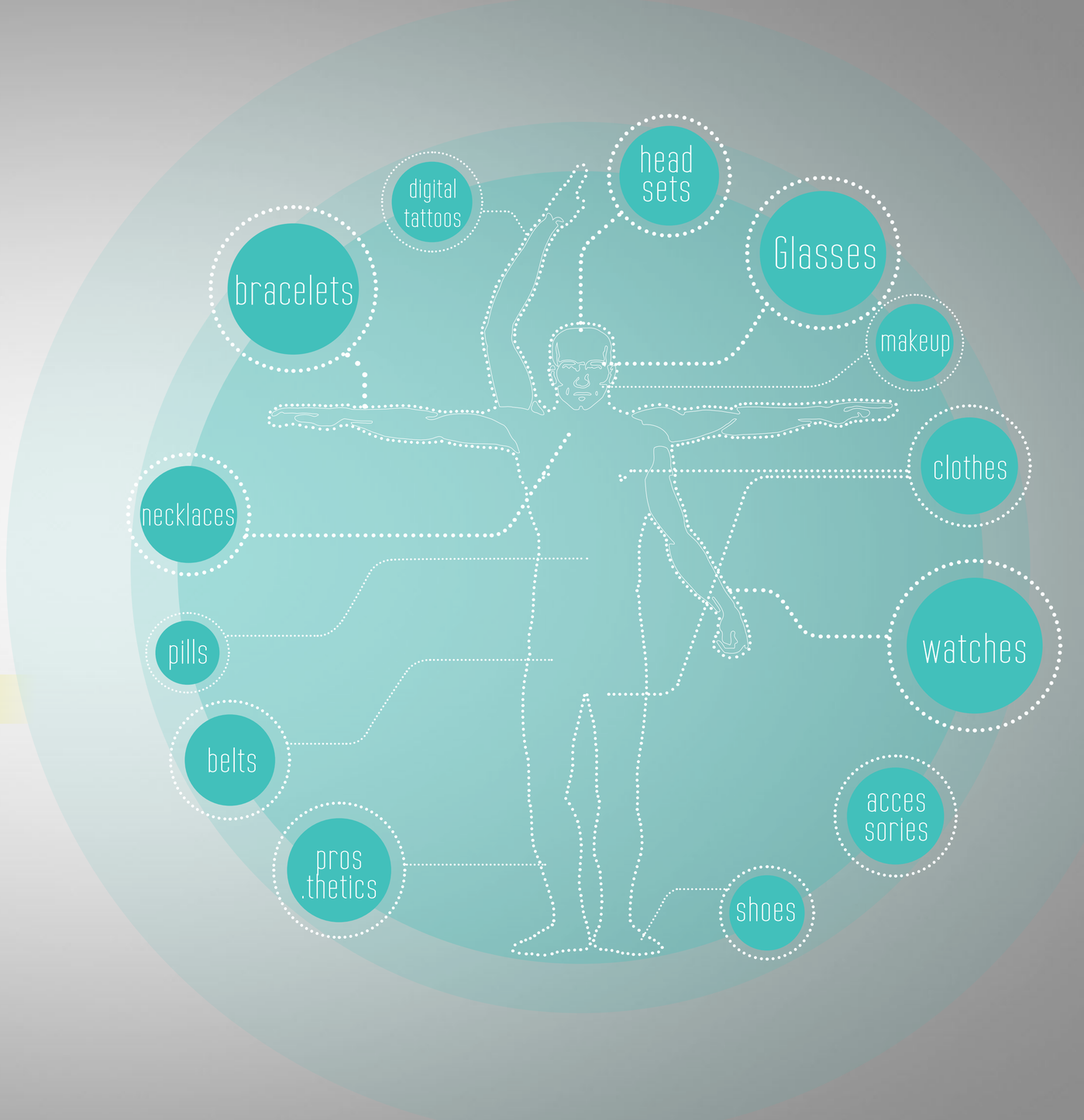
Entertainment

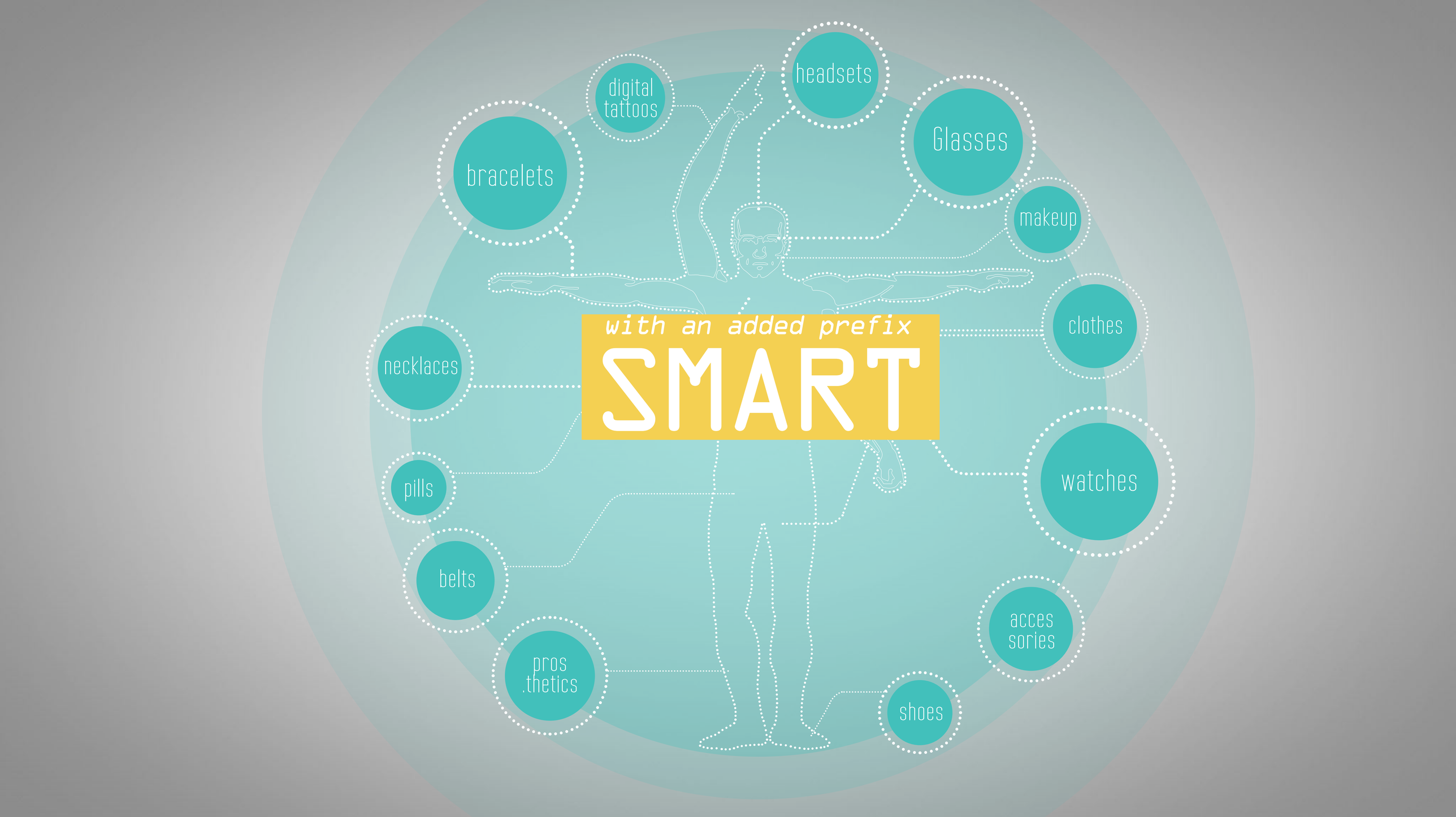
Health

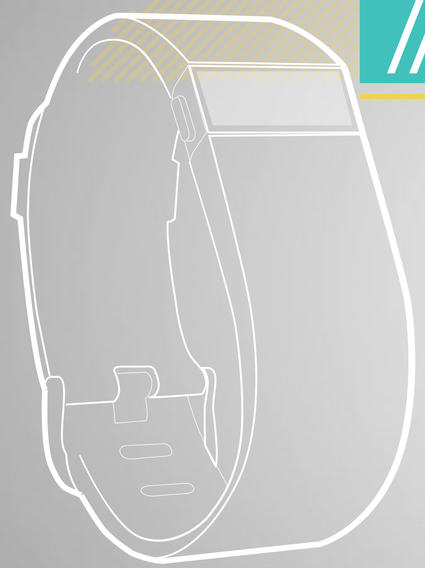
Industrial

Lifestyle

Others




digital tattoos
headsets
bracelets
Glasses
makeup
with an added prefix
SMART
necklaces
clothes
pills
watches
belts
acces sories
pros .thetics
shoes



// FITBIT CHARGE HR

.TYPE

Information Appliance

.CLASS

BodyTracker

.ecoSystem

Ios/Android

app based data sense

.FOCUS AREAS

HEALTH

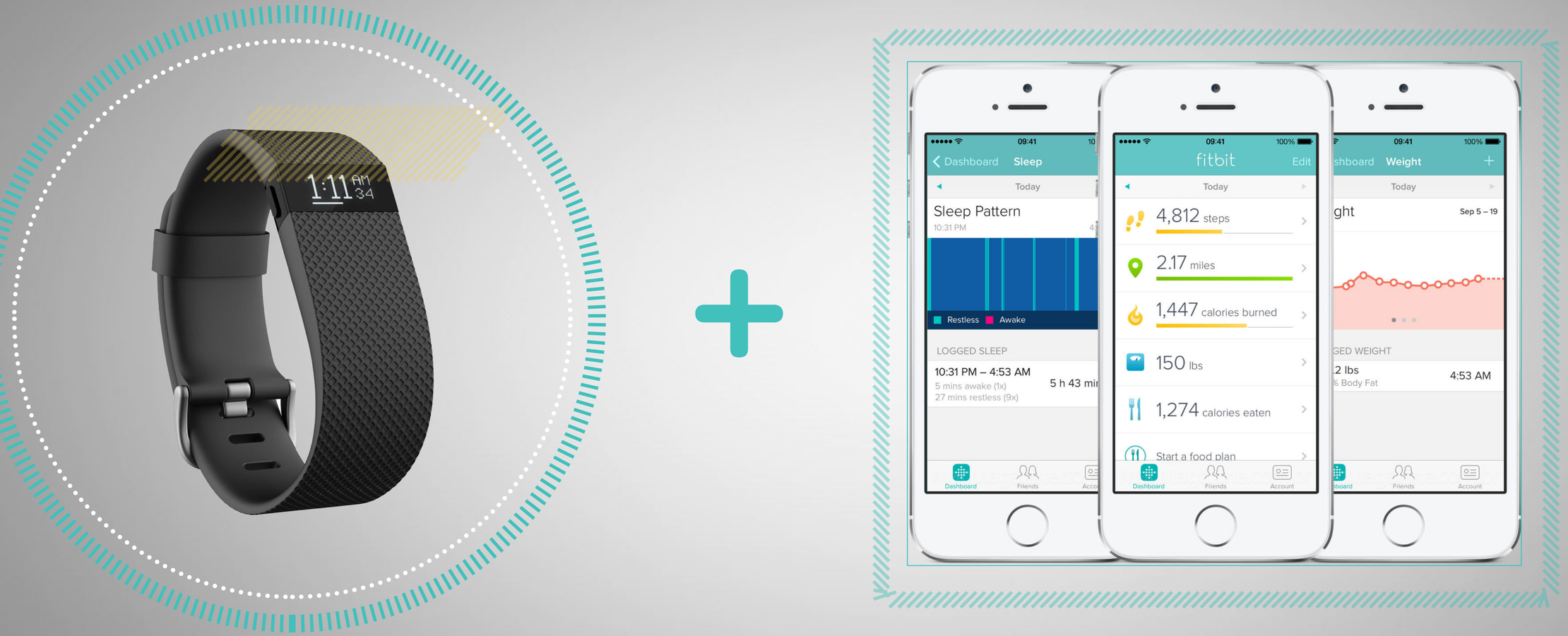
- Run/Step/Calorie Count
- Excercise/Activity Tracking
- 24 hour Heart Rate Monitor
- Sleep Tracker

Lifestyle

- Watch
- Caller Identification

.WORN

Wrist


1:11 AM
34
09:41
Dashboard
Sleep
Today
Sleep Pattern
10:31 PM
Restless
Awake
LOGGED SLEEP
10:31 PM – 4:53 AM
5 mins awake (1x)
27 mins restless (9x)
Dashboard
Friends
09:41
100%
fitbit
Edit
Today
4,812 steps
2.17 miles
1,447 calories burned
150 lbs
1,274 calories eaten
Start a food plan
Dashboard
Friends
Account
09:41
100%
Weight
Today
Sep 5 – 19
4:53 AM
Friends
Account


12:45 AM 34
12:45 AM 34
12:45 AM 34
12:45 AM 34

// JAWBONE UP

// RAZER NABU

// XIAOMI BAND

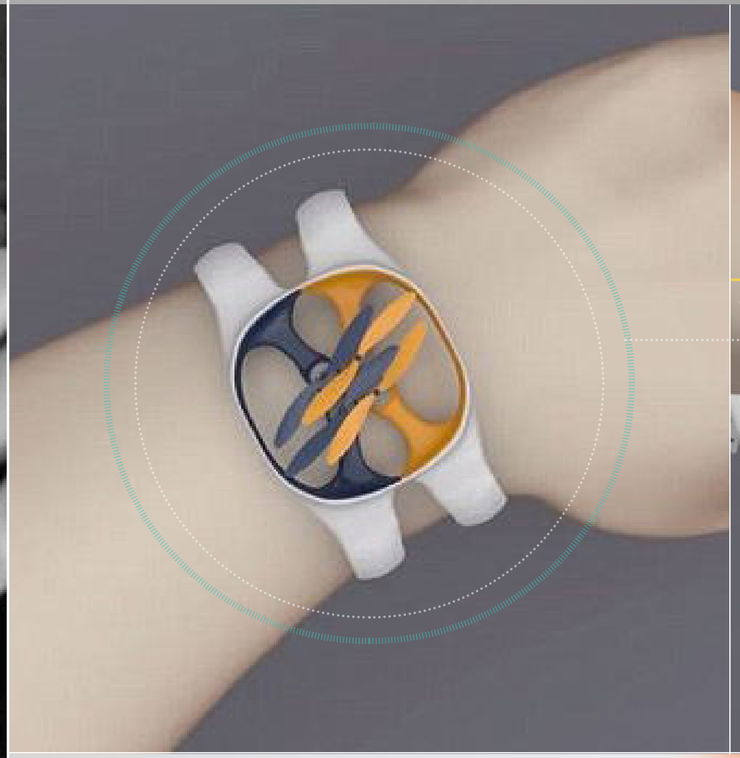
// GARMIN 920XT

//BASIS PEAK

//MISFIT SHINE

//TACTILU

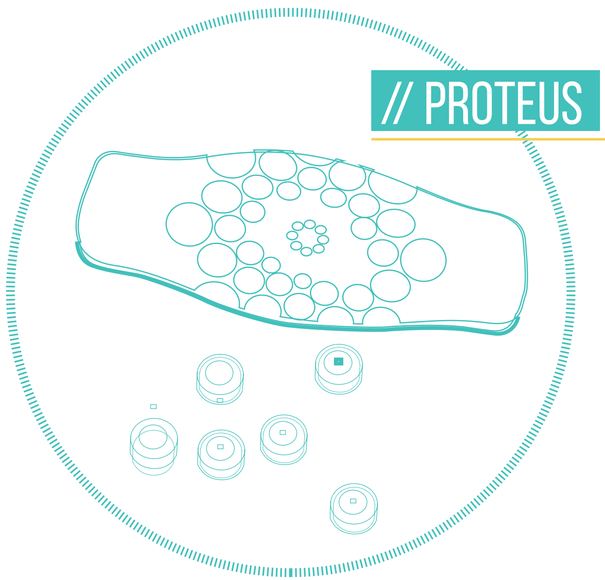
feel each others touch from afar

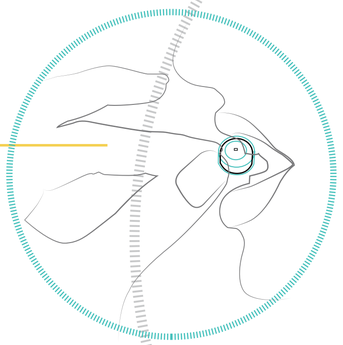


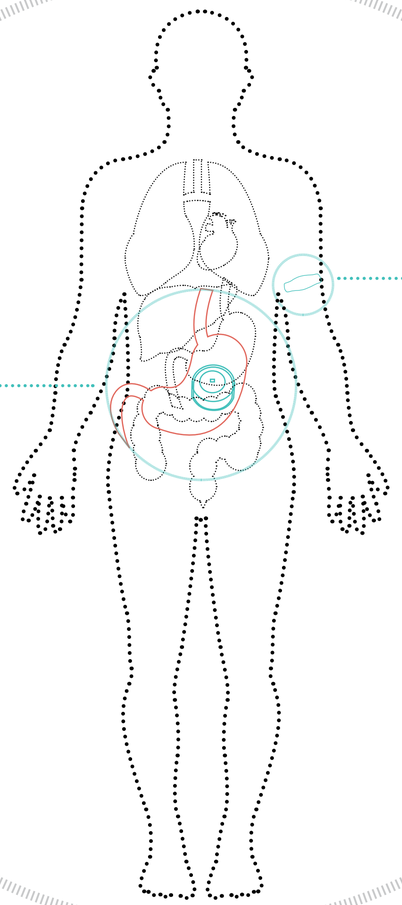
//NIXIE

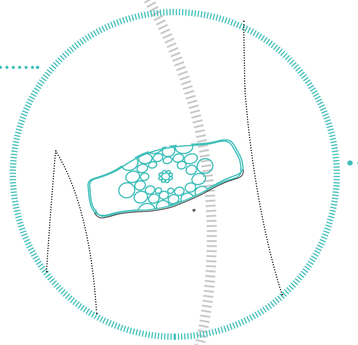
a drone camera on your wrist

// PROTEUS

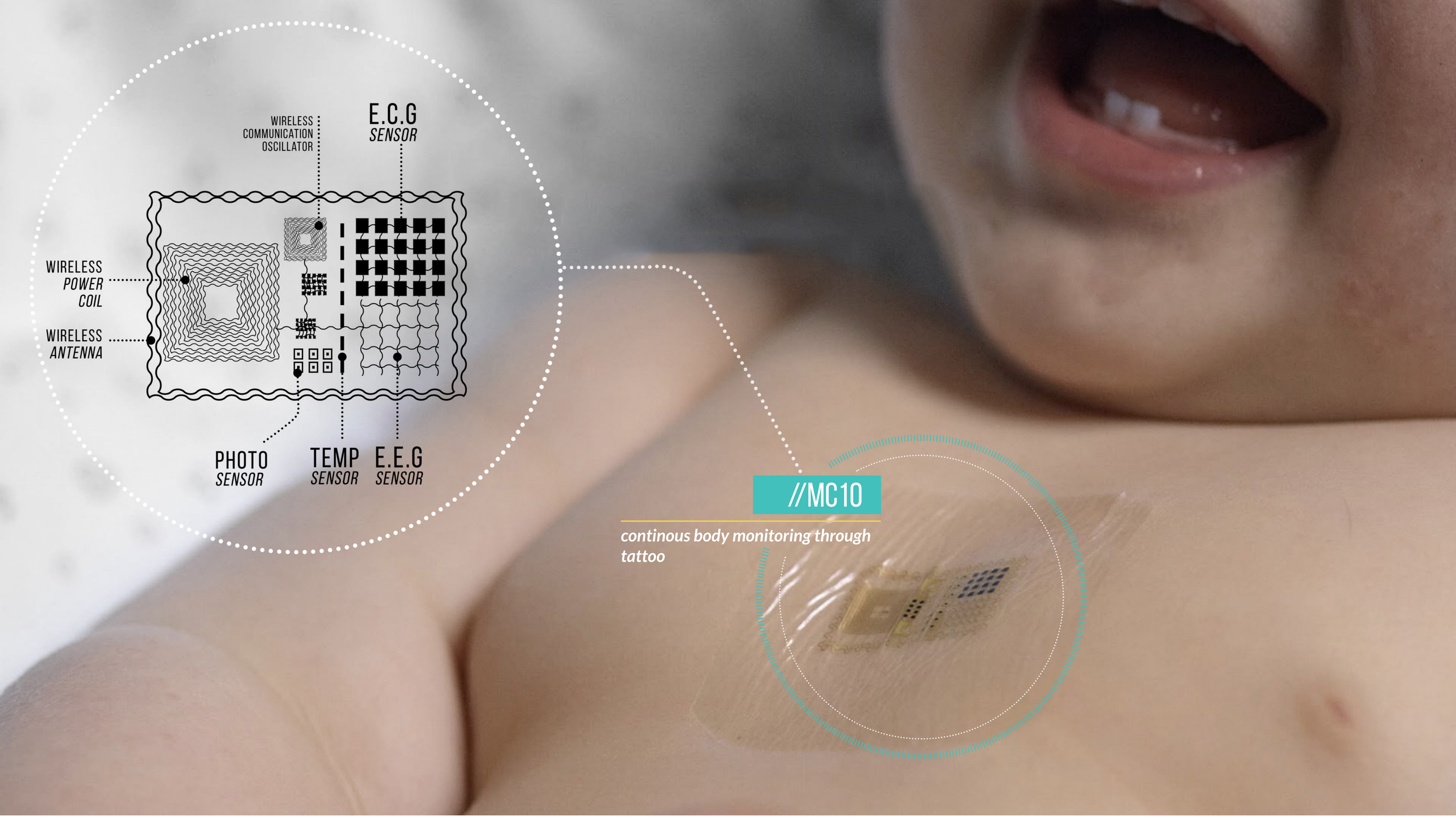






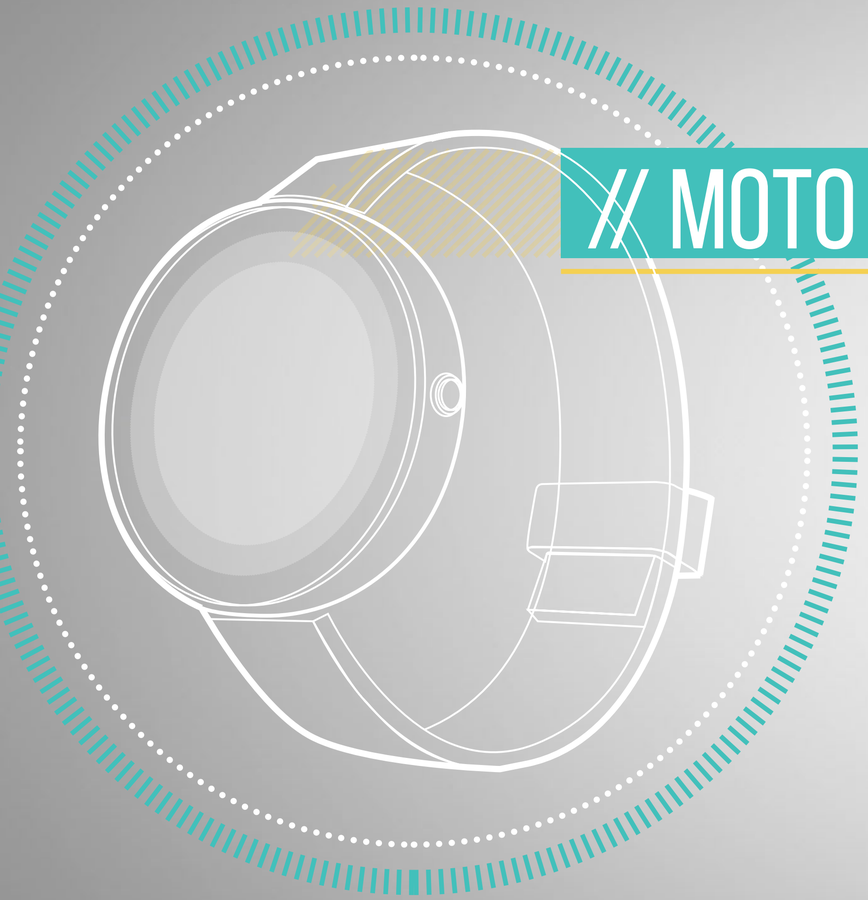



BP
140/80
ACTIVITY
1,425 Steps
SLEEP
6.5 Hrs
WEIGHT
245 lbs
MEDS
Yesterday
4/4
BP
Today 7:10
110
220
GLUCOSE
Last Reading: Today, 2:07
235
130 190 280 114 90 115 400
4/7 4/8 4/9 4/10 4/11 4/12 4/13
More Information
WEIGHT
Today, 11:00 PM
140
MEDS
GLUCOSE
235
TODAY 60,120,10
TUE 150, 22
WED 60,1
THU 150, 2
FRI 60
SAT 150
SUN



//MC10

continous body monitoring through tattoo



// MOTO 360

.TYPE

Information Appliance

.FORM FACTOR

Smart.Watch

.ecoSystem

Android Wear 5.0

Smartphone Accessory

.FOCUS AREAS

Lifestyle

- Reminders/Information
- Search Internet
- Communication
- Navigation

Health

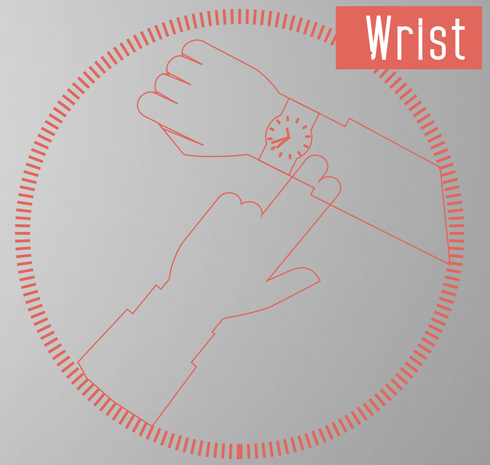
- Step Count/Calorie
- Sleep Tracker
- Heart Rate Monitor

Entertainment

- Music Player/Controls

.WORN

Wrist




Ben Myers
Happy hour at the usual spot?
8
10:00
Turn right onto Washington St
50ft
5/43
Tiffani Thiessen
(315) 555-7832
62
bpm
220
40


1,040 steps
36 min
to home
Light traffic on A12
MORTDALE ⇄ CENTRAL
NEXT TRAIN IN
2 mins
MORTDALE
8:45 am
CENTRAL
9:16 am
Running on time
1:23
IMAGINE DRAGONS
NIGHT VISIONS
Radioactive
Imagine Dragons

//SAMSUNG GEAR S

//ASUS ZENWATCH

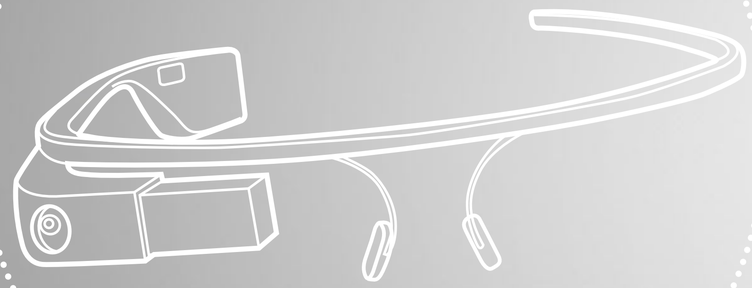
// SONY WATCH 3

PEBBLE STEEL

//LG G WATCH R

//APPLE WATCH

// GOOGLE GLASS



.TYPE

Information Appliance

.CLASS

Smart Glass

.ecoSystem

Android

.FOCUS AREAS

Lifestyle

- Reminders/Information
- Search Internet
- Communication
- Navigation

Entertainment

- Music Player/Controls
- video recording

.WORN

Face

// OCCULUS RIFT

.TYPE

Computers.Worn

.CLASS

Virtual reality headset

.ecoSystem

.FOCUS AREAS

Entertainment.

- virtual reality experiences
- games
- Immersive movies

.WORN

Face/Head

//NEUROSKY MINDWAVE

.TYPE

Information Appliance

.CLASS

EEG Headset

.ecoSystem

.FOCUS AREAS

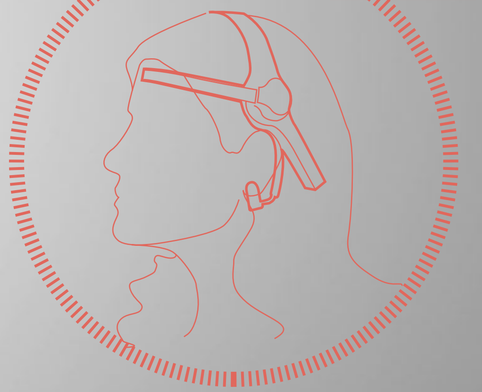
Lifestyle

Health

Entertainment

.WORN

Head



//GOOGLE CARDBOARD

// SAMSUNG GEAR VR

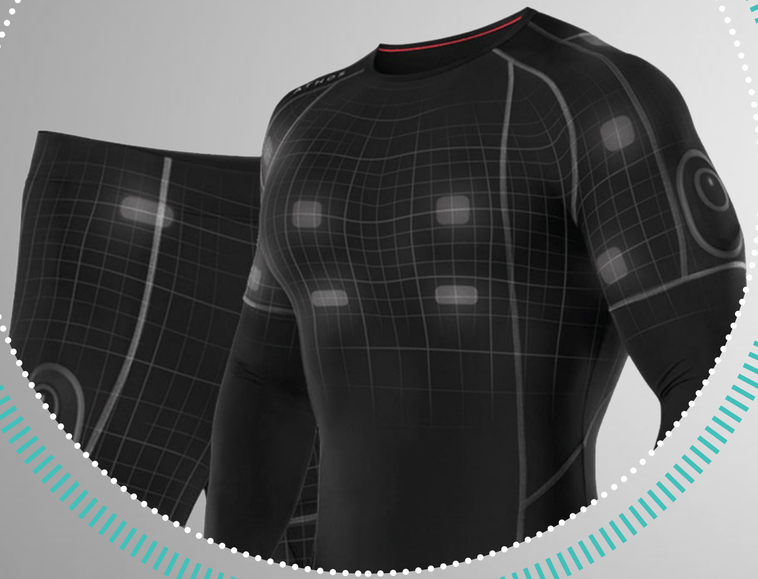
// SONY SMARTEYE

VUZIX M100

// JINS MEME

//LAFORGE OPTICAL

// ATHOS WEAR



·TYPE

Clothing as Computer

·CLASS

sportswear

·ecoSystem

IOS/Android

·FOCUS AREAS

SPORTS/HEALTH

- Run/Step/Calorie Count
- Excercise/Activity Tracking
- Muscle Effort
- Cadence/rhythm of workout

·WORN

torso+legs

The Experience

When you exercise with Athos, you'll get a wealth of personalized data to help you get an edge on the competition.

Muscle Effort

We provide you with a score so you know how effectively you are working out.

Heart Rate

Reach your target zone to get the results you want.

Balance

Make sure you're pedaling, lifting, and stretching evenly.

Reps

Leave the pen and pad at home. We'll keep track of your reps and sets for you.

Cadence

Keep your rhythm consistent and where you want it throughout your workout.

Form

Stay safe and focus on the muscles that are important for the results you want.

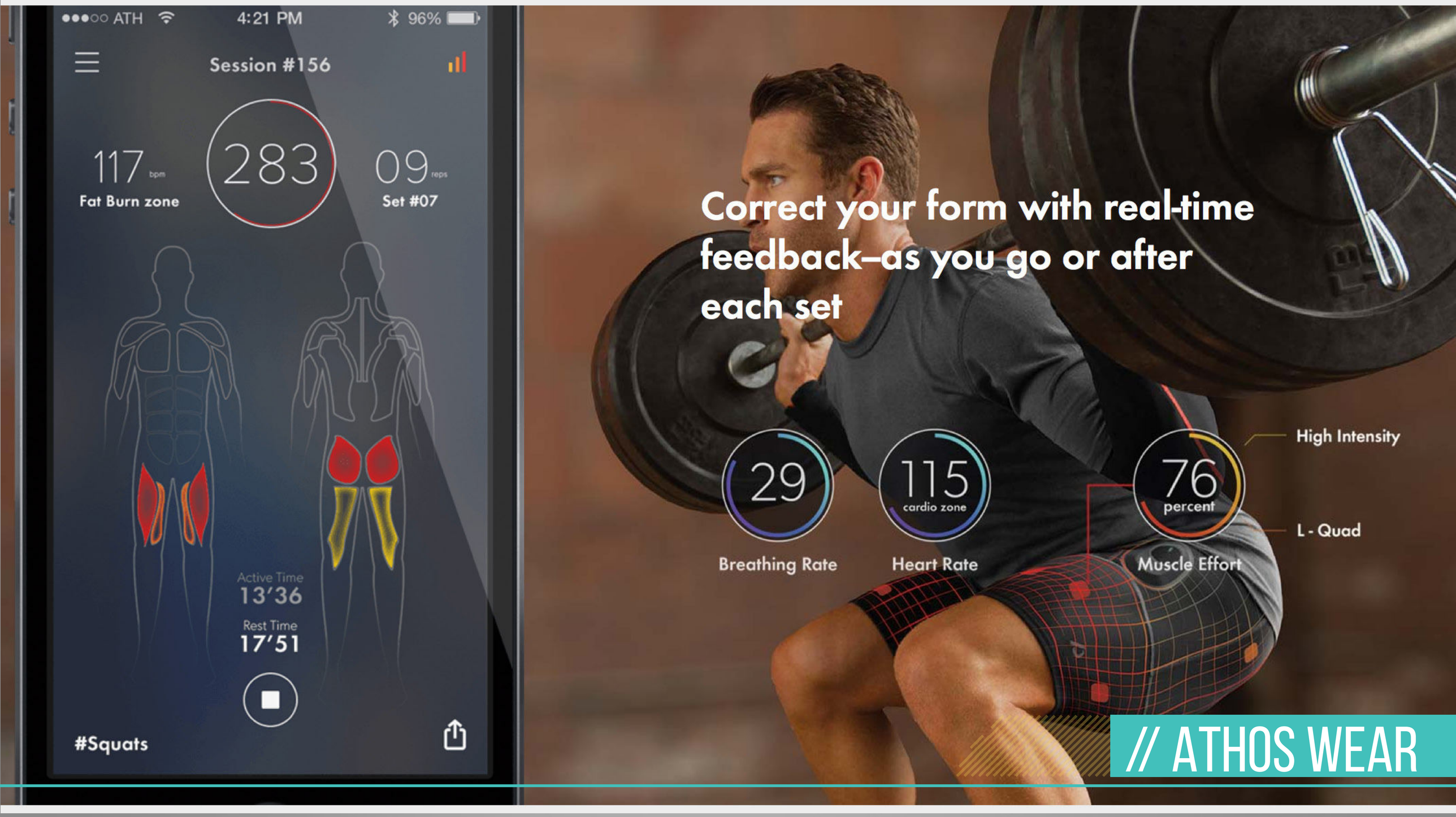
Time Tracking

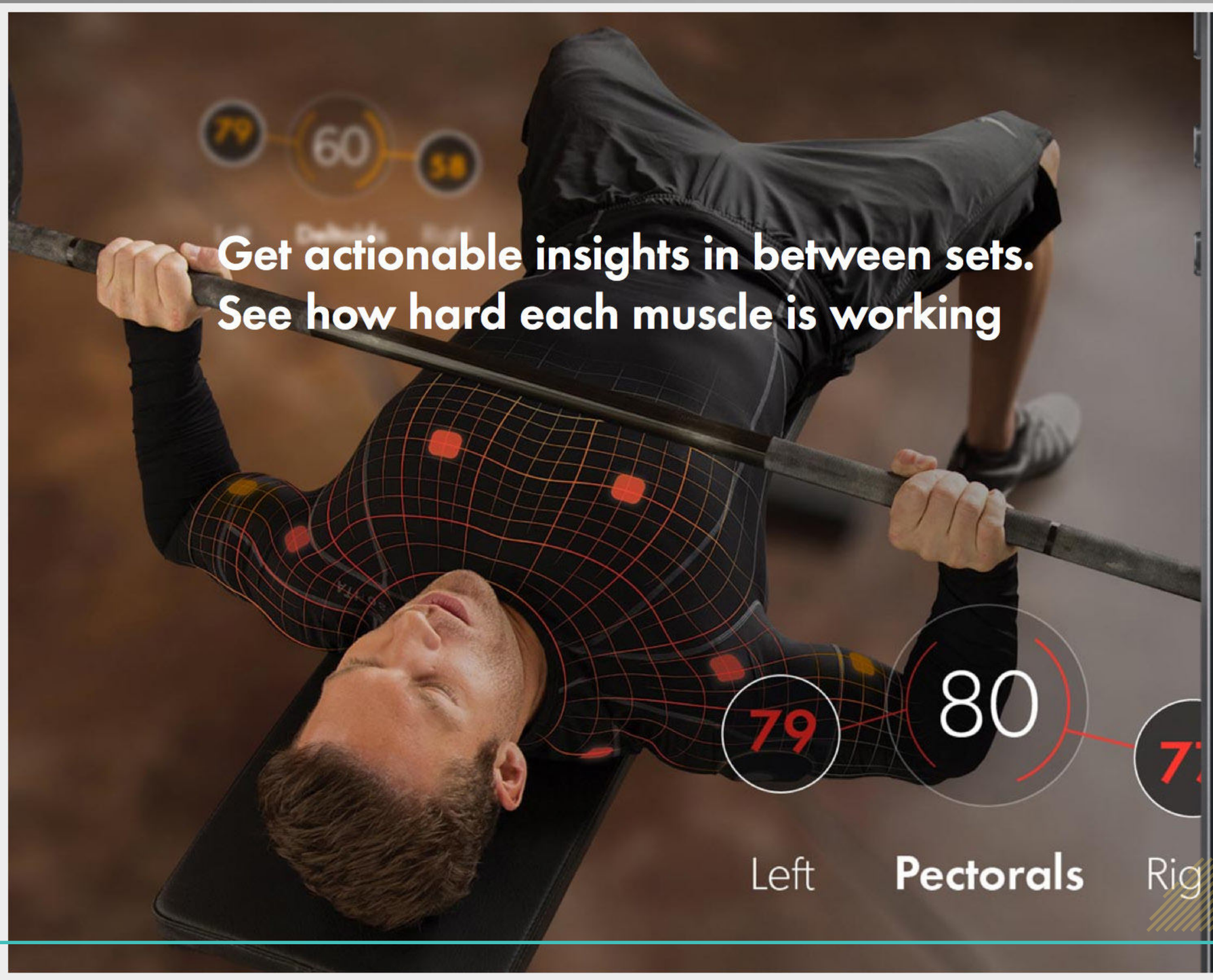
Know how much time you spent active or resting, in a cardio or a fat-burning zone.

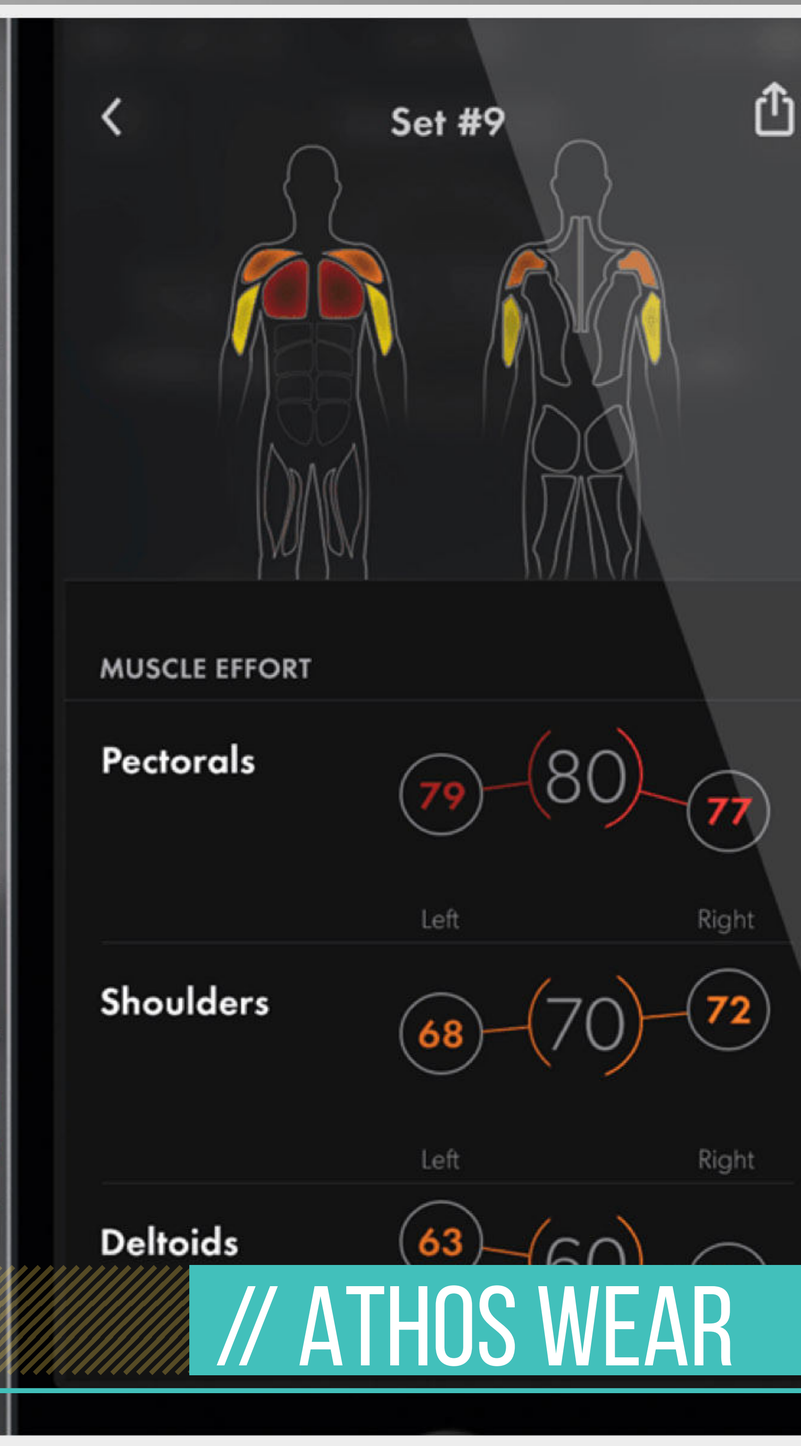
Activation

See how both stretching and lifting heavy things contribute to getting the results you want.

// ATHOS WEAR


ATH 4:21 PM 96%
Session #156
117 bpm
Fat Burn zone
283
09 reps
Set #07
Active Time
13'36
Rest Time
17'51
#Squats
Correct your form with real-time feedback–as you go or after each set
29
Breathing Rate
115
cardio zone
Heart Rate
76
percent
Muscle Effort
High Intensity
L - Quad
// ATHOS WEAR


Get actionable insights in between sets.
See how hard each muscle is working
79
80
Left
Pectorals


Set #9
MUSCLE EFFORT
Pectorals
79
80
77
Left
Right
Shoulders
68
70
72
Left
Right
Deltoids
63

// ATHOS WEAR

//OM SIGNAL

//V.S. INCREDIBLE

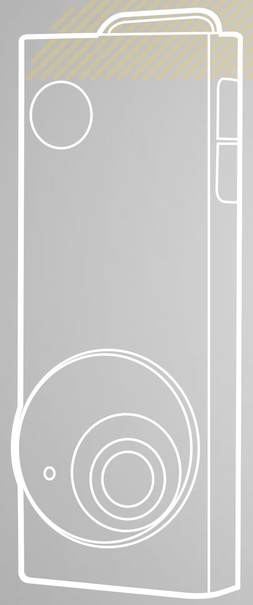
// VISIJAX JACKET

EXMOBABY

//T.JACKET

//SYNAPSE

/AUTOGRAPHER



.TYPE

Information Appliance

.CLASS

Camera

.ecoSystem

IOS/Android

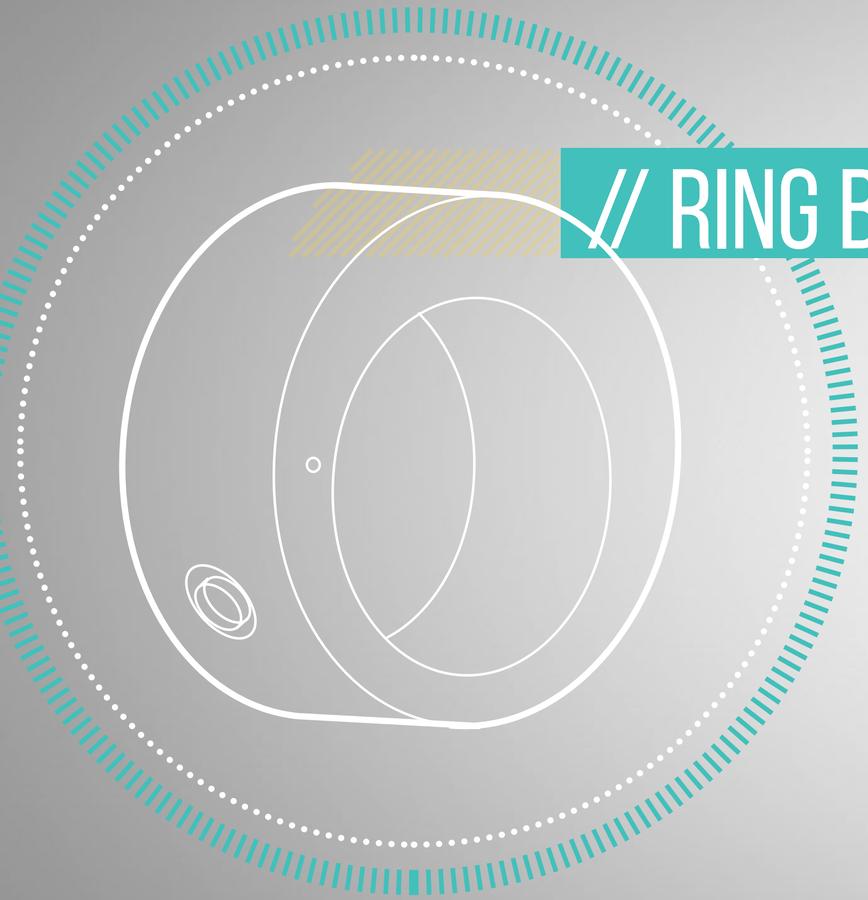
.FOCUS AREAS

Lifestyle

- 24/7 automated photographs
- life looging

.WORN

neck/clothes



// RING BY LOGBAR

.TYPE

Information Appliance

.CLASS

Smart Ring

.ecoSystem

IOS/Android

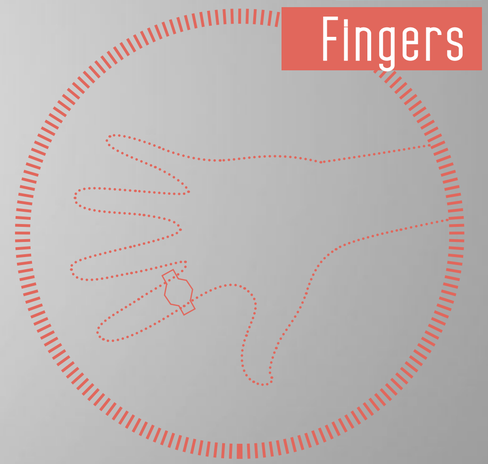
.FOCUS AREAS

Lifestyle

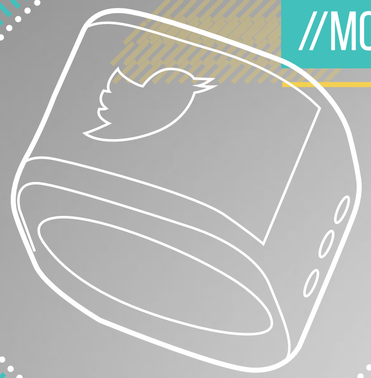
- Reminders/Information
- Communication
- Gesture COntrol

.WORN

Fingers

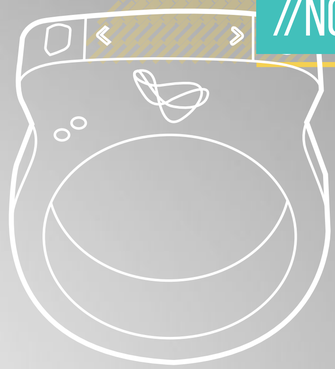


//MOTA RING

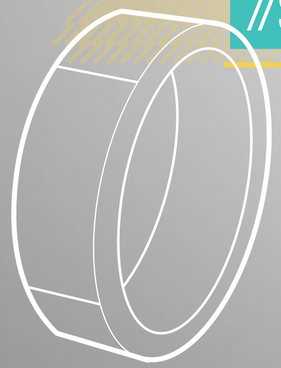


// FIN

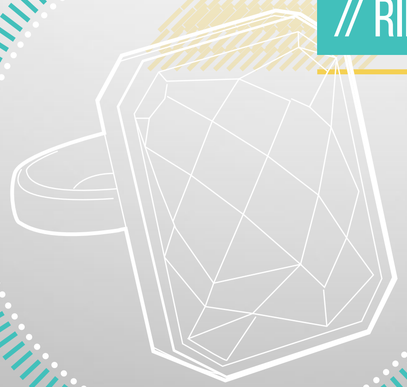
//NOD



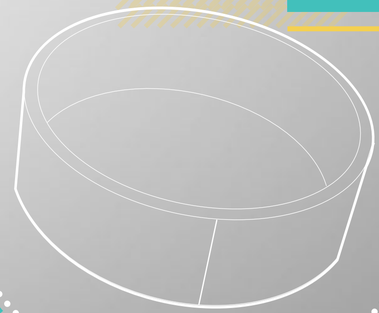
//SMARTY RING



// RINGLY



//NFC RING



//MOTA RING

// FIN

//NOD

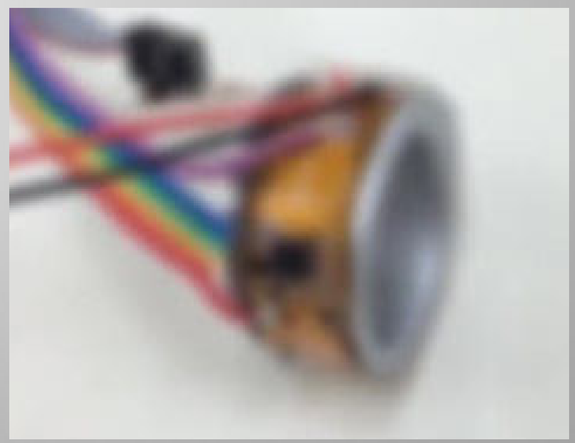
//SMARTY RING

// RINGLY

//NFC RING

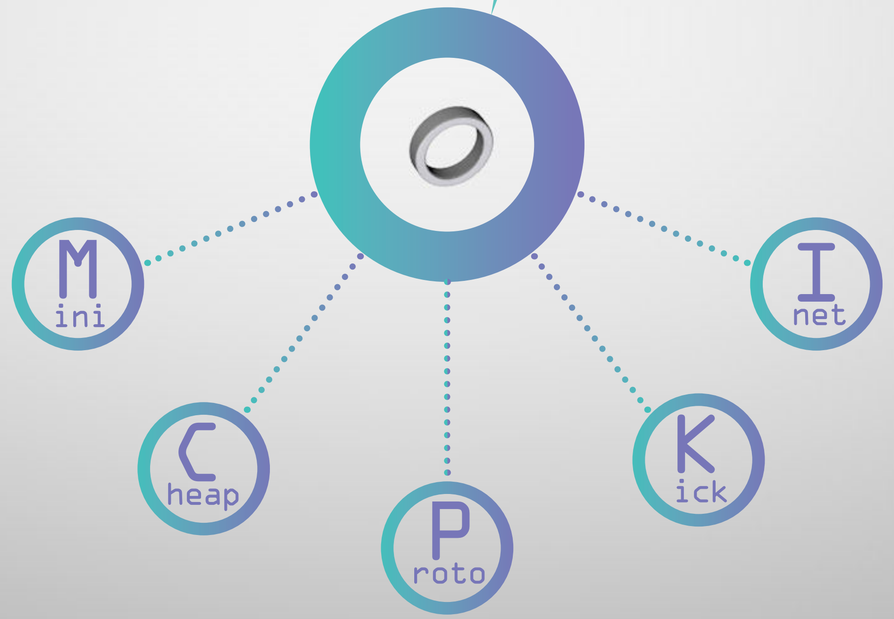
thinking//

CASE OF THE RING




how does it make my life better?
Do i really need it?
Why would i want to wear it?
How do i feel when i wear it?
Does it simplify my life?
is this the right direction ?

> “The very reasons that have made wearable computing explode, has become its weaknes and the cause of directionless development.”



“Much of what is being done with wearable devices is happening simply because it can be done.”

Donald Norman

"Much of what is being done with wearable devices is happening simply because it can be done."

Donald Norman

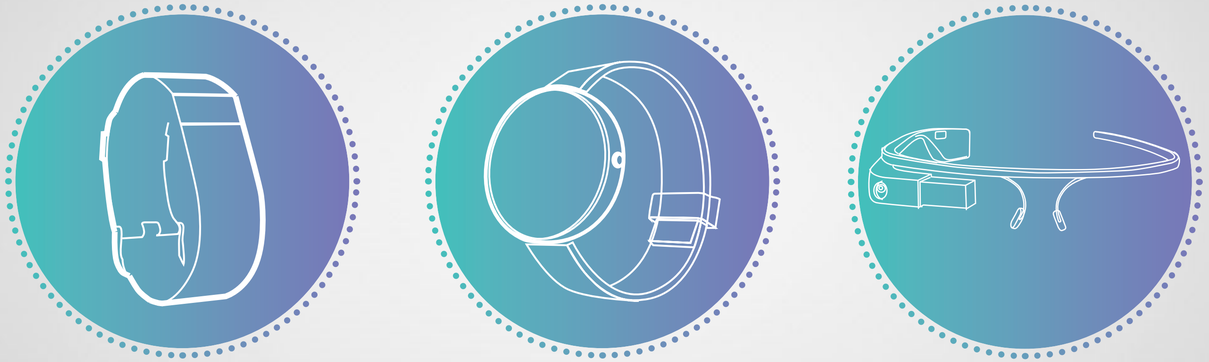
not catering to core needs

negelectance of human factors

little consideration towards human behaviour

low understanding of "X" variables involved

lack of coherent vision



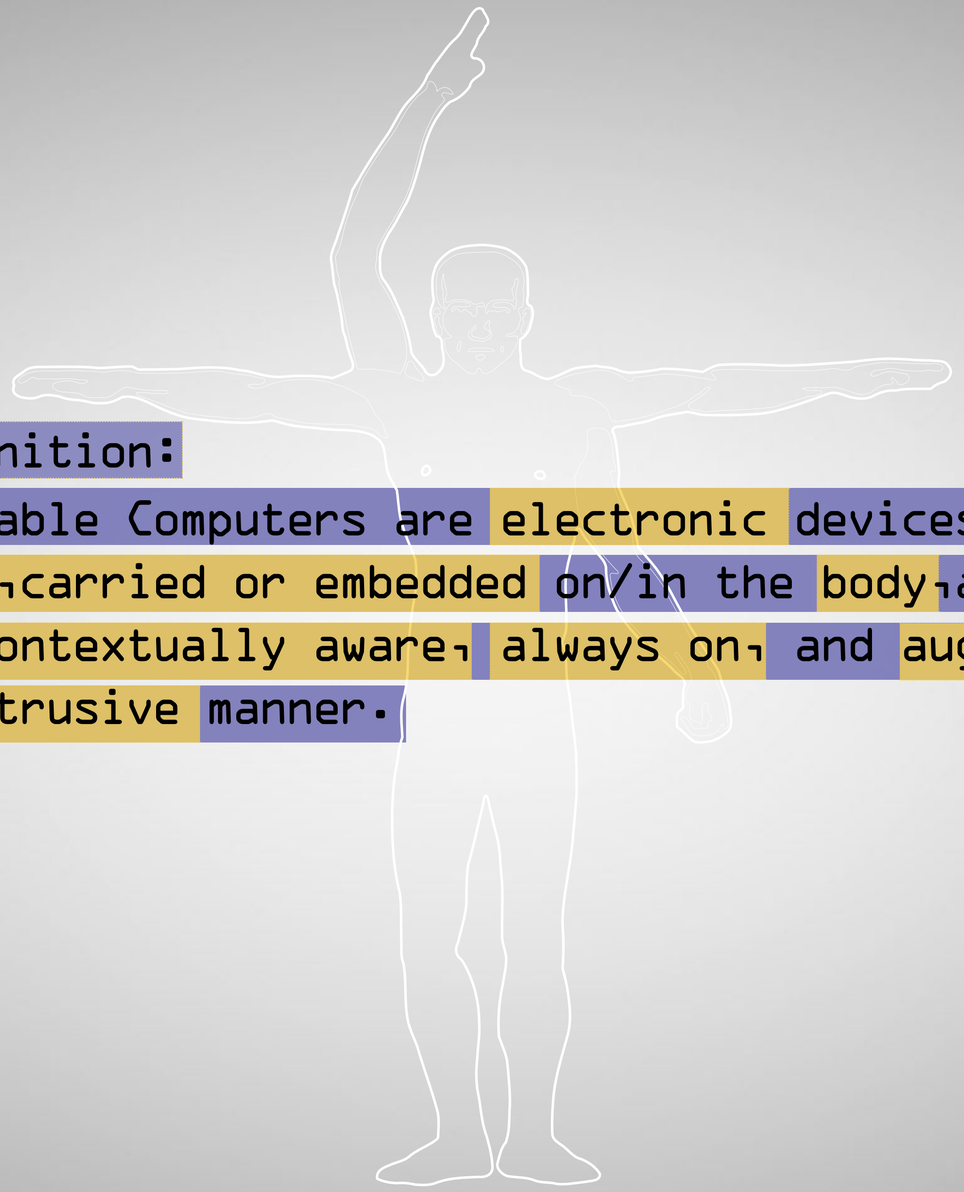
What is wrong ith these wearables?

// HOW

LACK OF UNDERSTANDING OF NEW VARIABLES

"Initial development of wearable technology (those of engineering an computer science) have no precedent of intimate interaction with the human body/mind/psyche in a continuous operation, body mounted paradigm, since these variables have not existed in prior research(mobile or desktop devices) Ignoring these considerations is often the cause of failure of new product."

Lucy E. Dunne



Definition:

Wearable Computers are electronic devices that are worn,carried or embedded on/in the body,are designed to be contextually aware, always on, and augment us in unobtrusive manner.

Variables:

electronic

worn carried embedded

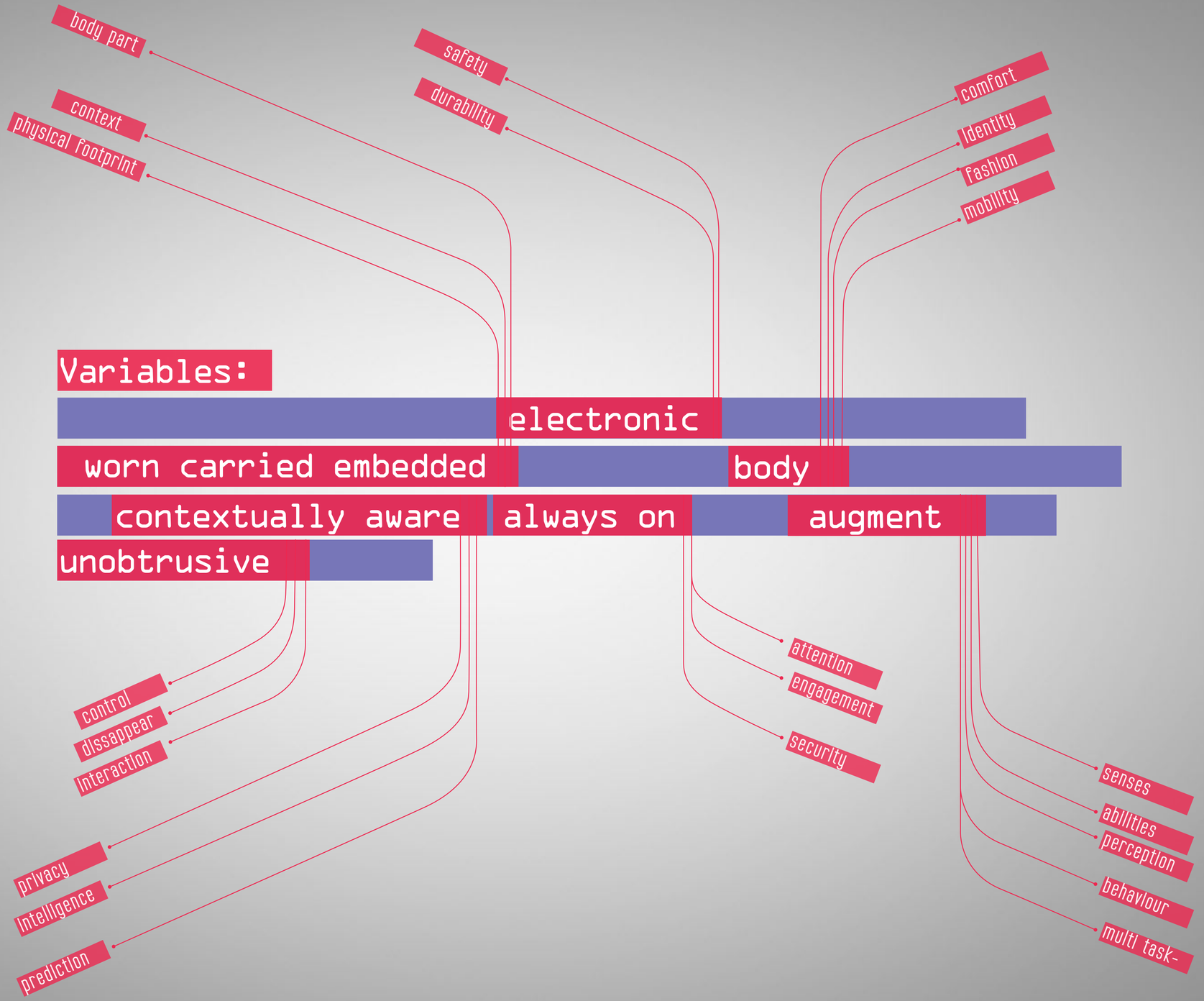
body

contextually aware

always on

augment

unobtrusive


body part
context
physical footprint
safety
durability
comfort
identity
fashion
mobility
Variables:
electronic
worn carried embedded
body
contextually aware
always on
augment
unobtrusive
control
dissappear
interaction
attention
engagement
security
privacy
intelligence
prediction
senses
abilities
perception
behaviour
multi task-

How can we DESIGN for this type of contextually aware always on unobtrusive Augmentation?

// J.C.R. LICKLIDER 1960

MAN COMPUTER SYMBIOSIS

Summary

Man-computer symbiosis is an expected development in cooperative interaction between men and electronic computers. It will involve very close coupling between the human and the electronic members of the partnership.

The main aims are:

1) to let computers facilitate formulative thinking as they now facilitate the solution of formulated problems, and

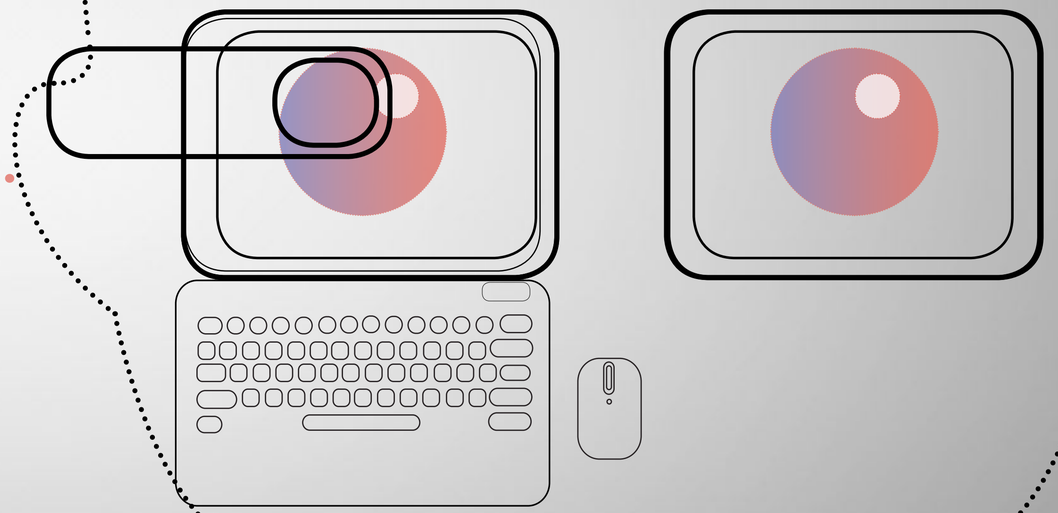
2) to enable men and computers to cooperate in making decisions and controlling complex situations without inflexible dependence on predetermined programs.

In the anticipated symbiotic partnership, men will set the goals, formulate the hypotheses, determine the criteria, and perform the evaluations. Computing machines will do the routinizable work that must be done to prepare the way for insights and decisions in technical and scientific thinking. Preliminary analyses indicate that the symbiotic partnership will perform intellectual operations much more effectively than man alone can perform them. Prerequisites for the achievement of the effective cooperative association include developments in computer time sharing, in memory components, in memory organization, in programming languages, and in input and output equipment.

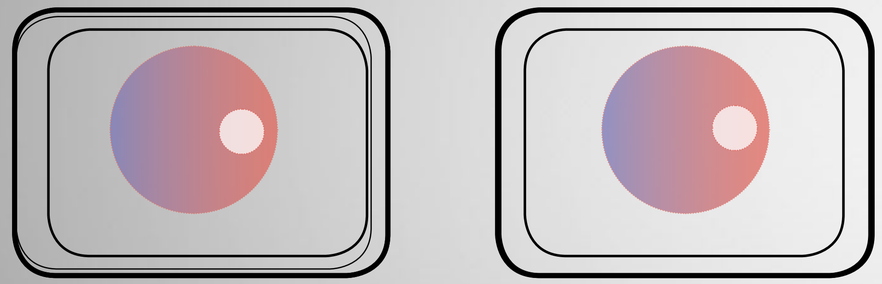
1 Introduction
1.1 Symbiosis

The fig tree is pollinated only by the insect Blastophaga grossorun. The larva of the insect lives in the ovary of the fig tree, and there it gets its food. The tree and the insect are thus heavily interdependent: the tree cannot reproduce wit bout the insect; the insect cannot eat wit bout the tree; together, they constitute not only a viable but a productive and thriving partnership. This cooperative "living together in intimate association, or even close union, of two dissimilar organisms" is called symbiosis [27].
"Man-computer symbiosis is a subclass of man-machine systems. There are many man-machine systems. At present, however, there are no man-computer symbioses. The purposes of this paper are to present the concept and, hopefully, to foster the development of man-computer symbiosis by analyzing some problems of interaction between men and computing machines, calling attention to applicable principles of man-machine engineering, and pointing out a few questions to which research answers are needed. The hope is that, in not too many years, human brains and computing machines will be coupled together very tightly, and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today.
1.2 Between "Mechanically Extended Man" and "Artificial Intelligence"
As a concept, man-computer symbiosis is different in an important way from what North [21] has called "mechanically extended man." In the man-machine systems of the past, the human operator supplied the initiative, the direction, the integration, and the criterion. The mechanical parts of the systems were mere extensions, first of the human arm, then of the human eye.

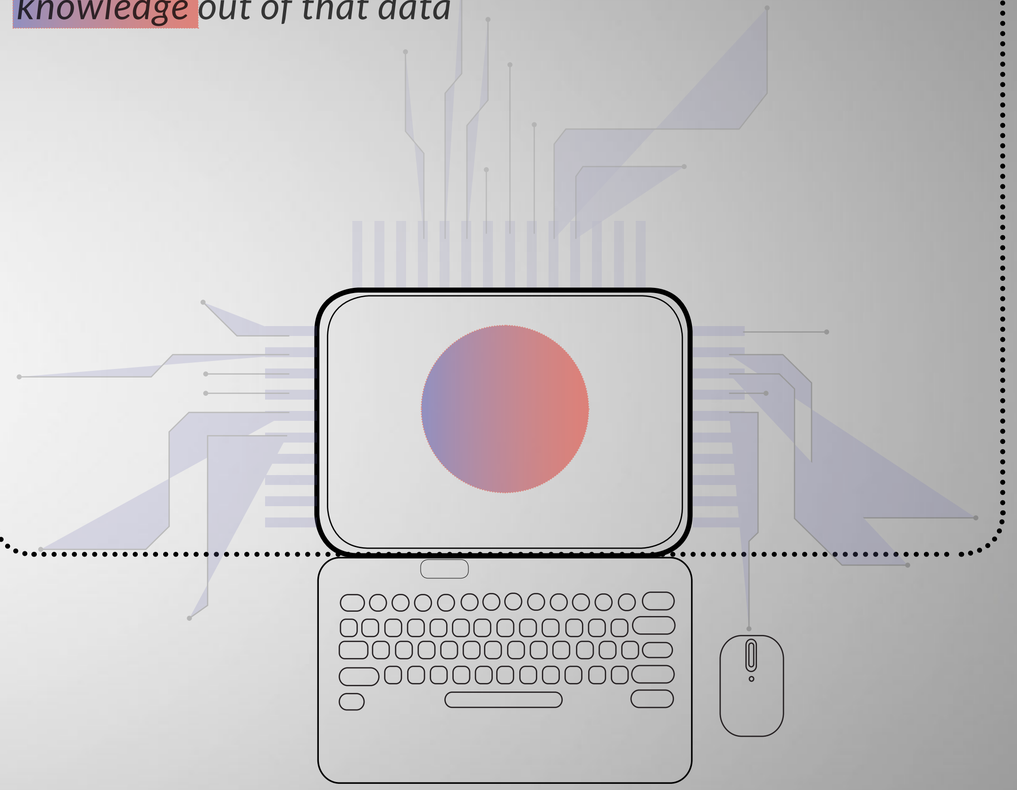
"The hope is that, in not too many years, human brains and computing machines will be coupled together very tightly, and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today. "



A human input or logic is advanced at handling new situations, making connections, find patterns and solve them well.
Humans are bad at storing large amounts of data, and processing it all by themselves.



Can easily process huge amounts of data and churn them into information
Still extremely bad at making sense or knowledge out of that data



//ARTEFACTS

First of all there is the tool itself, the physical part of the technology, which is used by the man to solve a particular problem.

// METHOD

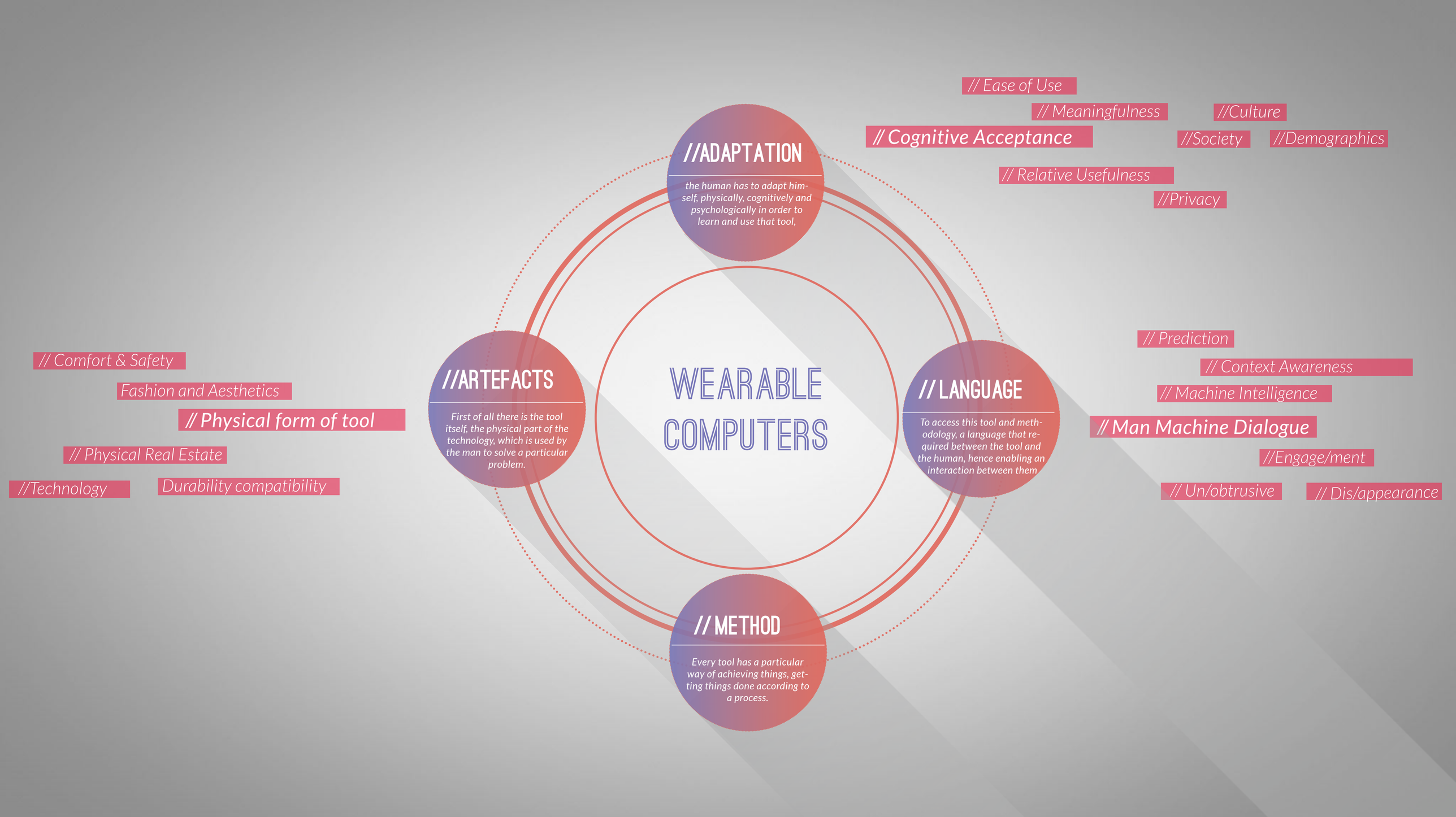
Every tool has a particular way of achieving things, getting things done according to a process.

// LANGUAGE

To access this tool and methodology, a language that required between the tool and the human, hence enabling an interaction between them

//ADAPTATION

the human has to adapt himself, physically, cognitively and psychologically in order to learn and use that tool,


// Ease of Use
// Meaningfulness
//Culture
// Cognitive Acceptance
//Society
//Demographics
// Relative Usefulness
//Privacy
//ADAPTATION
the human has to adapt himself, physically, cognitively and psychologically in order to learn and use that tool,
// Comfort & Safety
Fashion and Aesthetics
// Physical form of tool
// Physical Real Estate
//Technology
Durability compatibility
//ARTEFACTS
First of all there is the tool itself, the physical part of the technology, which is used by the man to solve a particular problem.
WEARABLE COMPUTERS
// Prediction
// Context Awareness
// Machine Intelligence
// Man Machine Dialogue
//Engage/ment
// Un/obtrusive
// Dis/appearance
// LANGUAGE
To access this tool and methodology, a language that required between the tool and the human, hence enabling an interaction between them
// METHOD
Every tool has a particular way of achieving things, getting things done according to a process.

//ARTEFACTS

First of all there is the tool itself, the physical part of the technology, which is used by the man to solve a particular problem.

// Physical form of tool

// Comfort & Safety

// Physical Real Estate

Fashion and Aesthetics

Durability compatibility

//Technology

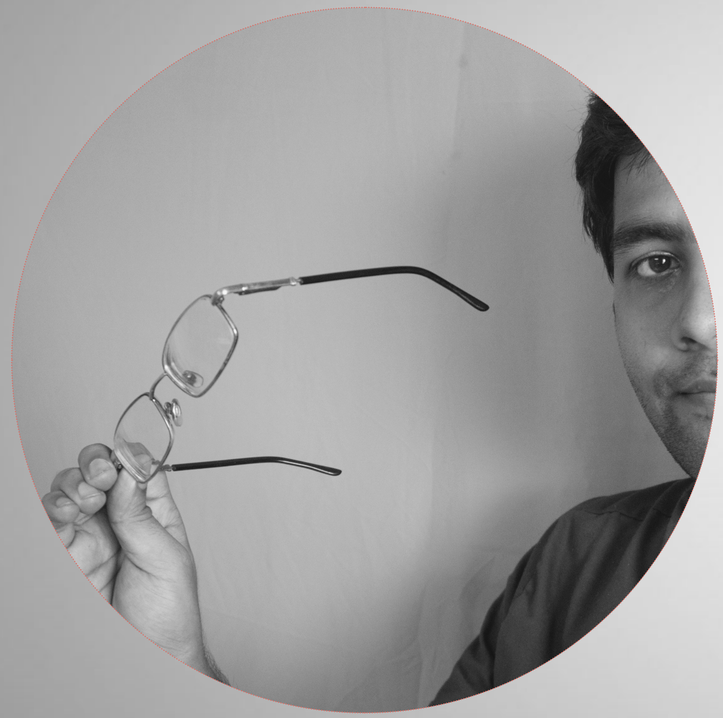
// Physical form of tool

Intially the form of wearable computers was heavy, bulky, odd looking and unwelcoming. This lead to problems in comfort and safety related to obstruction in natural heat and moisture dissipation, problems in movement and flexibility of the body. It also caused mechanical damage to the body parts over a prolonged usage

// Physical form of tool

Lately wearable devices have shifted to take forms of regular body worn accessories, such as garments, eyeglasses, helmets, bracelets, watches, hand gloves, necklaces and other jewellery, belts, socks, shoes and anything else that human kind has been wearing as regular daily objects.

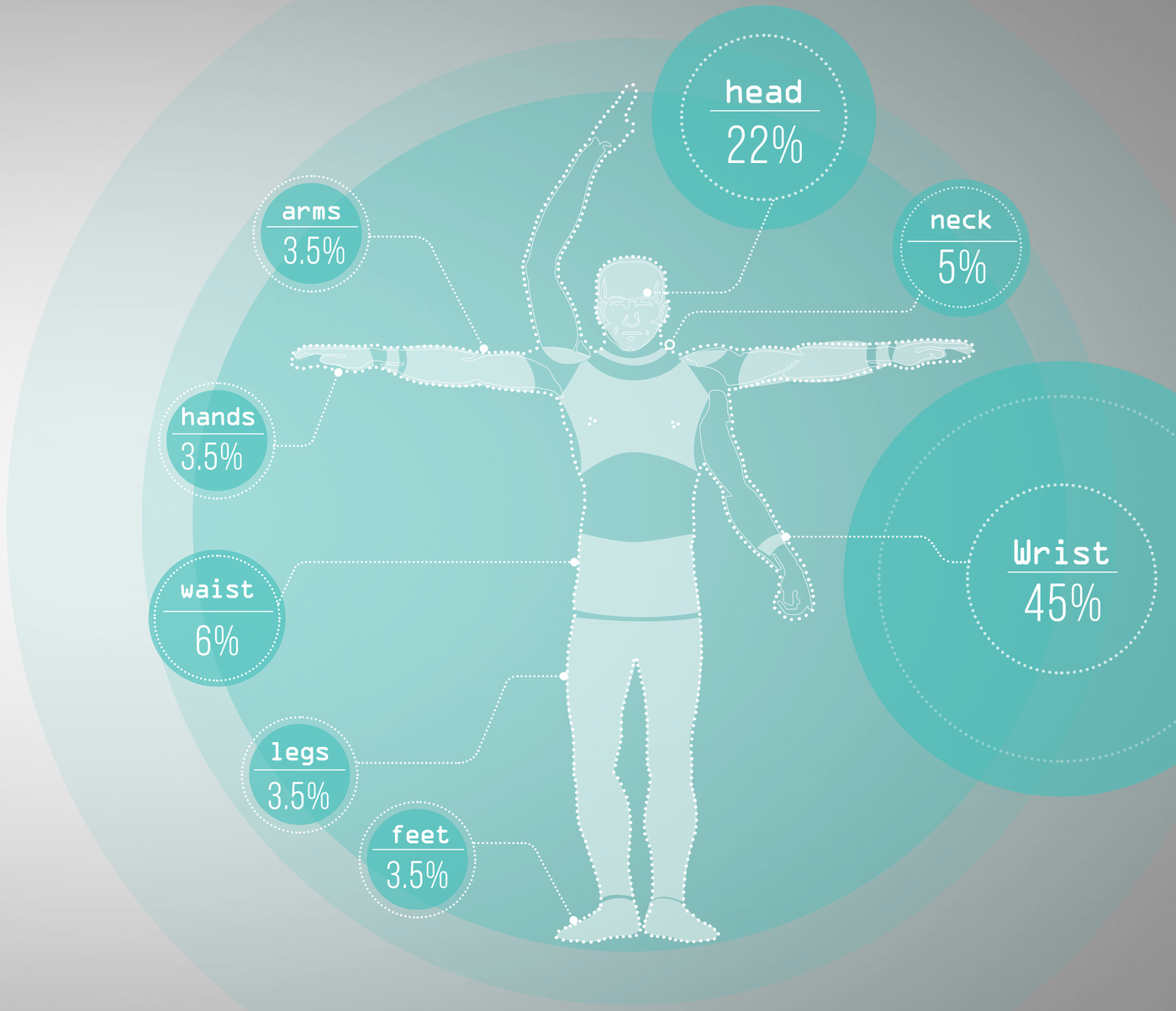
// Physical form of tool



Invisibles rather than wearables:

As technology improves and wearable computing matures, it may be possible that wearable devices become smaller and almost invisible on our bodies, hiding themselves behind our clothes or even the skin. Becoming formless, wearables will overcome a lot of stigmas and issues people have towards accepting on body computer, thereby leading to a better and more natural symbiosis of man and machine.

// Physical Real Estate



// Physical Real Estate

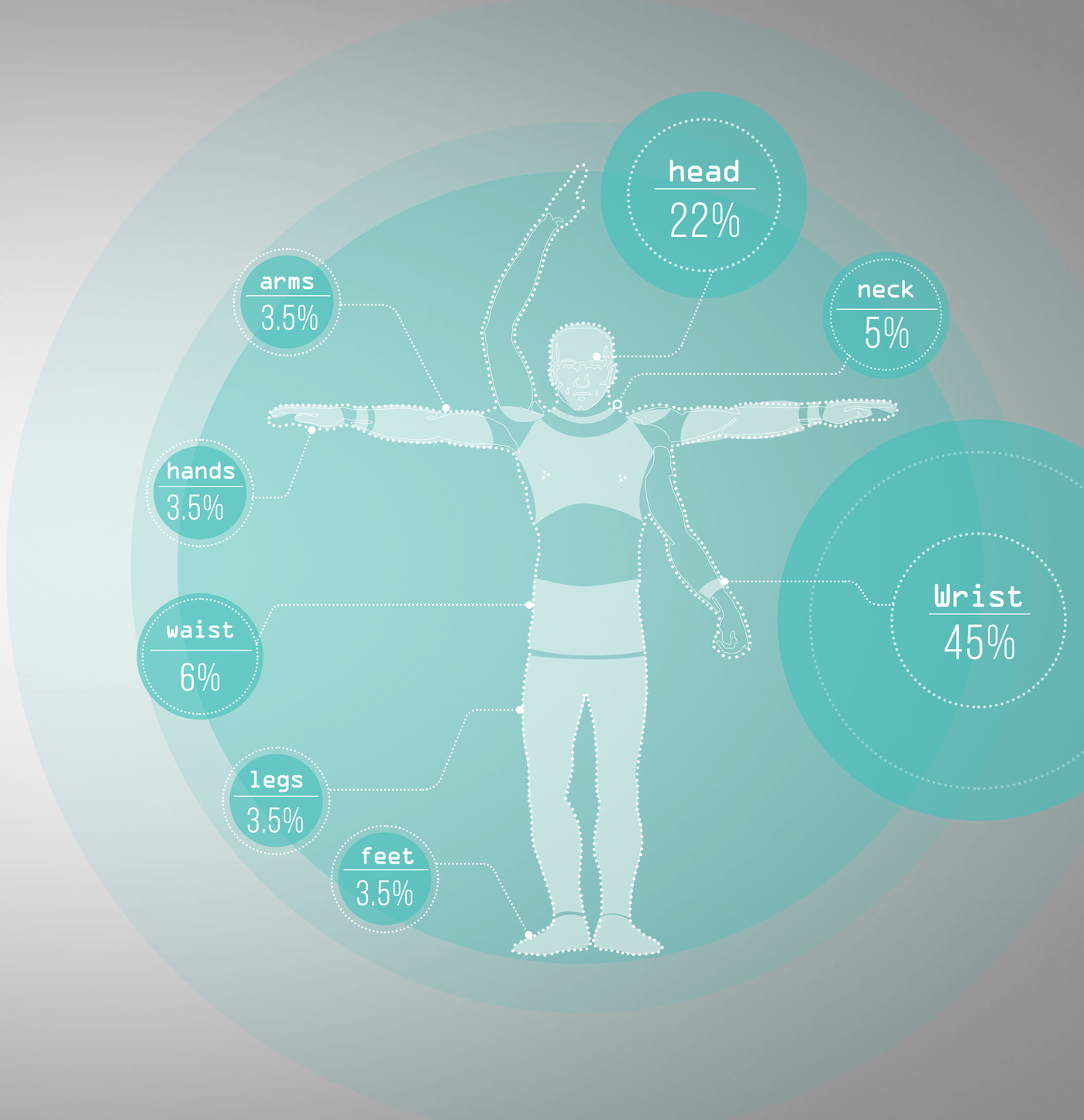
Device makers need to understand this contradiction and look for other forms and body parts to aim while designing the product.

A good alternative for placing fitness and heartbeat sensors might be undergarments which have the advantage over wrist beacause:

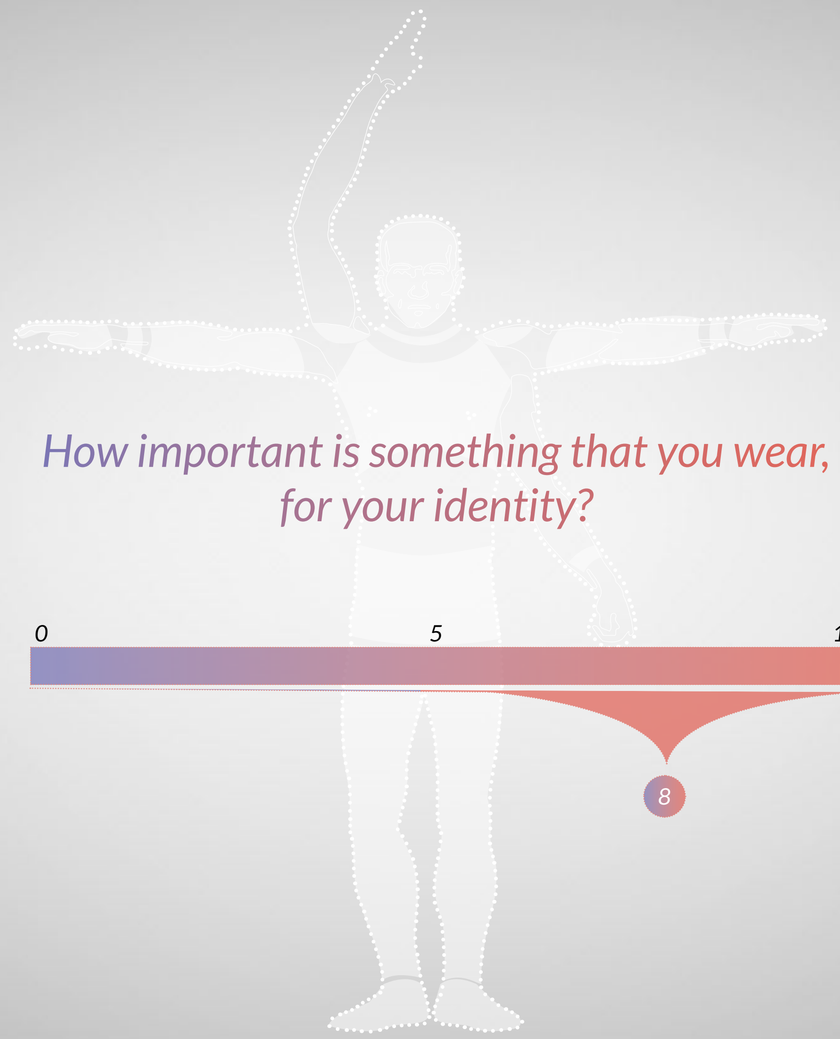
//undergarments are much more closer to heart/body and cover larger area which can provide for more sensors and higher accuracy of data collected.

//wristband fitness sensors get inaccurate readings of steps taken becuase they take in aribitary movments of the wrist throughout the day, while undergarments are more stable and putting sensors there will allow for better and true readings,

//undergarments are generally worn throughout the day, are not visible and hence can easily provide for longer and more in depth tracking of body vitals.



// Fashion & Aesthetics

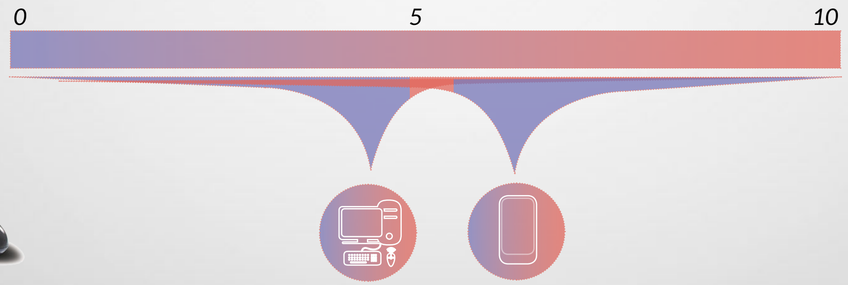


How important is something that you wear, for your identity?

// BLAND

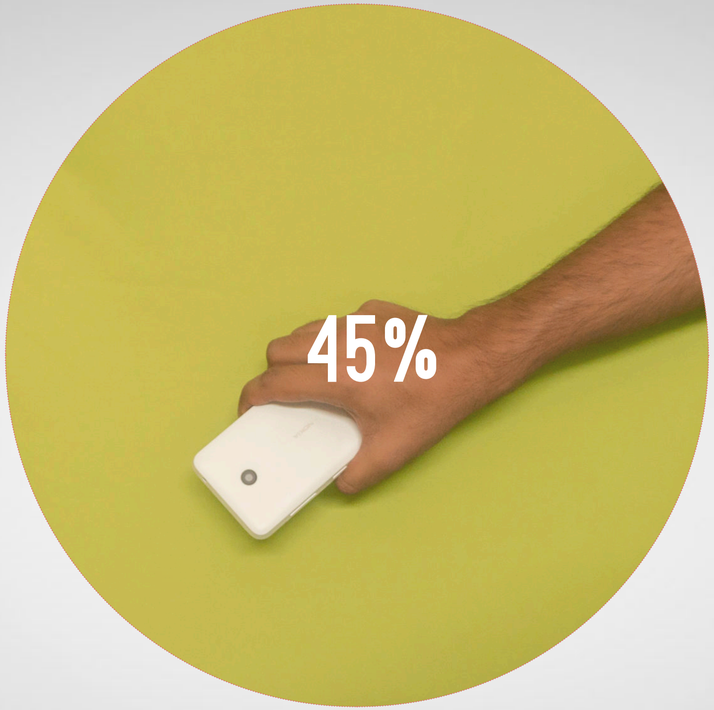
// Fashion & Aesthetics

How much you consider the visual appeal of the computing device when buying?



// Fashion & Aesthetics

“they have held their smartphones for atleast an hour or more on a daily basis”



“they have held their smartphones for atleast an hour or more on a daily basis”

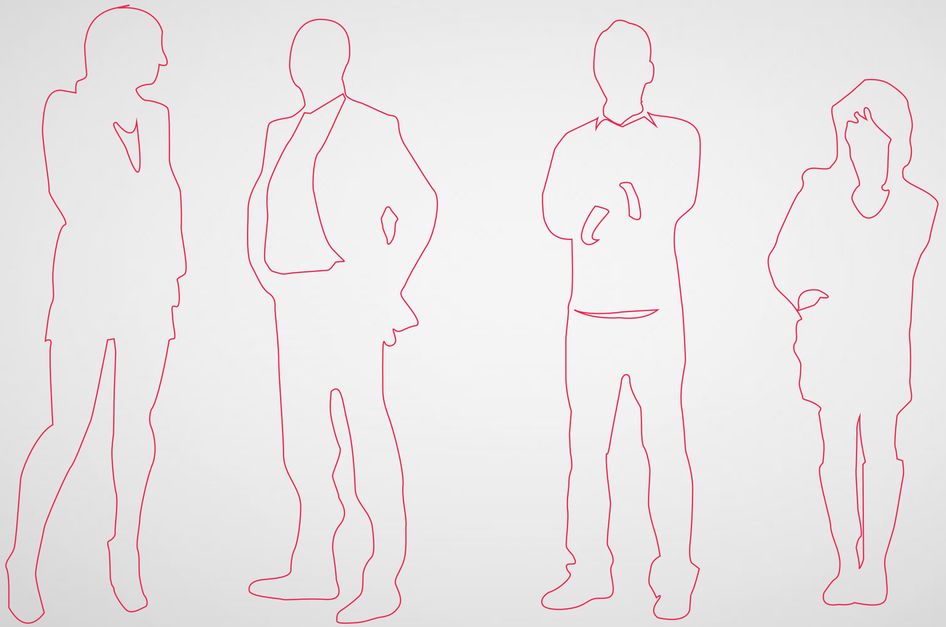
What among these matters to you, when you buy something to wear?

PRICE

STYLE & COLOUR

UTILITY

// Fashion & Aesthetics



Every person has a different body and equally diverse are their choices.

// Fashion & Aesthetics

The problem is that they are still designed as products, and a lot of them are good examples of industrial design but fail badly as something fashionable.

// Fashion & Aesthetics

Though they have started tending to the fashion need, it is still a long way to go beyond giving people the option of just a few colour choices.


100s
OF CHOICES

Do you find yourself confused, when buying things to wear?

52%
YES

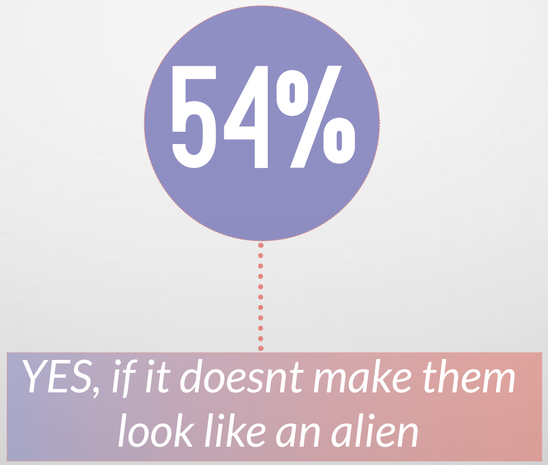
because its difficult to find something that they really like

Consider a situation where you move into a café and everyone is wearing the same glass, or maybe the same glass in a few different colors,

65%

they will find themselves uncomfortable in that situation

Do you wear/prefer to wear something that is not generally worn in your environment/culture?



// Fashion & Aesthetics

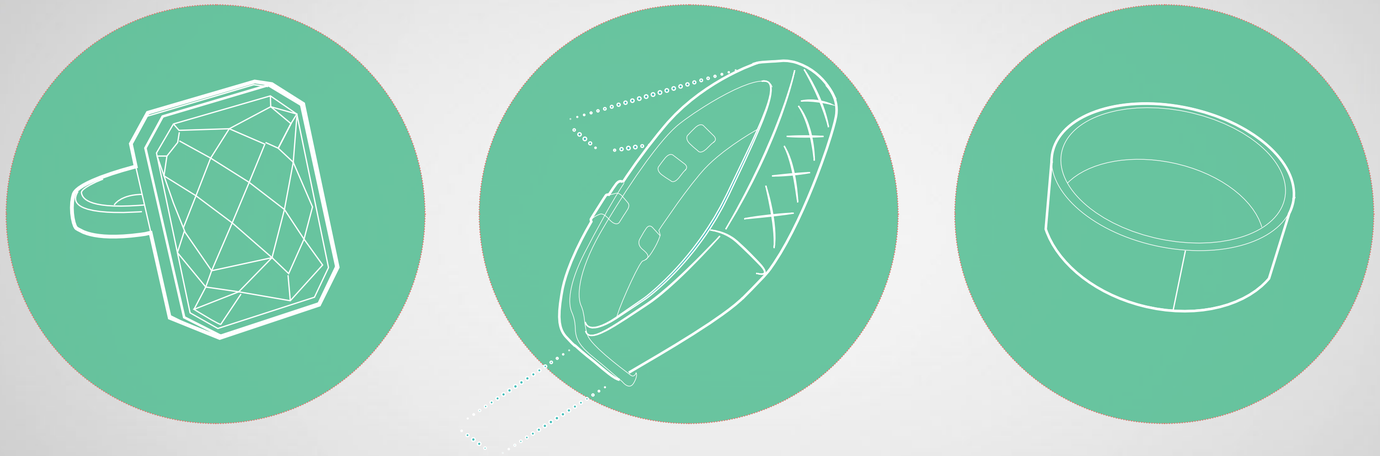
C.N.F.U.

consumer need for uniqueness scale

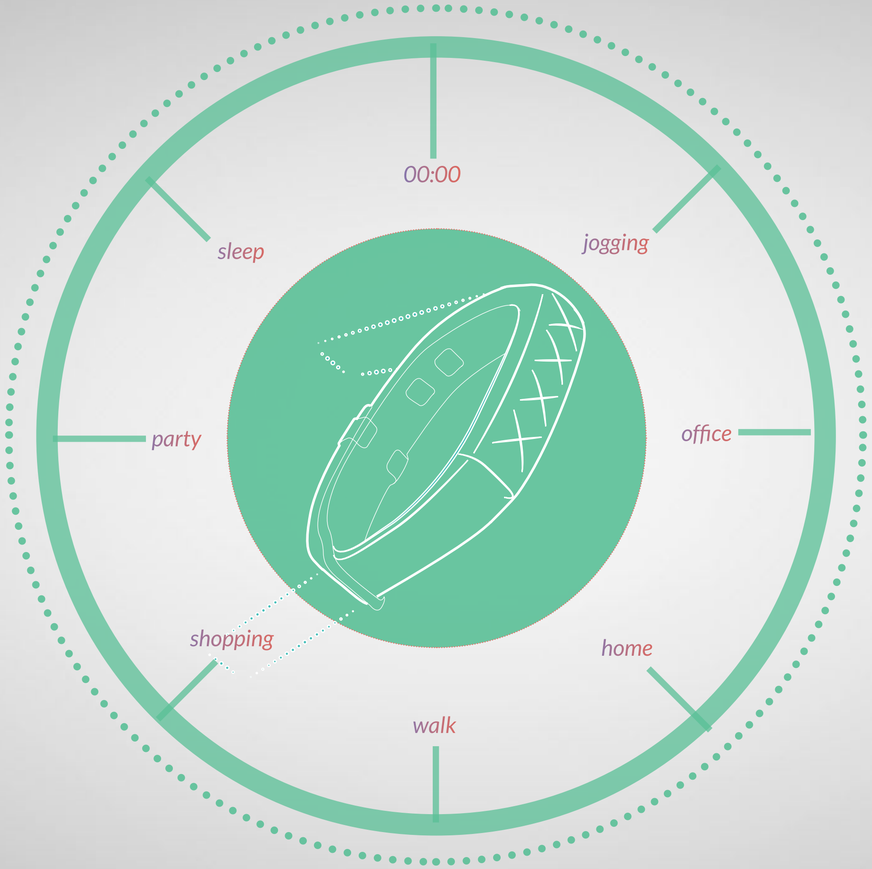
// Fashion & Aesthetics

Wearable makers need to think how to design products that can cater to this individual need for style.

// Fashion & Aesthetics



To overcome this hurdle, many wearable devices are hiding themselves as jewelry and other fashionable accessories. While that is a good step towards making them fashionable, a very few people actually wear one particular accessory all throughout the day.



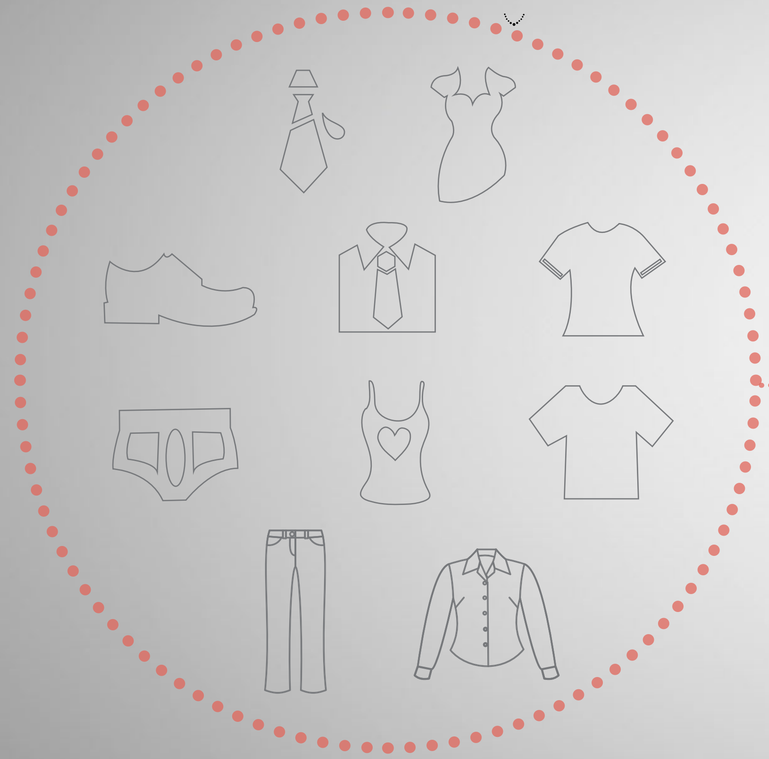
very few people actually wear one particular accessory all throughout the day.

What effects/influences your choice of things you wear?

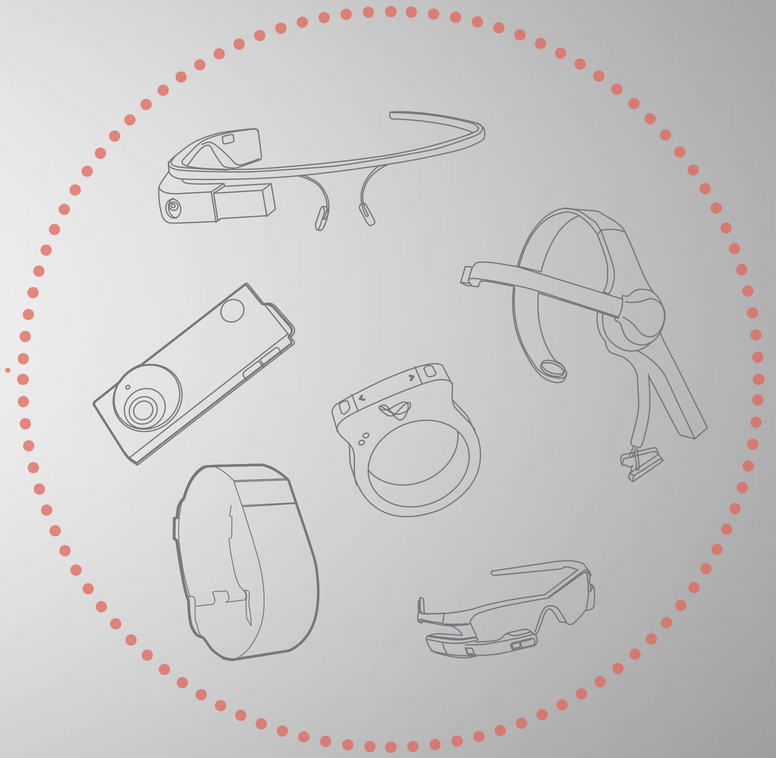
// Fashion & Aesthetics

If a device is meant to be worn 24/7 , how can it respond to various moods, contexts and occasions? If it cannot, then do I need to have multiple versions of the same smart device/accessory for different occasions? Or maybe I will just put the smart device off my body in favour of a dumb accessory that suits more to my choice for an occasion. How can this issue be addressed? Probably a modular system can be used which allows swapping different parts of the device and create a unique style for a wide array of contexts? Or maybe the electronics/tech part becomes a module small and light enough to be attached to regular accessories thereby leveraging their edge in availability of choices. Wearable smart clothing, has a lot of potential to solve this issue. With the development of fabrics that have conductive fibers woven with traditional ones, sensors and electronics can be directly built into the wide array of clothing available to choose. But such fabrics are still under development and still a little uncomfortable to wear. No doubt electronics embedded in nomral garments will usher a new era of acceptance and use of wearable computing, specially with the ease of making them available in literaaly hundreds of choices, similar to regular garments. This brings us to another issue, i.e. the usage and function of garments and electronics is different.

// Daily Wearability & Durability



The way we use our clothes/ accesories and electronic devices are very different in context of their life cycle, cleaning frequency, prices, frequency of usage, way of usage etc.



// Daily Wearability & Durability

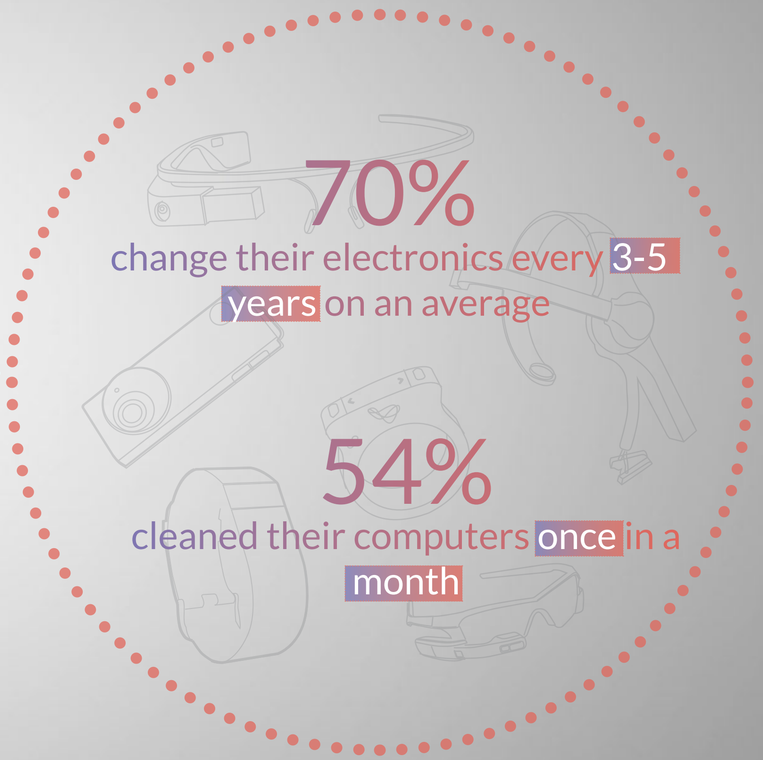
62%

change their daily wear **every six** months

85%

wash their daily wear **twice** a week

The way we use our clothes/ accesories and electronic devices are very different in context of their life cycle, cleaning frequency, prices, frequency of usage, way of usage etc.



70%

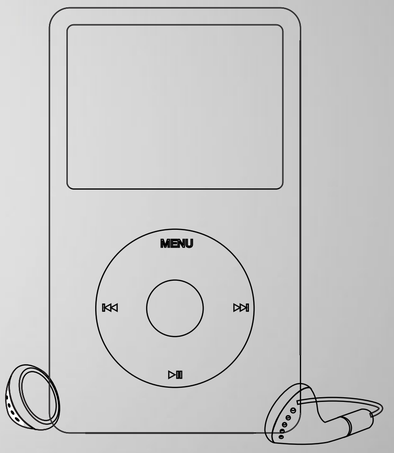
change their electronics every **3-5 years** on an average

54%

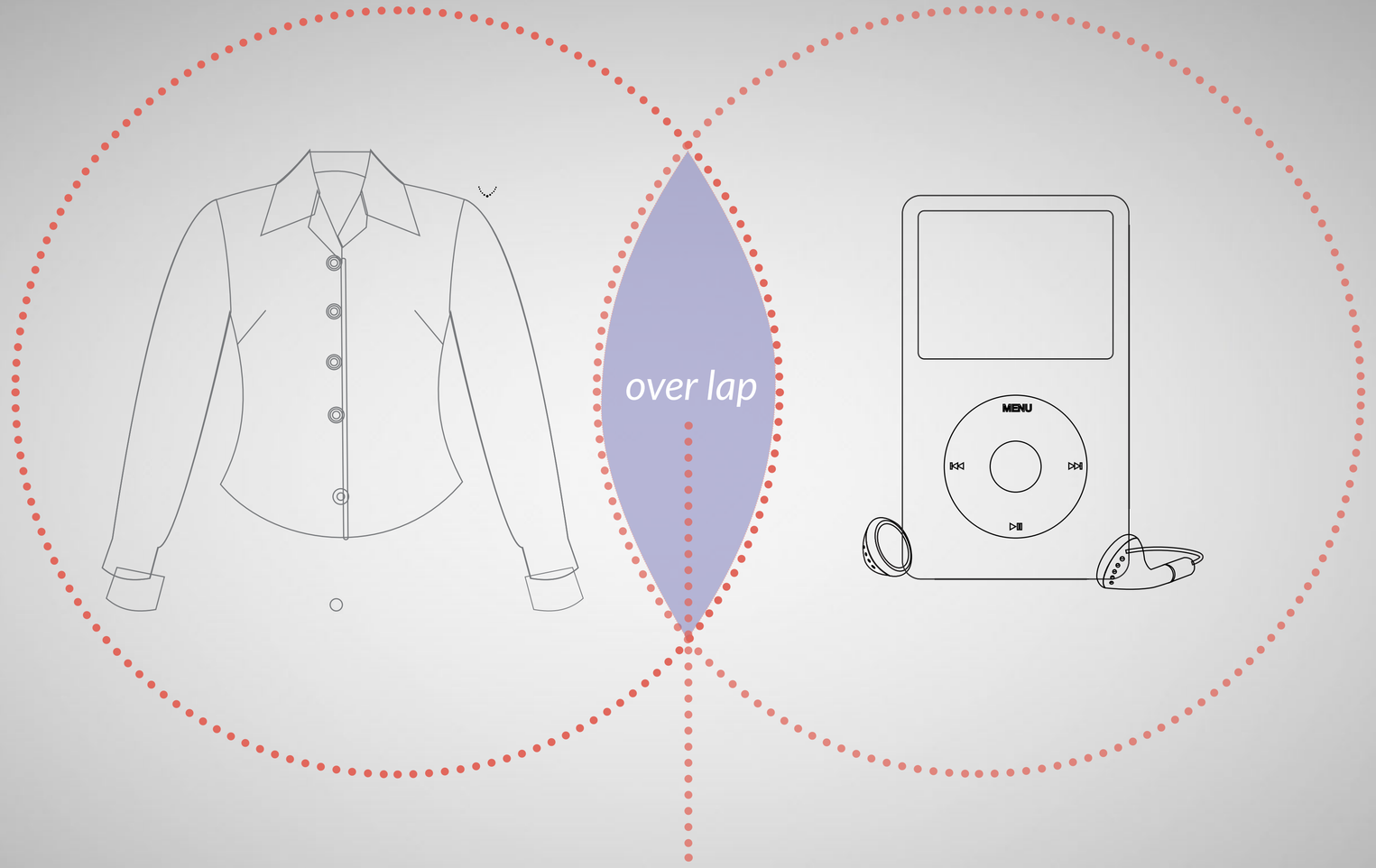
cleaned their computers **once** in a **month**

// Daily Wearability & Durability

When these electronic devices become a part of our clothes and footwear, how will the dynamics change? What happens to the electronics embedded when a certain clothing becomes old/outdated/wears off ? The price of the music player gets justified for a usage over several years (coming with a 1 year warranty too), how does the price point of electronic garments hold up, which one might wear for just one season?



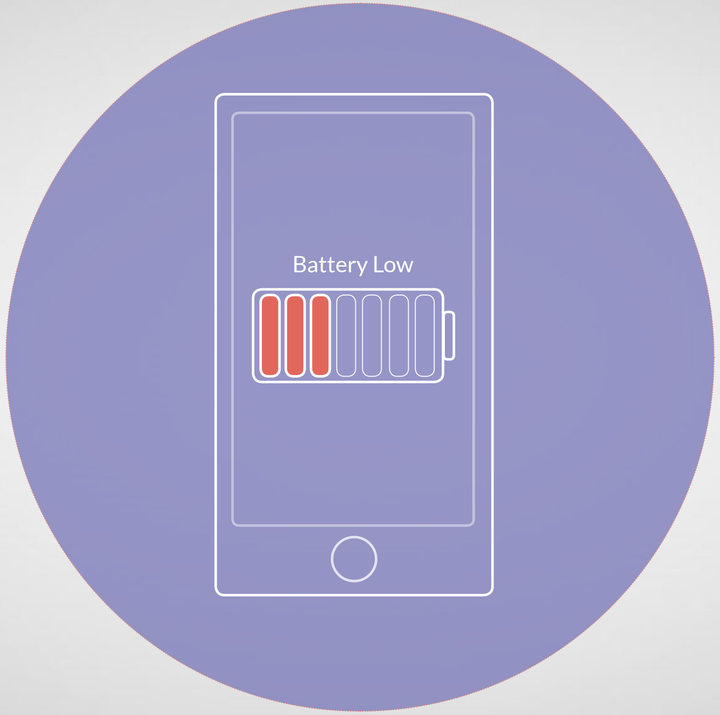
// Daily Wearability & Durability



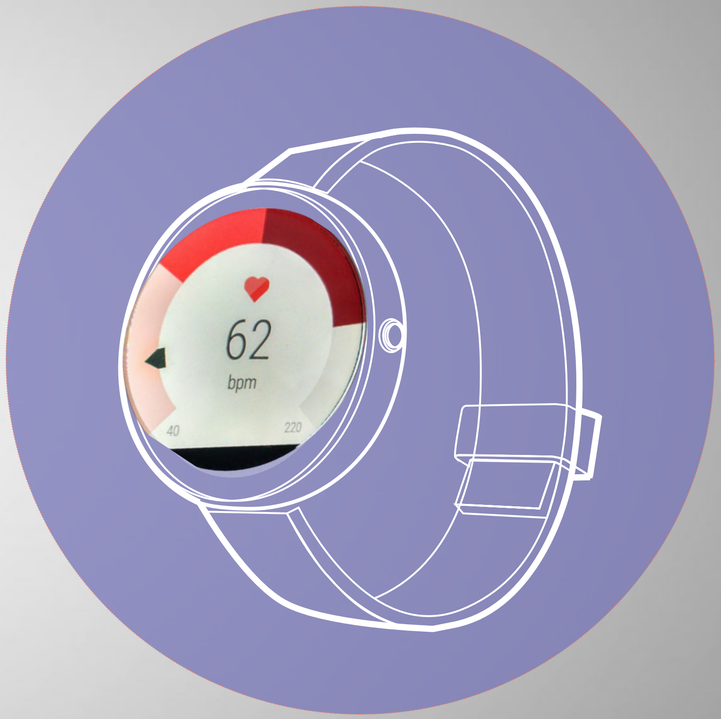
Wearable technology has still to figure out these issues, and find a common ground, a common set of usage pattern for both worlds. Modularity might provide a solution where devices can be attached or removed from the clothings/accessories as per requirement, and hence can be priced at separate price ranges.

//Technology

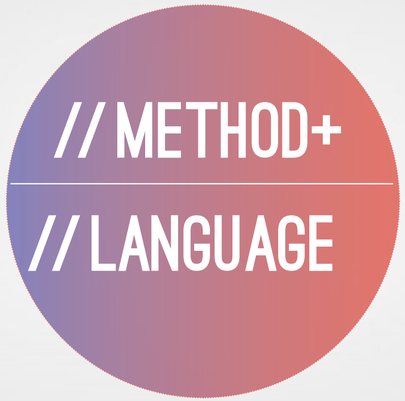
Highly visual additions. Technology still not there yet to hide in daily wear



Battery life is the Achiles heel of wearable devices most of them dont last more than a day, which is a huge problem considering the fact device is supposed to be worn all the time.



A lot of sensor technology is still not reliable to assess real health conditions. for example the Optical heart rate tracker is found to be very vague at times. Similarly during my one month with fitness tracker i noticed it counted my travels in auto as steps/distance walked.



// Prediction

// Context Awareness

// Machine Intelligence

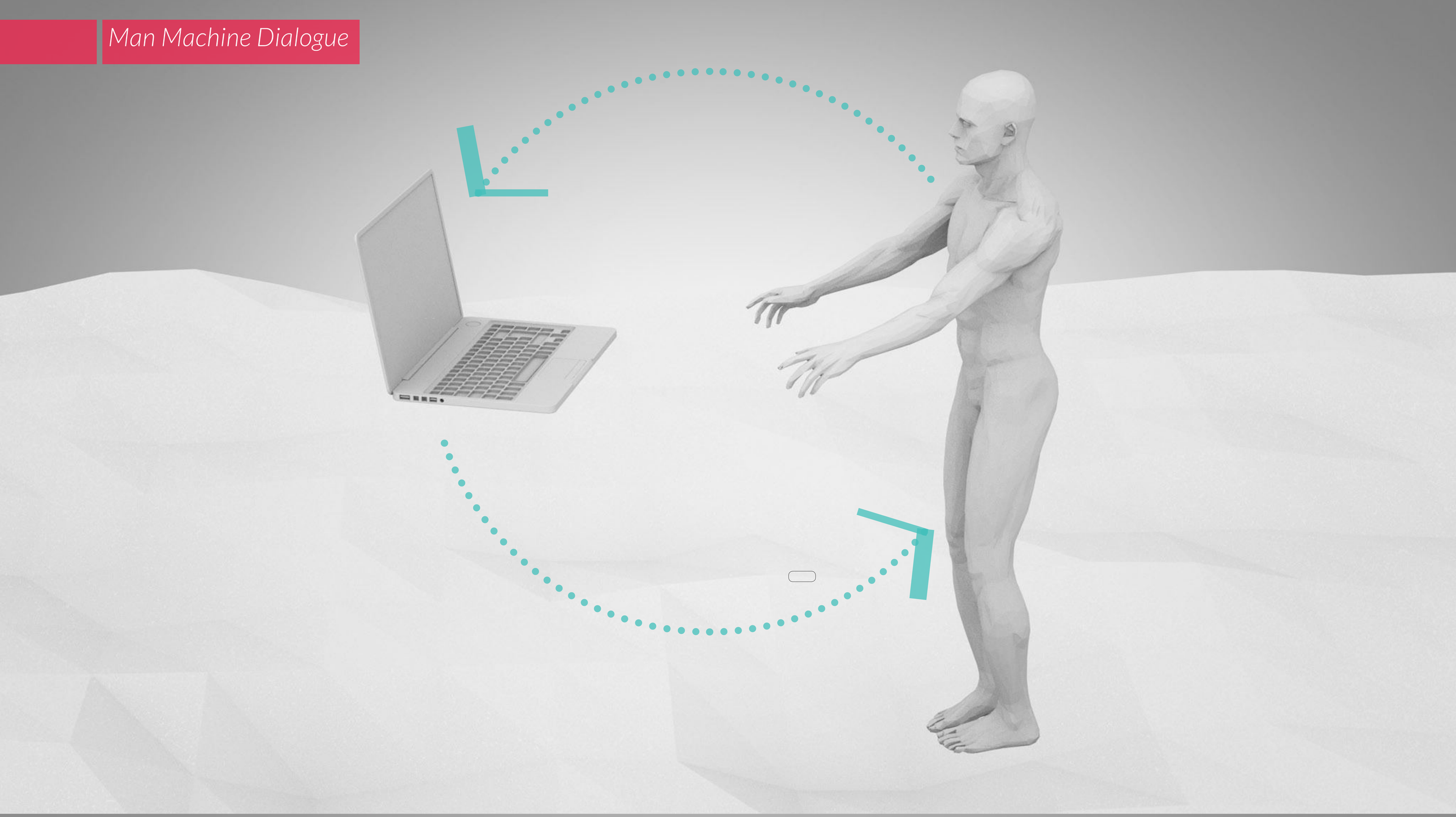
// Man Machine Dialogue

//Engage/ment

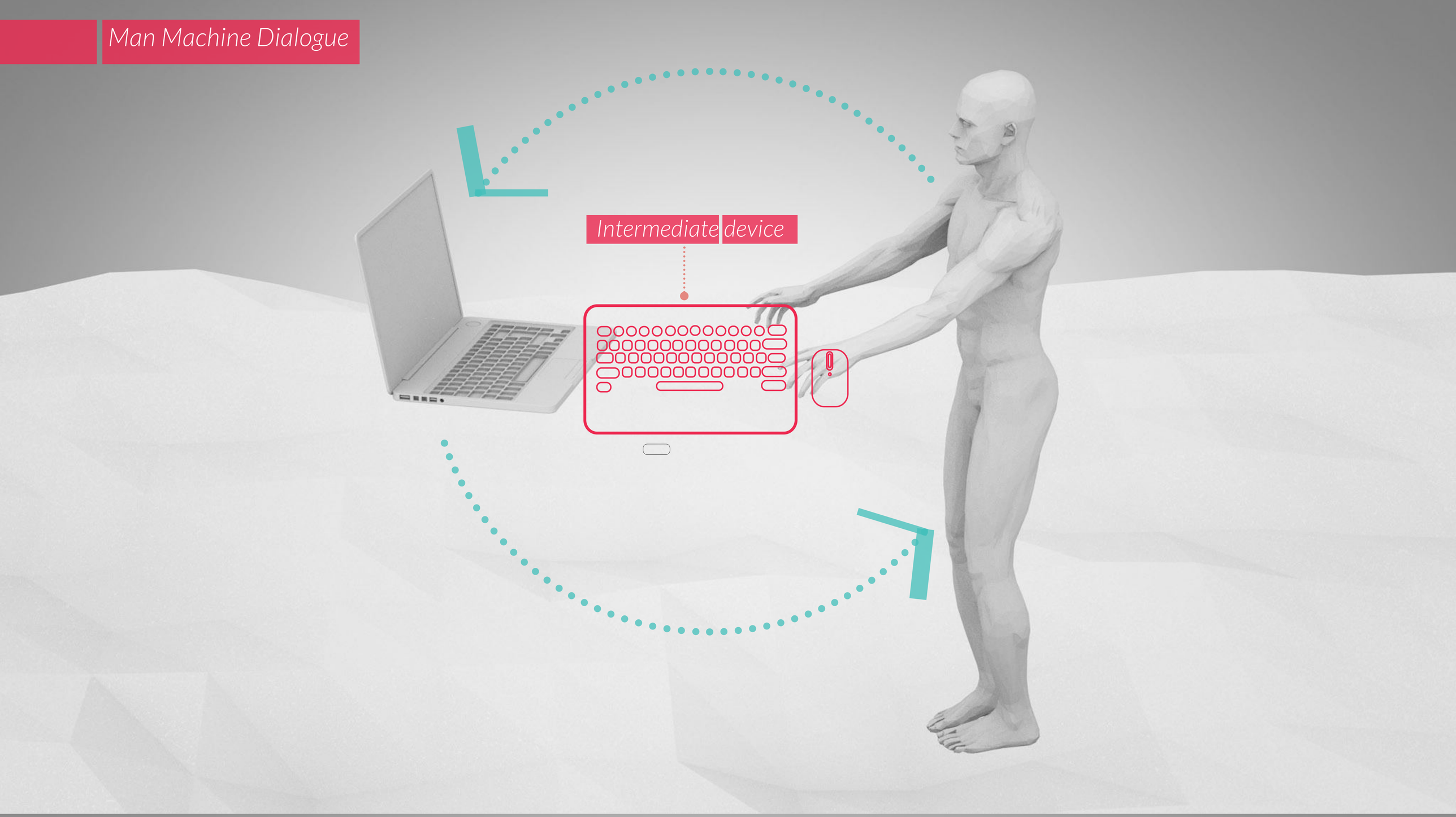
// Un/obtrusive

// Dis/appearance

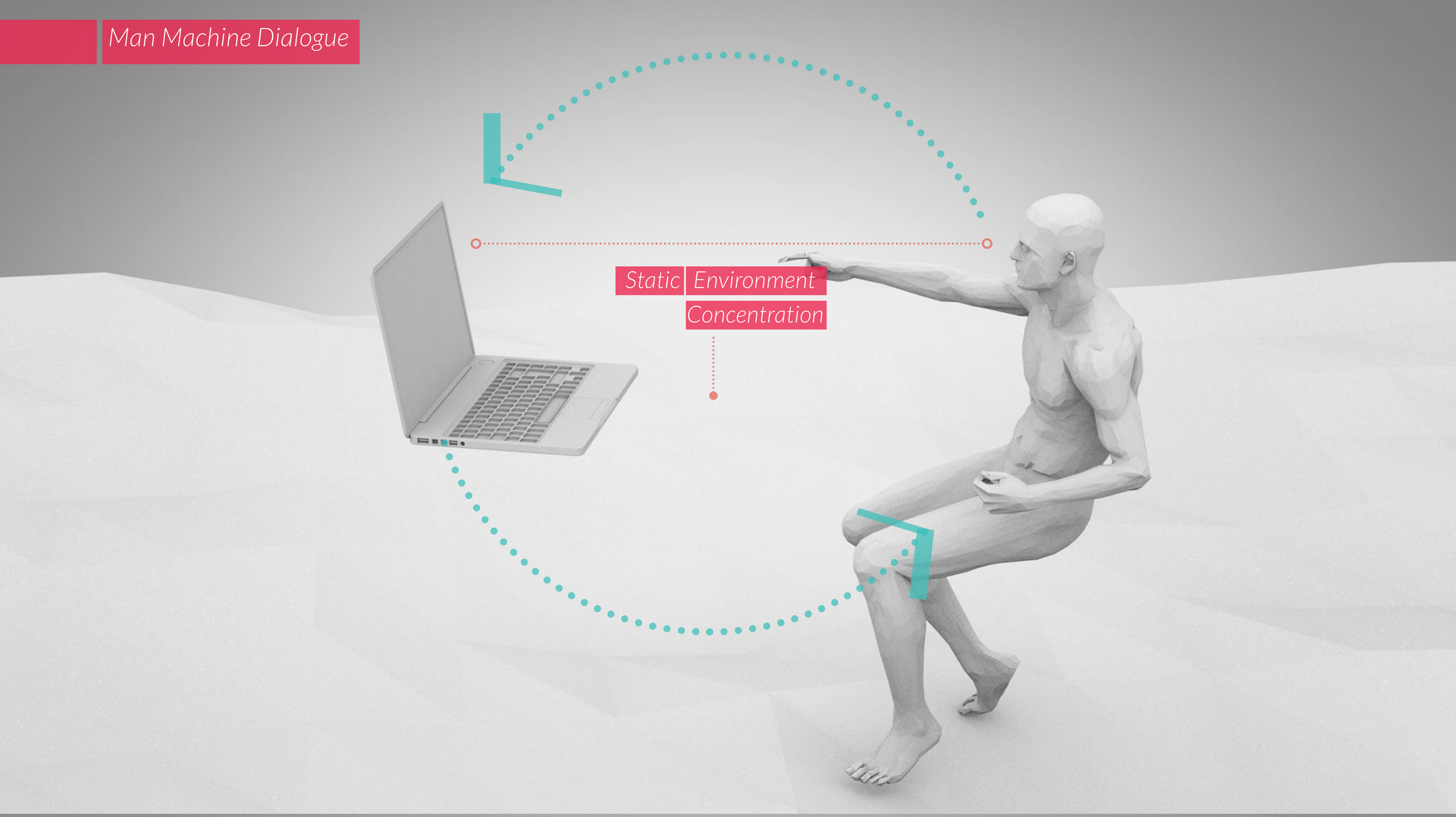
Man Machine Dialogue



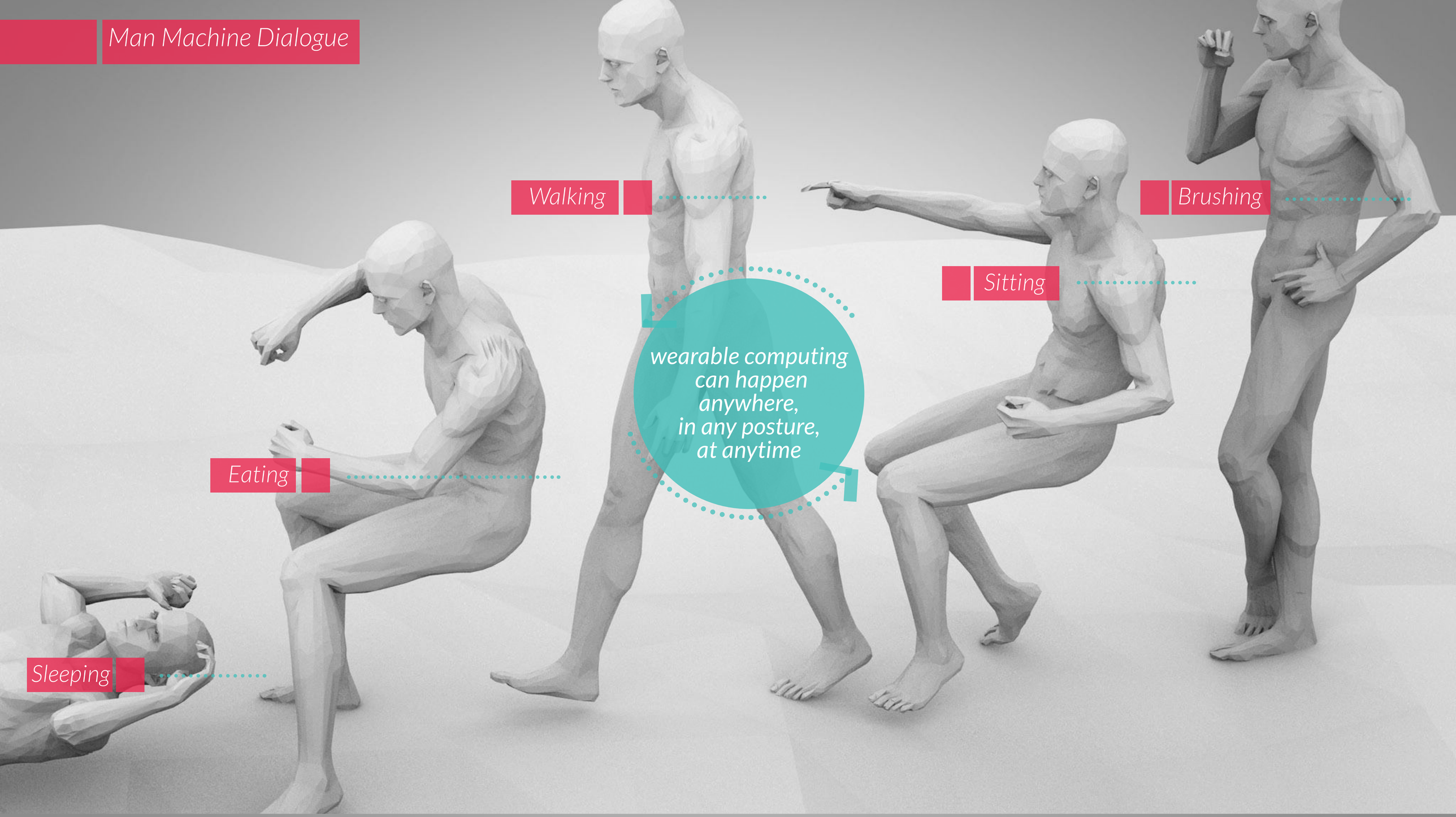
Man Machine Dialogue



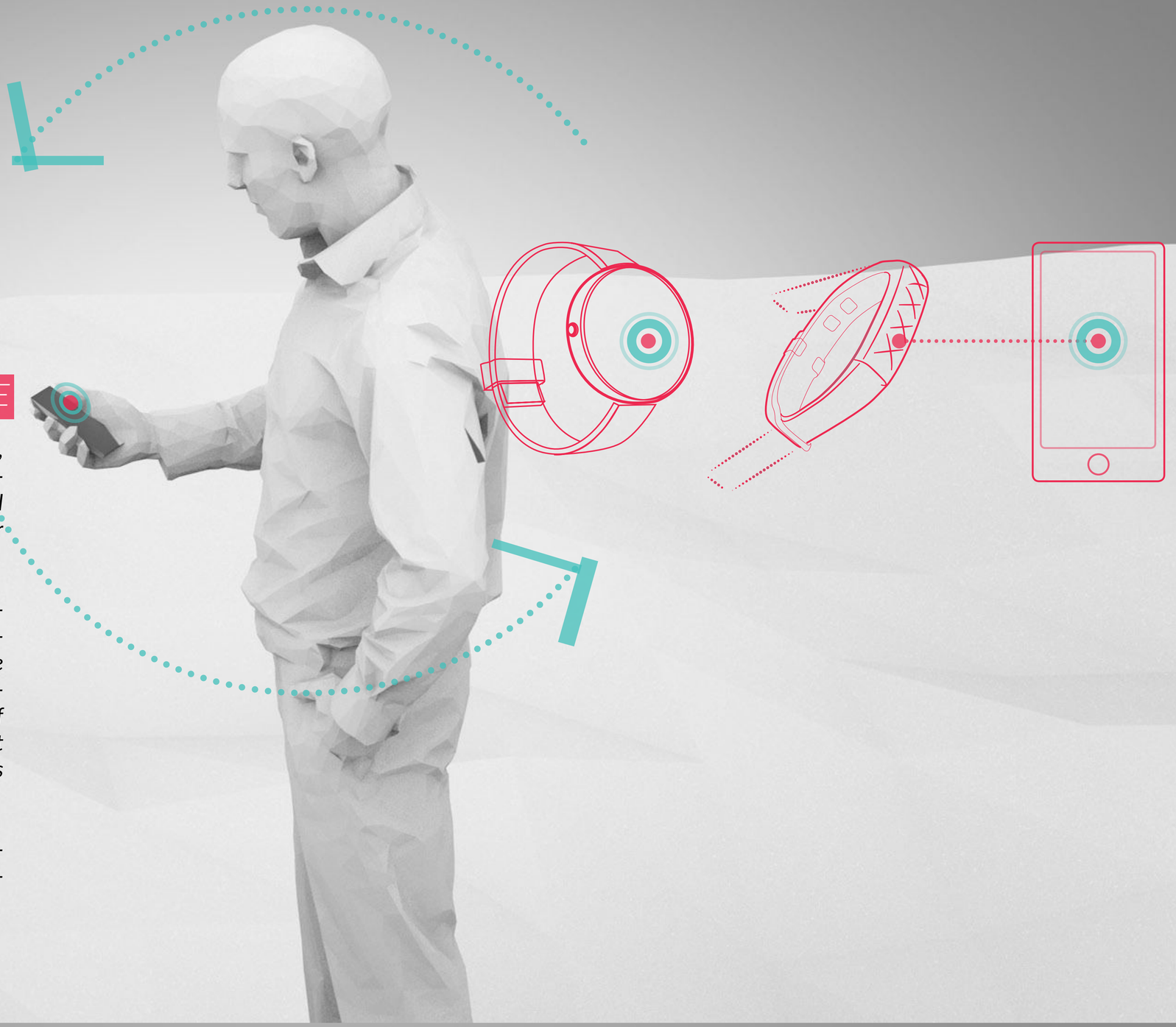
Man Machine Dialogue



Man Machine Dialogue



Man Machine Dialogue



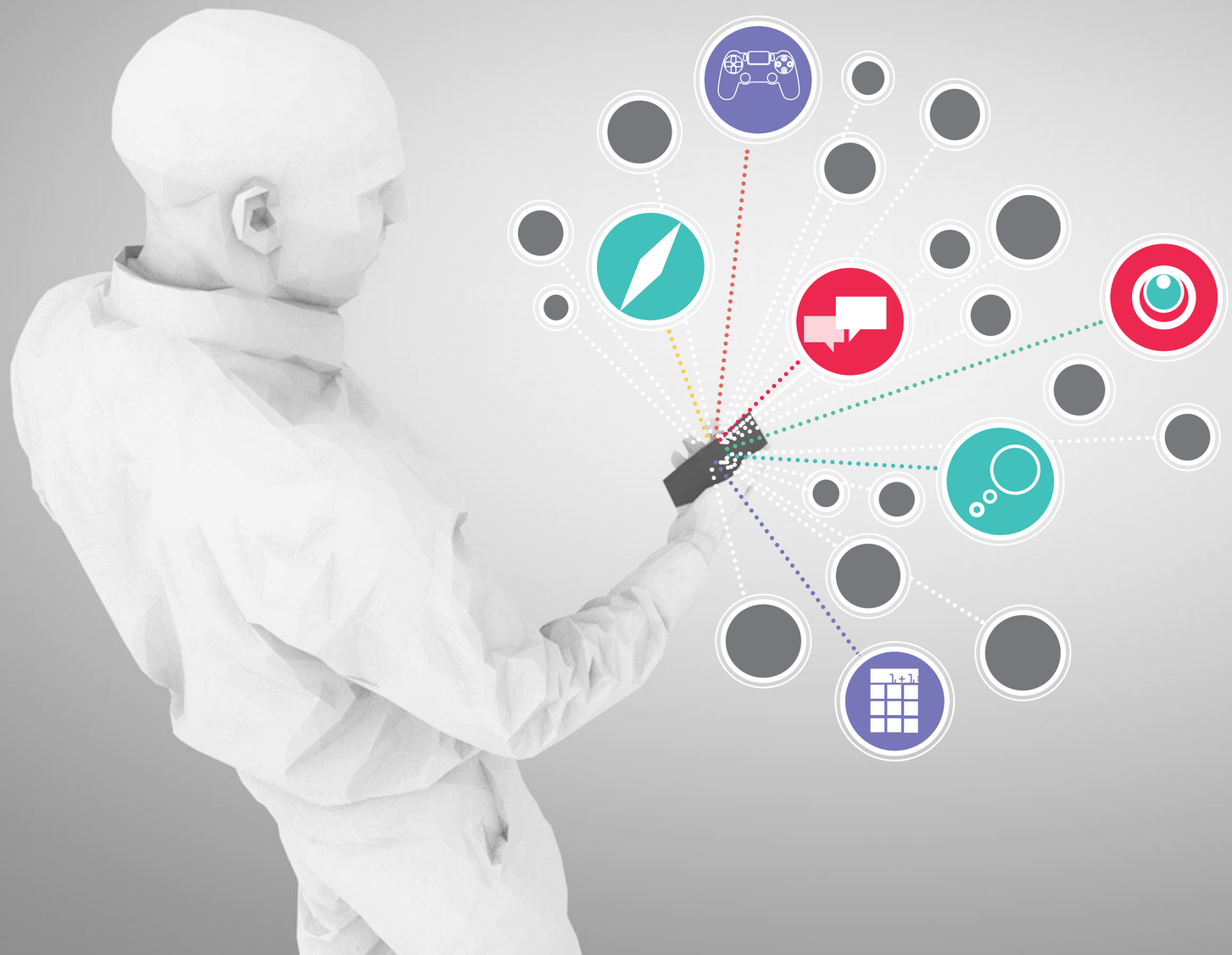
// Touchscreens Output/ Input is ONE

With the dawn of touchscreen enabled smartphones, the input and output device converged into a single slab. Smartphones didn't become a success until touchscreens became available, easy and precise for interacting in a limited space.

But even touchscreens fail to be practical for the wearable devices. the problem with toucschreen as interface devices are many, primarily they require all the attention of the user to them, leaving no room for other activity to happen. Becuase of the limited size of screens and fingers that operate on them, they cannot be successfully incorporated for Wearables devices which are small and tiny .

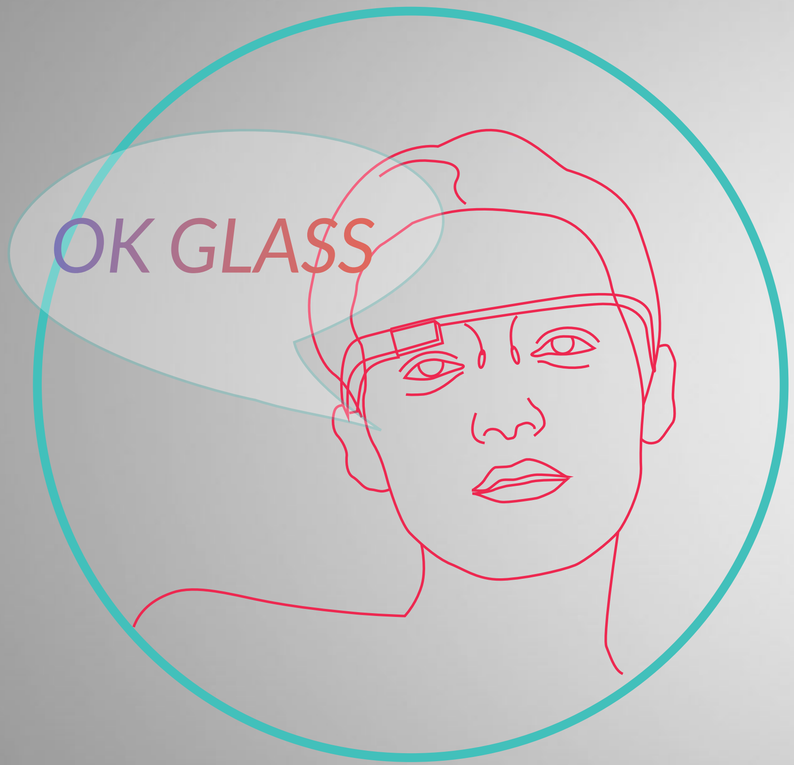
Still contempoary wearables are using these older interaction paradigms, leading to a dissapointing, limited and stale experience.

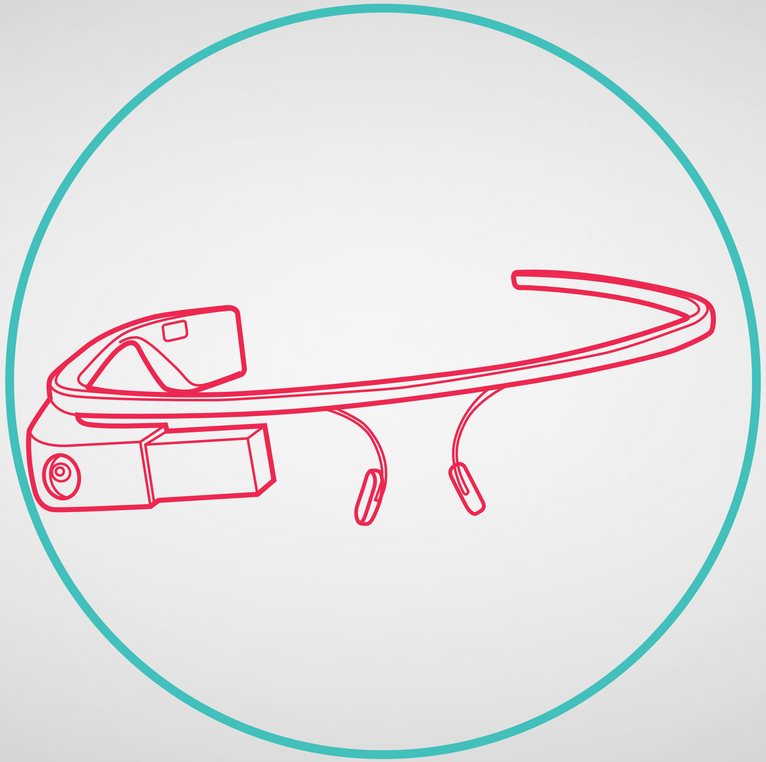
Man Machine Dialogue

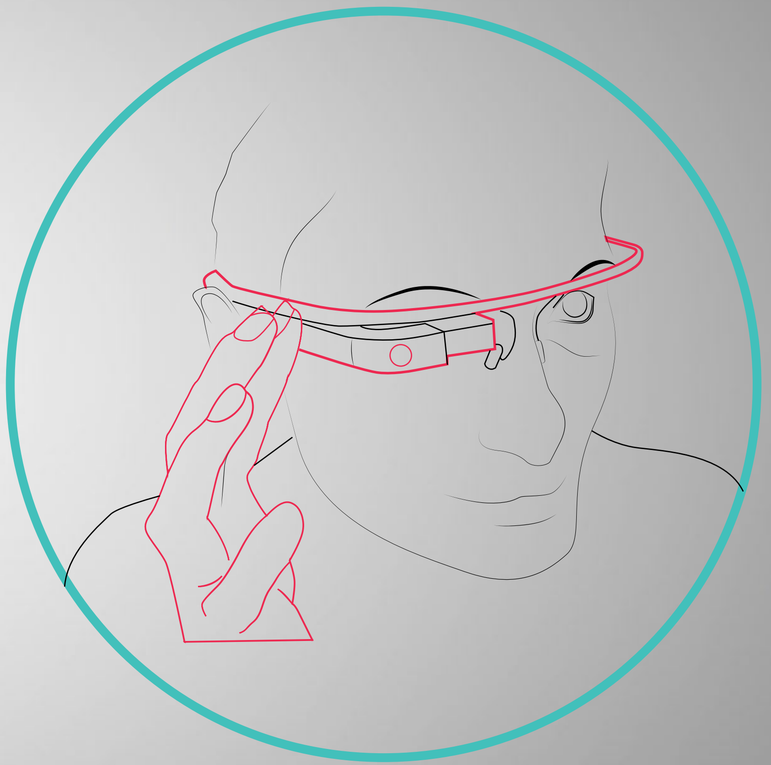


//Everything at Once

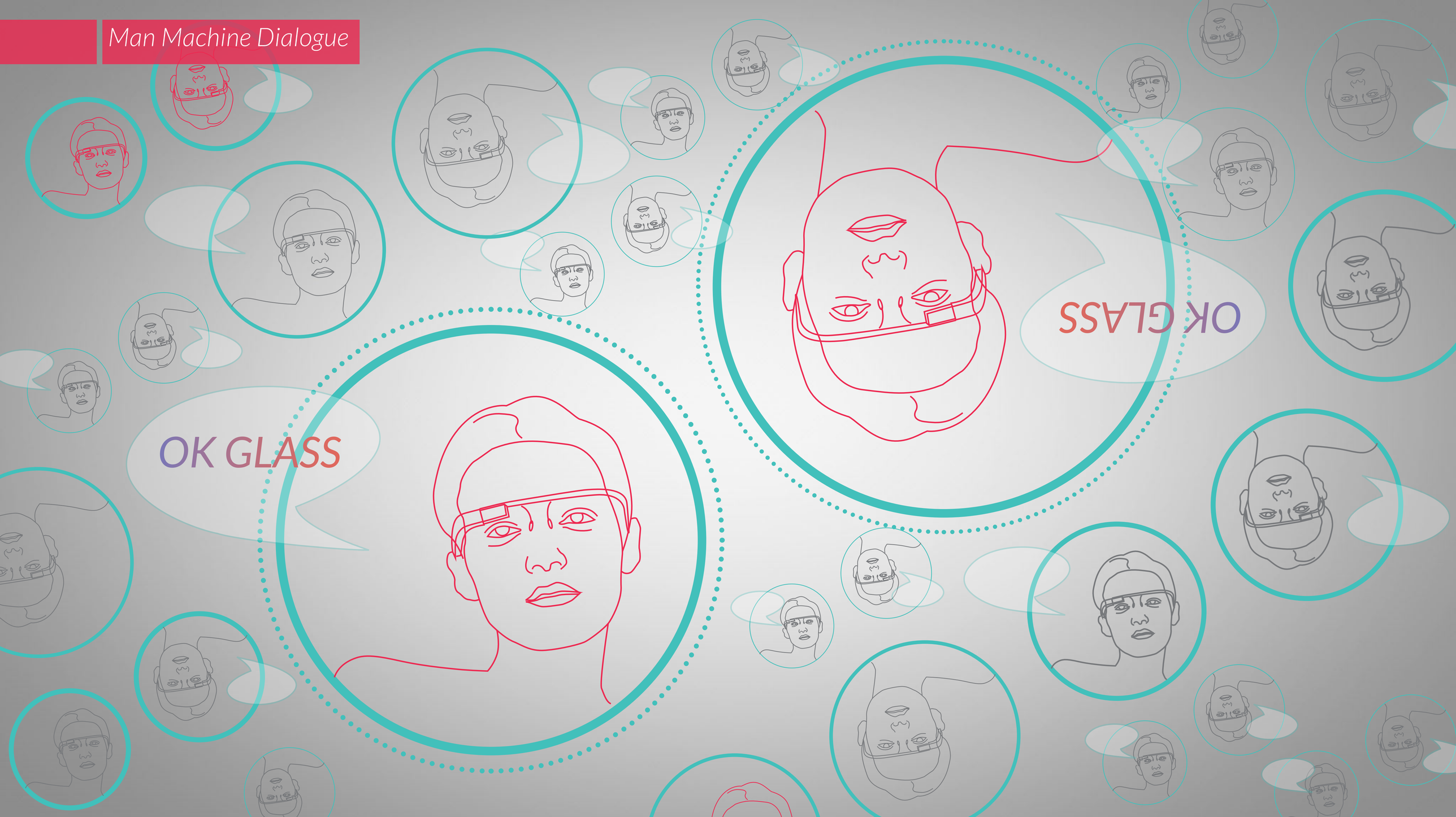
Man Machine Dialogue

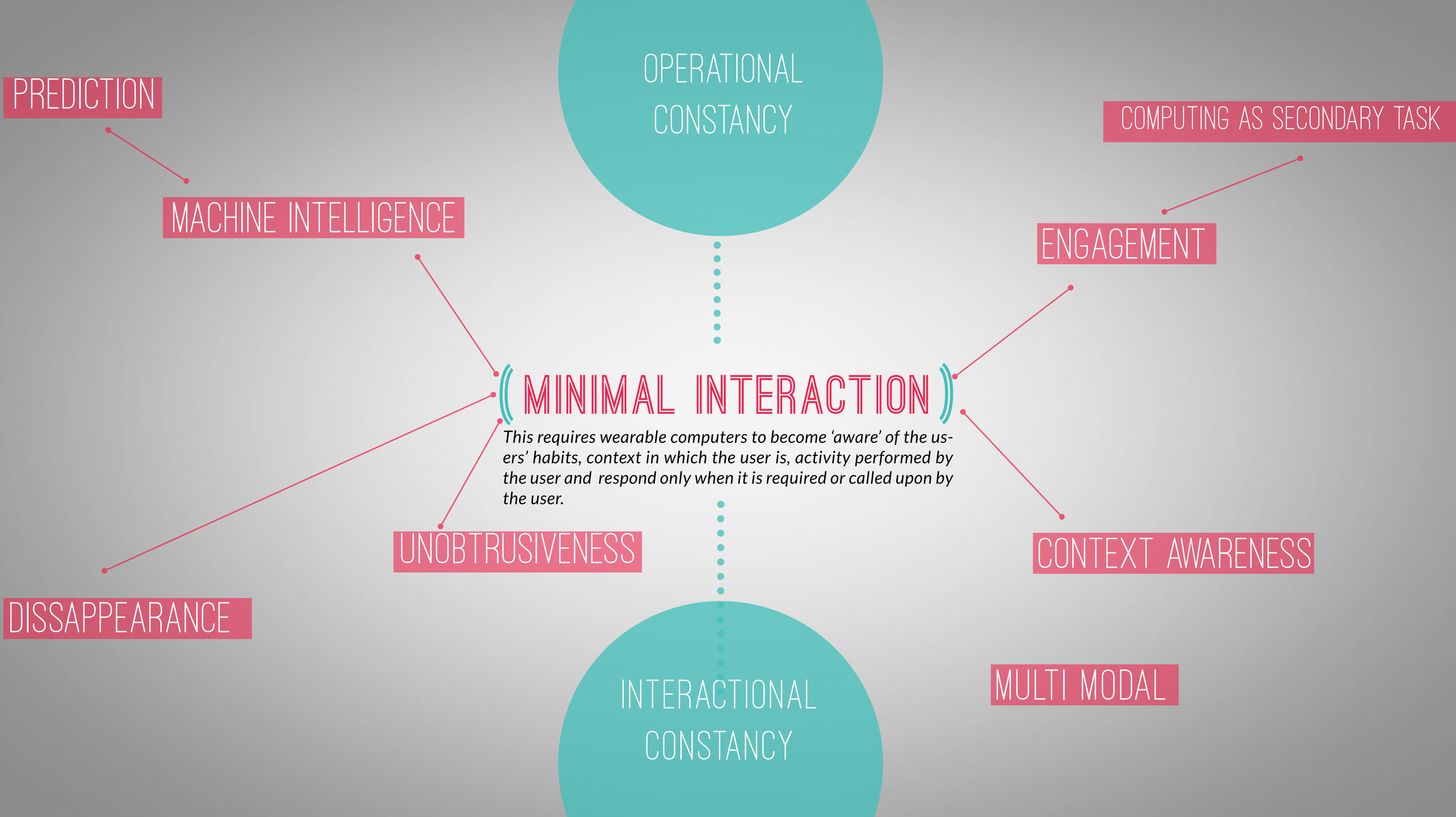




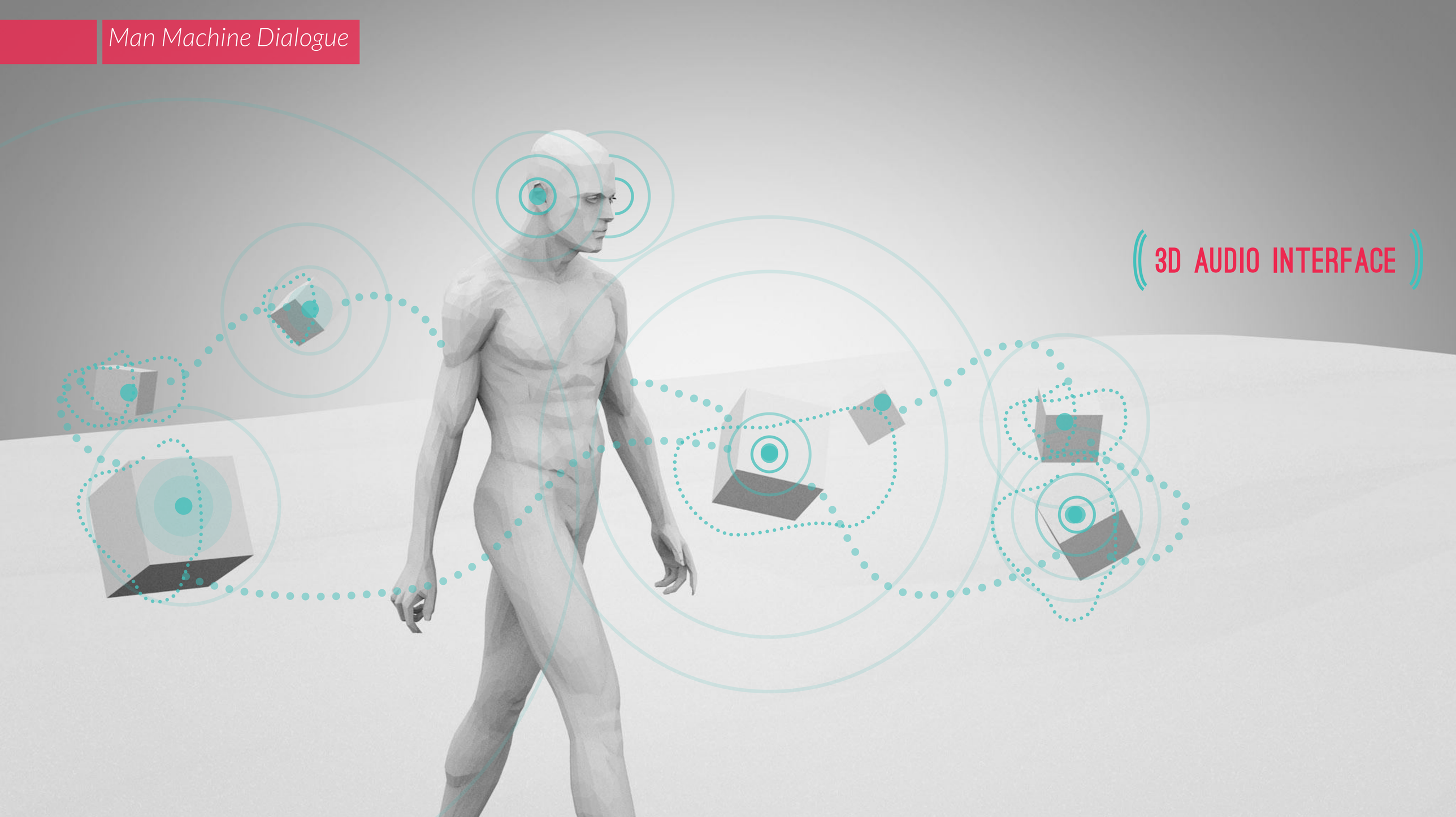


Man Machine Dialogue



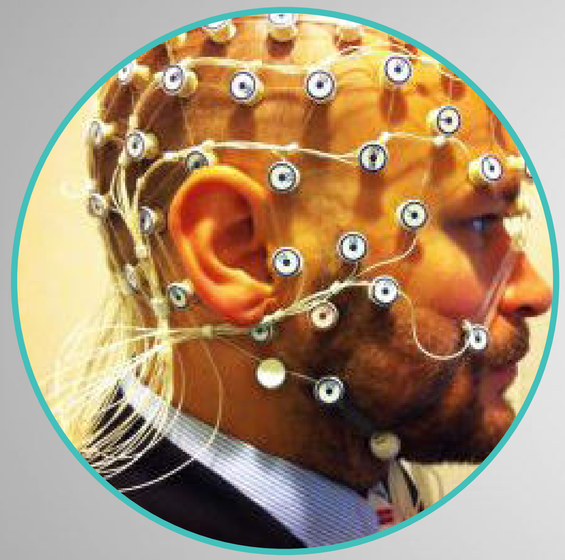

OPERATIONAL CONSTANCY
PREDICTION
MACHINE INTELLIGENCE
COMPUTING AS SECONDARY TASK
ENGAGEMENT
MINIMAL INTERACTION
This requires wearable computers to become 'aware' of the users' habits, context in which the user is, activity performed by the user and respond only when it is required or called upon by the user.
UNOBTRUSIVENESS
CONTEXT AWARENESS
DISSAPPEARANCE
MULTI MODAL
INTERACTIONAL CONSTANCY

Man Machine Dialogue

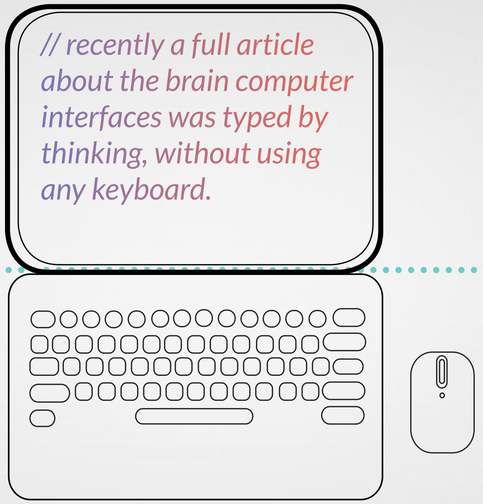


Man Machine Dialogue

Man Machine Dialogue



// recently a full article about the brain computer interfaces was typed by thinking, without using any keyboard.

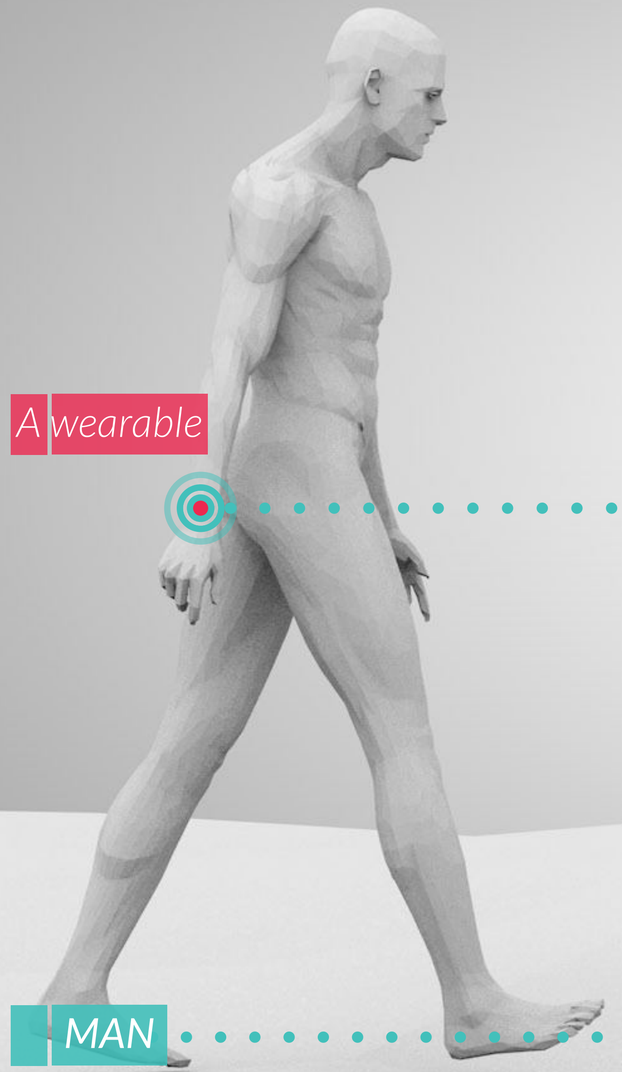


Man Machine Dialogue

//Digital Gateway

A wearable

Door Computer



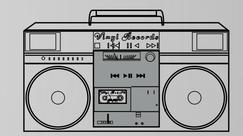
MAN

Machine

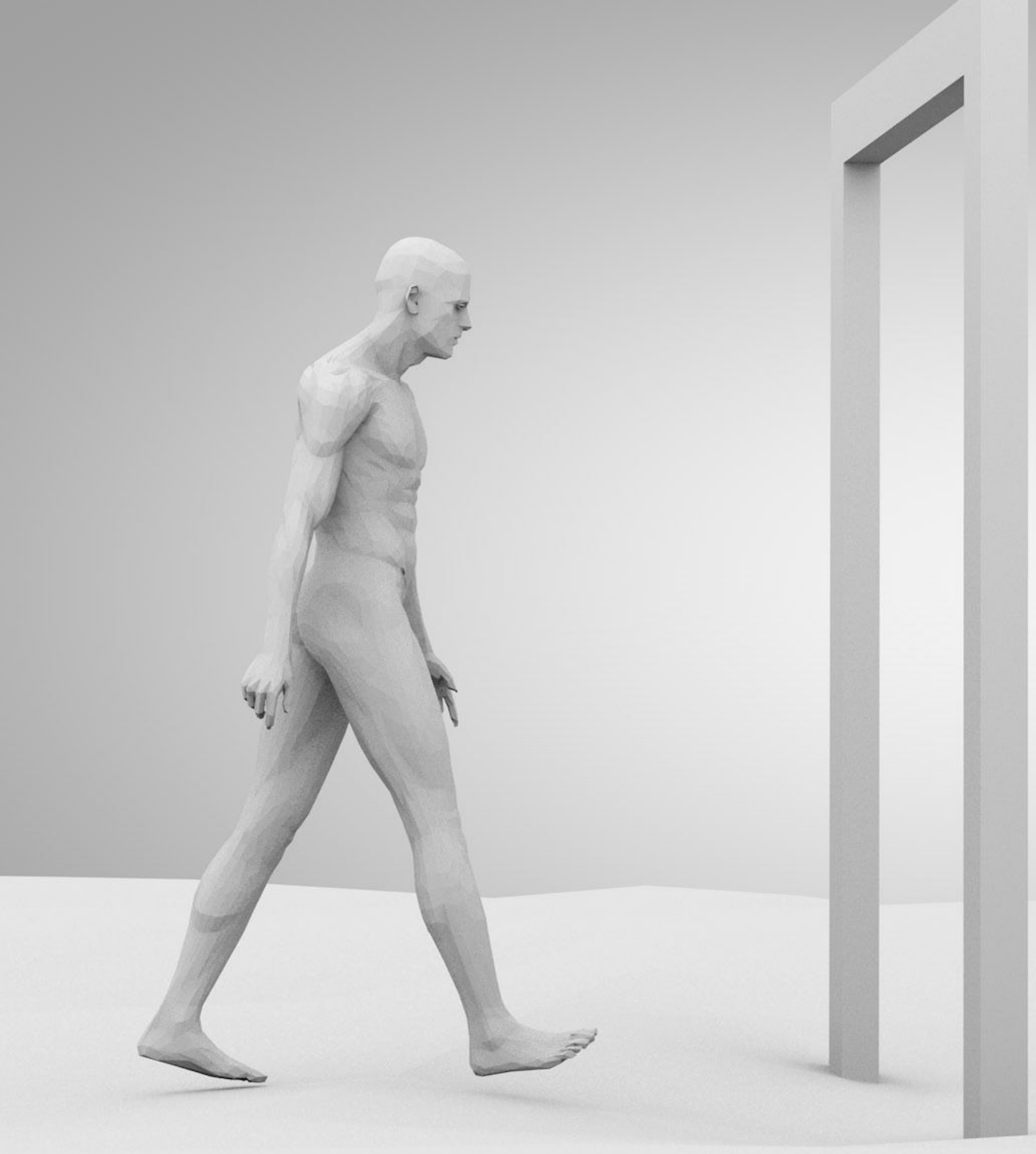
Machine

24°Celsius

20 new mails
Todays
Schedule



6000 K



The man and machines become one, and part of a singular system, and in order to achieve the perfect symbiosis, the interaction between the two needs to be natural, and with least possible friction and confusion.

Wearables cannot afford to use older ways of communicating with computers. Wearable cannot depend on just one mode of communication method. Humans use multiple ways to interact with each other, and communicate using more than one modes to do so.

Human Interactions are multi modal, we can be talking, gesturing, looking and drawing at the same time to communicate some idea to a friend. We might be engaging in all five senses while exchanging ideas and thoughts with each other.

This is the basis of natural interaction, and wearable computers need to understand and respond , enable and support this multi modal way of communicating. Wearable devices have the possibility of stimulating and talking to all our senses because they are placed on our bodies, and that should help wearable makers to grow beyond the screen which is extrememly dependant on just one sense, i.e. of vision. Other senses as input and output devices should be utilised.

//ADAPTATION

the human has to adapt himself, physically, cognitively and psychologically in order to learn and use that tool, in order to acheive the solution.

// Cognitive Acceptance

// Ease of Use

// Relative Usefulness

//Privacy

Society & Cultural Influence

Demogrpahics

//Insightful Mening

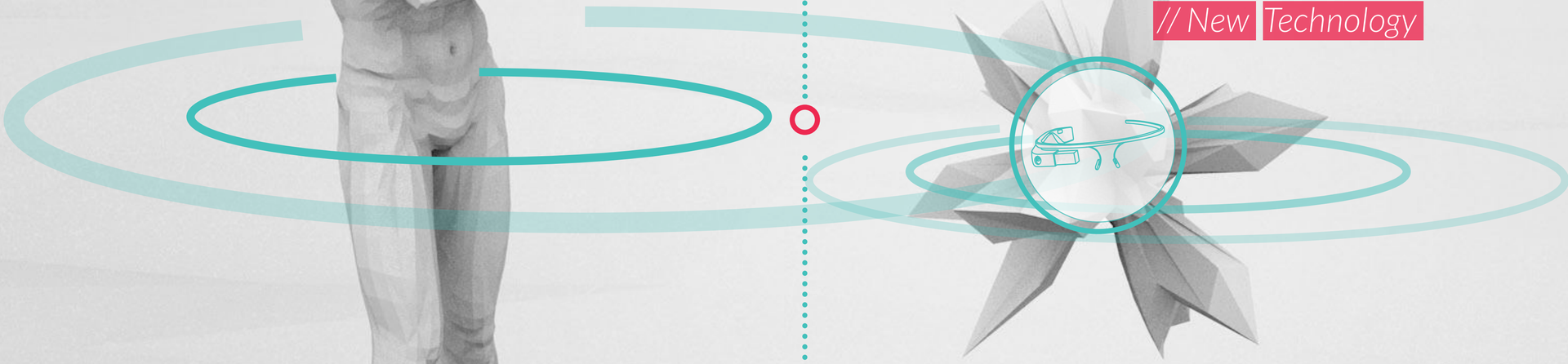
// Cognitive Acceptance

social

culture

//Stigmas

//Person

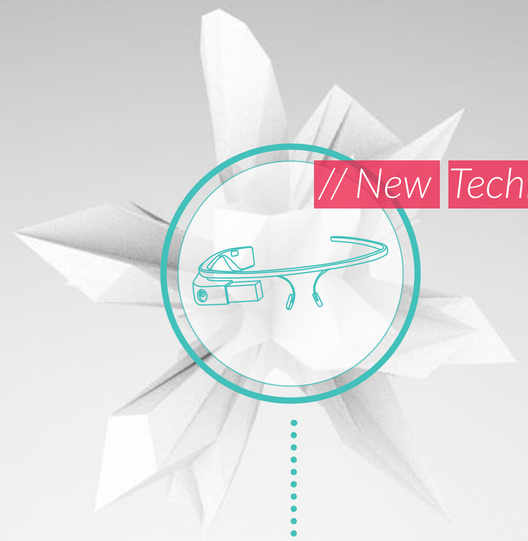


// New Technology

Hesitation

relative use

ease of use

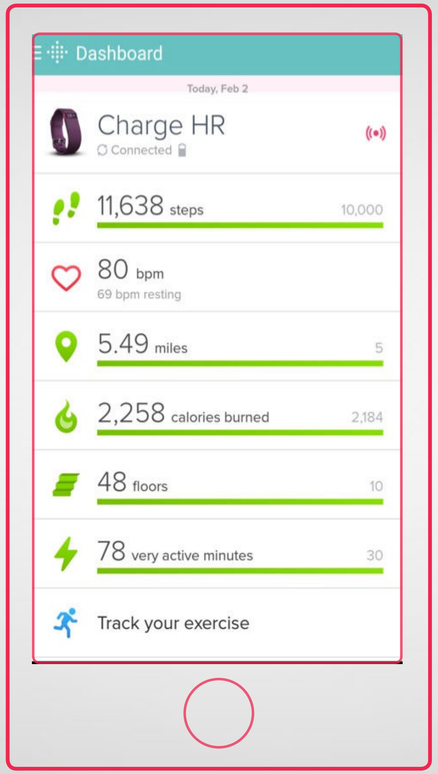


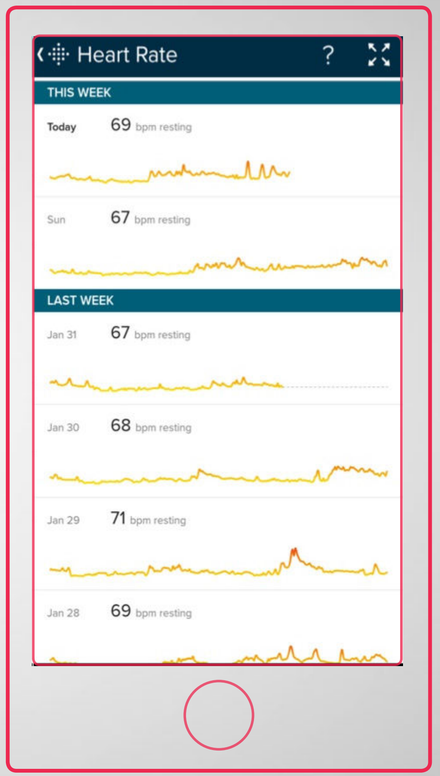
// New Technology

// RELATIVE ADVANTAGE

// COMPLEXITY

// COMPATIBILITY





Smartphone's own app was almost as accurate and the fitness tracker, in measuring the steps taken and calories burnt.

//A month with Fitness Tracker (fitbit Hr)

"A month with a fitness tracker revealed a simple truth, I actually do not need it. Yes it is an interesting way of tracking my calories and heart rate, but what do I do about it? It tells me I slept, and a little about the quality of sleep, it tells me the calories burned and kms walked, but all this information is something that I already have an idea about. Yes the tracker quantifies this information into nicely visualised number chart and makes me achieve a goal thereby making me feel good about self, but the novelty wears away soon."

A tiny touch screen is used for interactions with the device

//A week with Moto 360

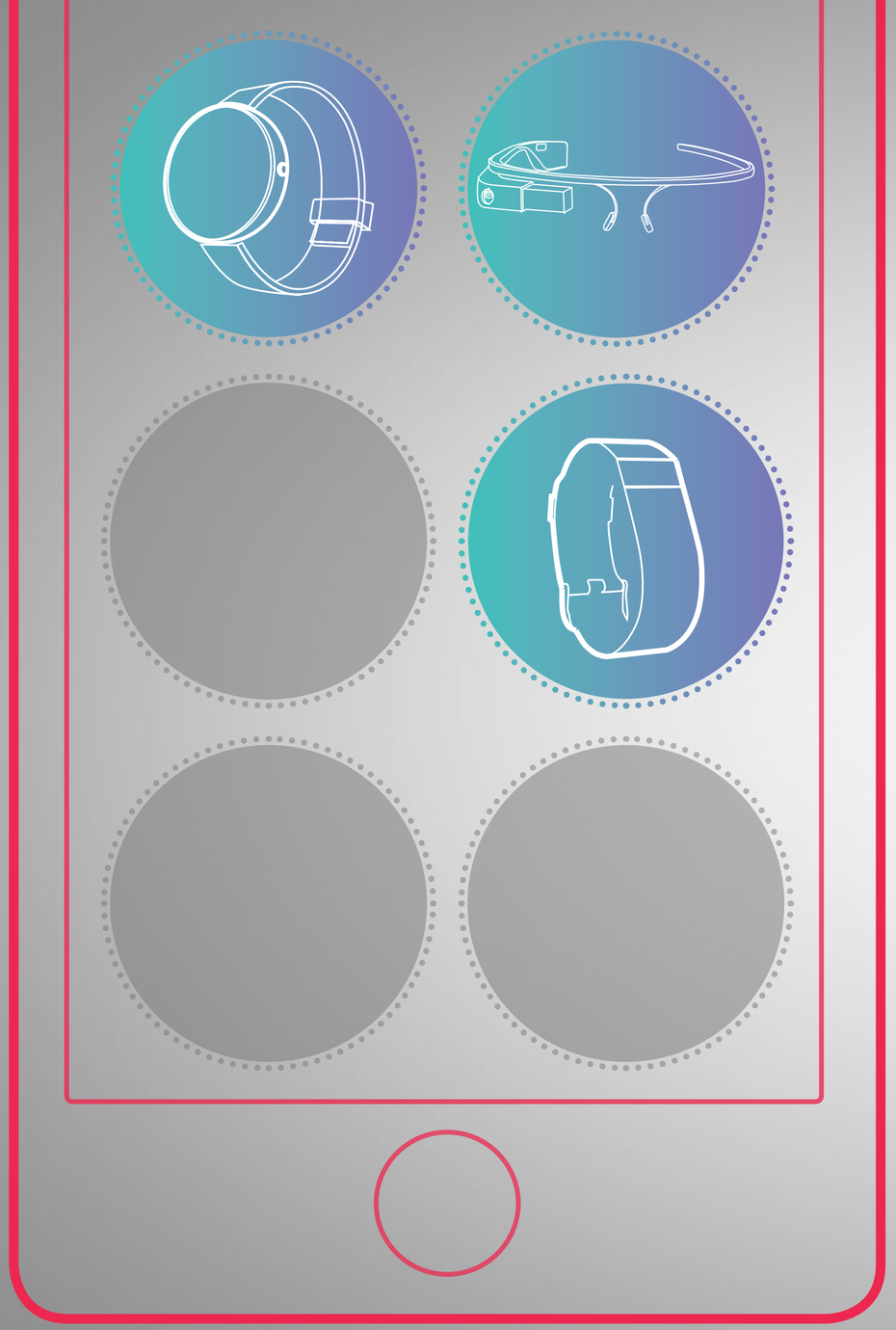
A week with Motorola 360 smartwatch did help me in reducing the number of times I took the phone out and the watch acted as a better way of following through my schedule and tasks. But there were a lot of times I had to end up taking the phone out, after fiddling with the watch for quite a few minutes to do a certain task (e.g. finding location on maps or replying to a message) At times I was confused whether I should just use the watch or take my phone out for a better experience, and i ended up usingboth. It was a mixed experience and eventually I didn't miss the watch much except for rare moments when I couldn't take my phone out because of the disruption it might cause in current activity.

//Two Days with Google Glass

Google's Glass is another device that tries to repeat the functions of a phone in order to make them available for instant consumption reducing the lag of taking the phone out, typing the password hundred times a day. Having critical information right in your visual field is definitely welcome, but the point is what defines critical information? The experience of navigating through real world guided by maps is seamless & fabulous on Glass,

//Two Days with Google Glass

but a constant array of notifications of Facebook statuses which tells me what my friend is having for lunch, is not. Once in a while I do see a important message or call that I was waiting for, but there is a lot of noise for that. And that's where google Glass fails. It depends heavily on smartphone & internet to be useful.



Appcessories

Wearables have to stop trying to become accessory to smart phones

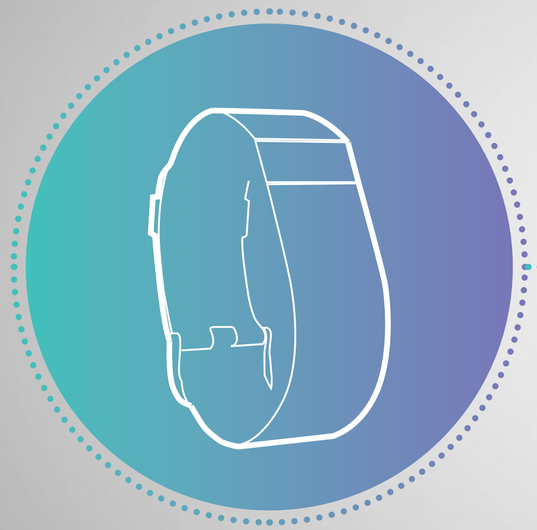
Wearables have to stop becoming phone repeaters, and if they do they have to be really useful.

Unnecessary Devices

Why wear a device to monitor your sleep? , when your sensor enabled pillow/mattress can do it. Why wear a device to correct your posture when the chair you sit upon can track it and correct it. Why use a fitness tracker when my smartphone can pretty much do it?

Wearable devices need to find specialised areas and scenarios which require the object to be worn on the body in order to function, and not unnecessarily burden the body.

Abraham Marslow laid out the extent of human needs in an hierarchal order, in his theory of human motivation. It is interesting to look at this hierarchy to understand how humans give importance to different needs. The marlsows pyramid places physiological needs at the bottom indicating that these are the most basic needs for a human.



health

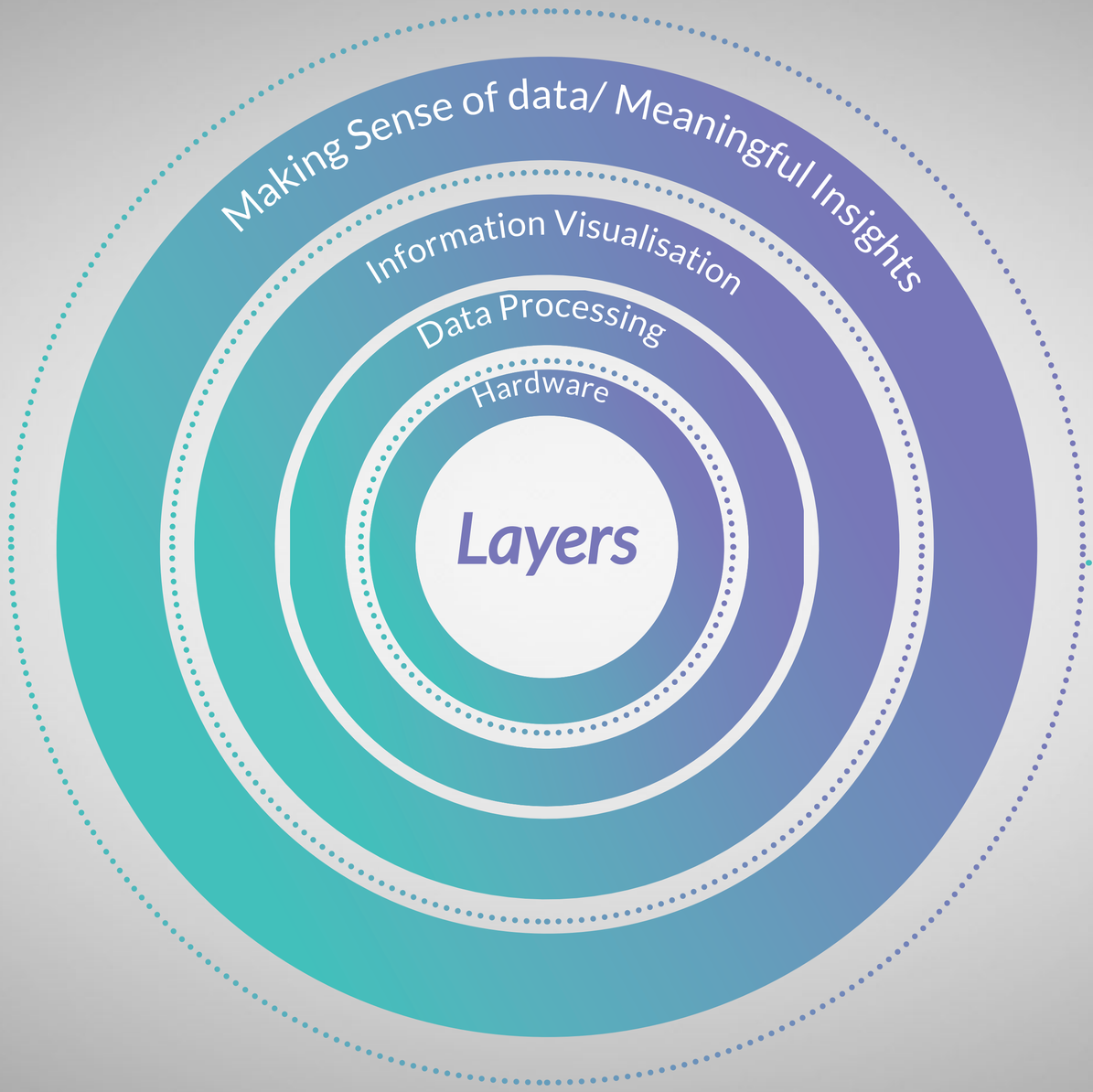
physiological need

safety & security

?

Why fitness wearables fail then?

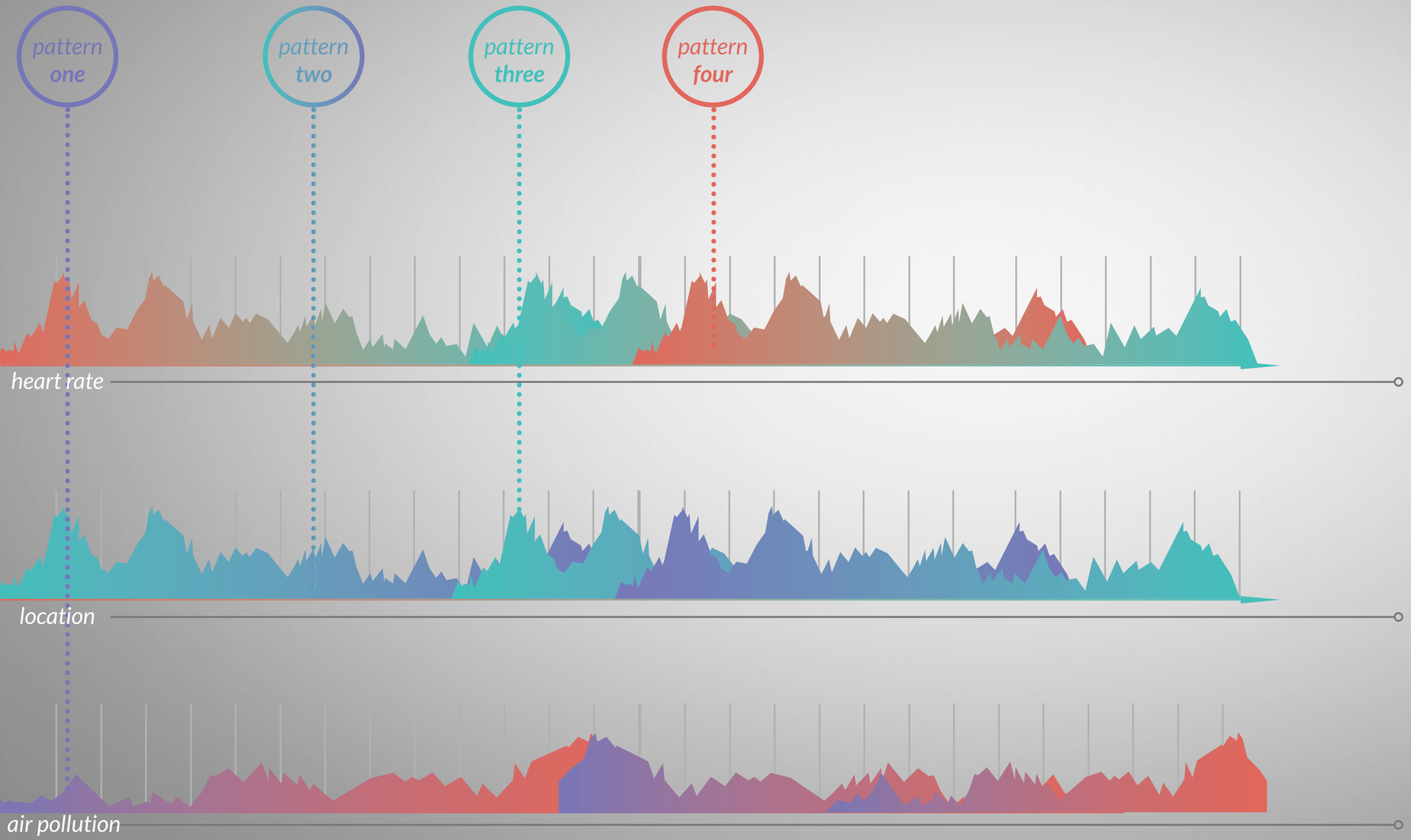
Fitness trackers seem to cater to the need of health safety and even the physiological needs, both of them being the basic needs but still have not managed to capture the imagination of people. Is there something else that is causing fitness trackers to fail? On a careful observation it is revealed that though fitness trackers have the potential to cater to deeper needs, their under explored capability has caused them to become accessories rather than important devices. The reason is that these trackers are not providing the users with meaningful information,



To make this data make more sense and cater to deeper need of health safety, there needs to be another layer to this system, i.e. the action taking layer. "This is the information presented in a context, in such a way where it would be obvious and intuitive which actions to take as a result of seeing the information"

"This is the information presented in a context, in such a way where it would be obvious and intuitive which actions to take as a result of seeing the information"
Melanie swan

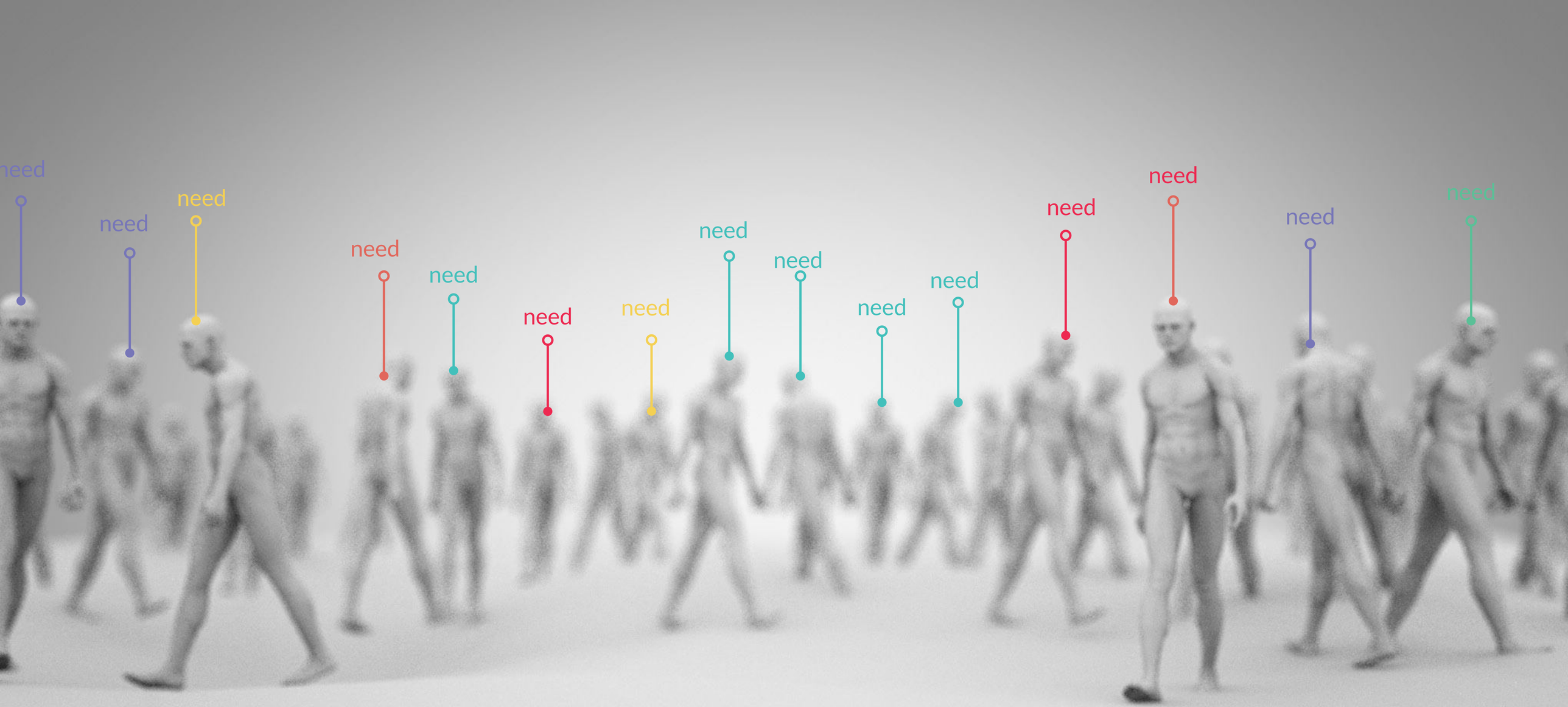
HIGH RESOLUTION DATA



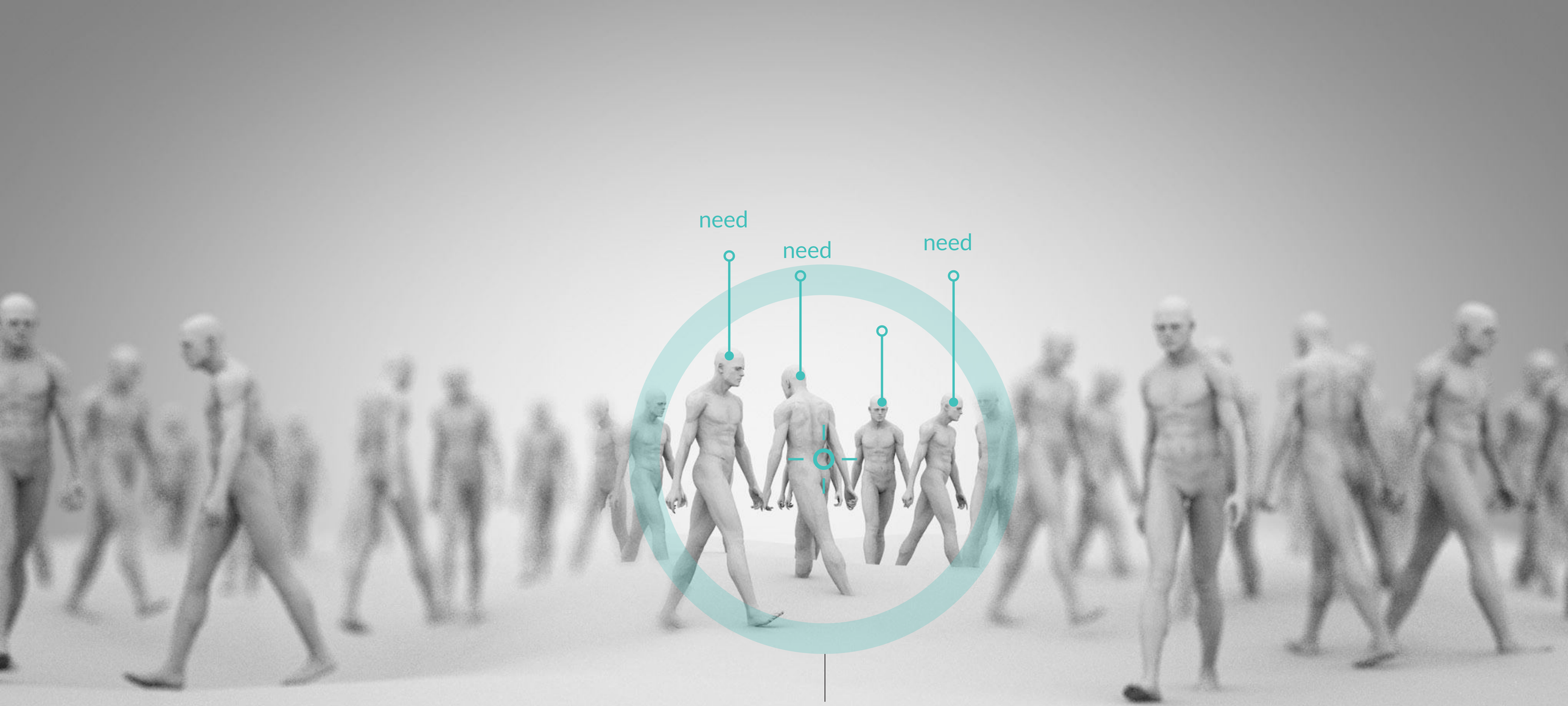
With wearables it is possible to get data from thousands and possibly millions of users continuously for days and months,which can be recorded and used to find patterns. These patters can be anaylsed by doctors/scientists/psychologists to understand the sleep, health condiotions, habits & behaviors, preferences and choices etc which can provide a deep insight into finding and imporivng the lifestyle choices we make, to live better healtheir and happier lives. In case of an epidemic this data can help to understand the way and spread of the contagious disease and control it informatively. Consider a wearable device which can analyse the pollution levels of air and water. Collecting data from all the users throughout an area will give a high resoltion map of the conditions and hence initiating proper action to combat that.

All this data has to make such sense, to tell personalized stories to individuals, to researchers, about themselves, their health, their state of being, their towns state of being. This is possible by understanding this data, finding patterns through algorithms, research and observation. Based on this layer, the devices can help in predicting the future health condition based on current habits and body condition. This will help in preventing diseases before they occur.

"Owners of wearable technology, like the upcoming Apple Watch or Microsoft Band, are the most vital part of the product ecosystem because they generate valuable information each time they wear their devices. Yet they also pay for the privilege. Brands should rethink their value proposition, make wearable devices free, and monetize the data, or risk losing out on the possibility of mass-market adoption."



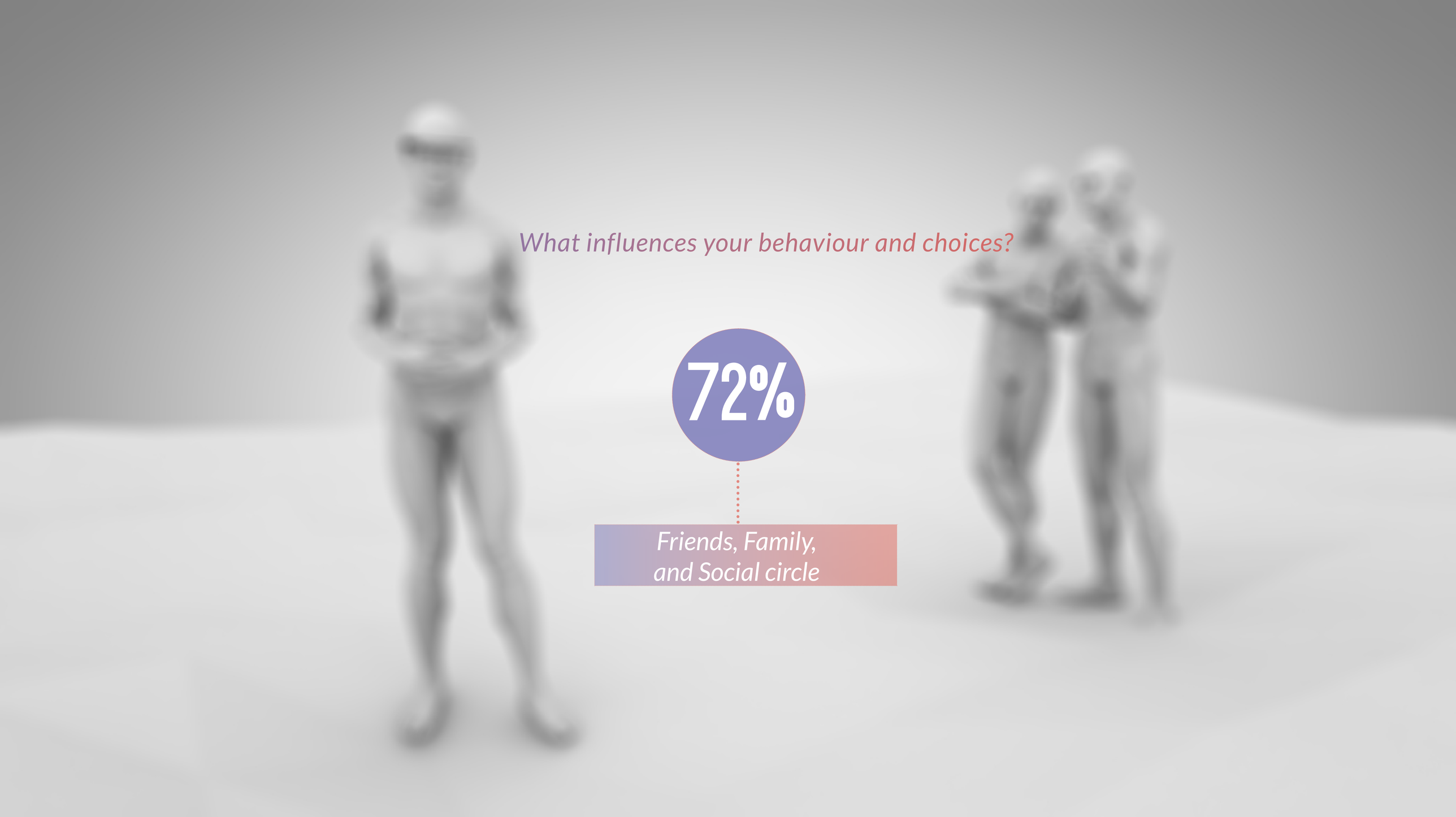
Another approach, for wearable devices is to create products for usage and needs of a specific set of users and not for masses in general.



Catering to a specific set of users with a specific set of needs.This overcomes a lot of issues like fashion, all day wear and other things that stop people from accepting wearables

// Social & Cultural Acceptance

"The mounting of a device directly onto the body, in a constant-wear paradigm, necessarily includes the visual appearance of the device in the individual's displayed identity. Because of this, technological innovation in the form of body-worn devices must adhere to the methods and pace of social assimilation of other body-worn articles, such as apparel and accessories."
Lucy E. Dunne


What influences your behaviour and choices?
72%
Friends, Family,
and Social circle

Will you wear something that is considered 'uncool' & is not a part of your culture or accepted by people around you?

The BlueDouche Principle

Google Glass is banned
on these premises

Google Glass is banned on these premises

Have you taken pictures of somebody unknown on your cellphone without their information?

59% — *no*

26% — *yes*

11% — *yes, part of job*

Google Glass is banned on these premises

Do you feel uncomfortable with cellphones if you are recorded in any way (picture/video/audio)?

48%

NO, but only if they are told and agree to it.

33%

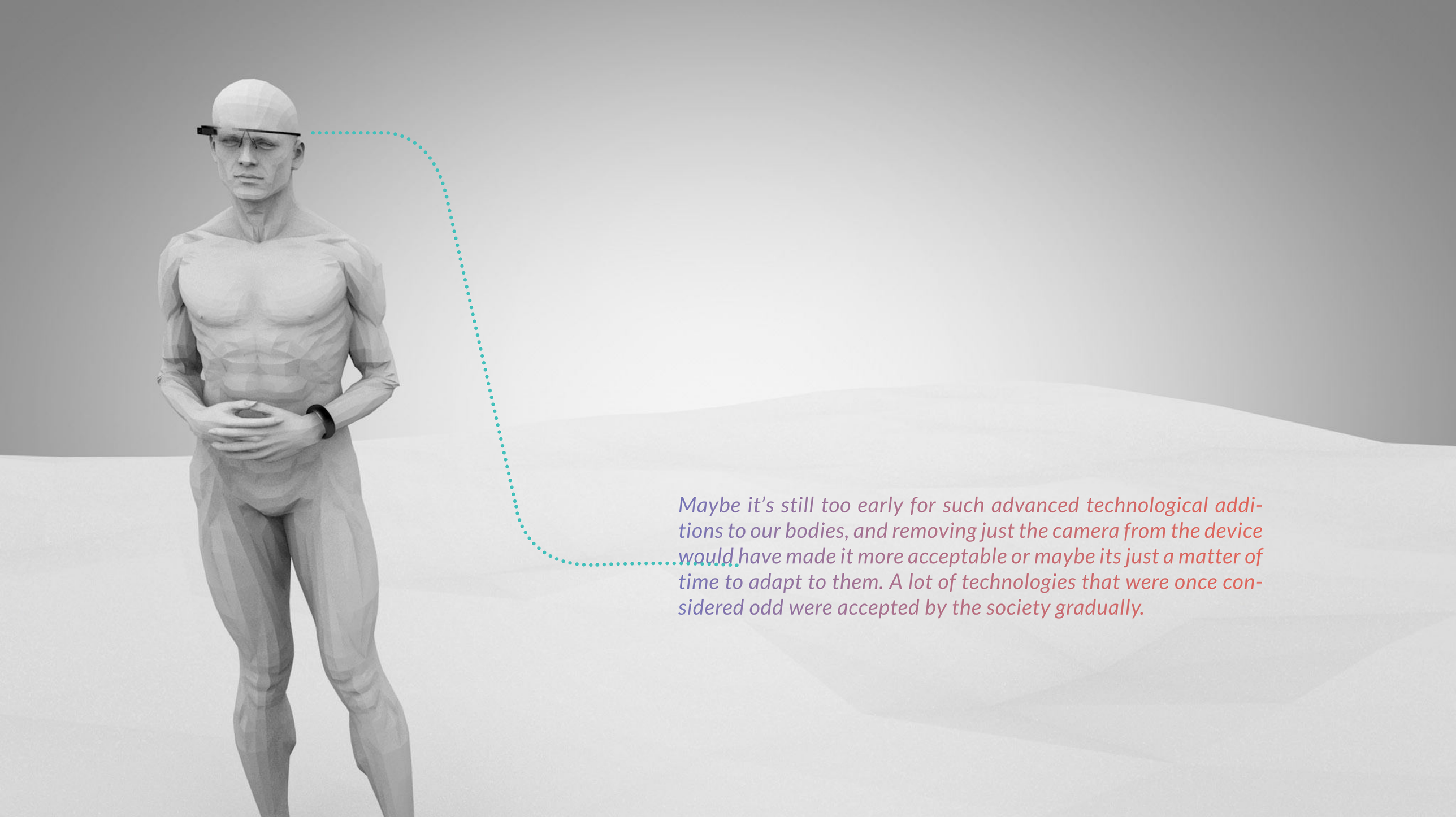
Yes, even if they are told and have agreed upon

15%

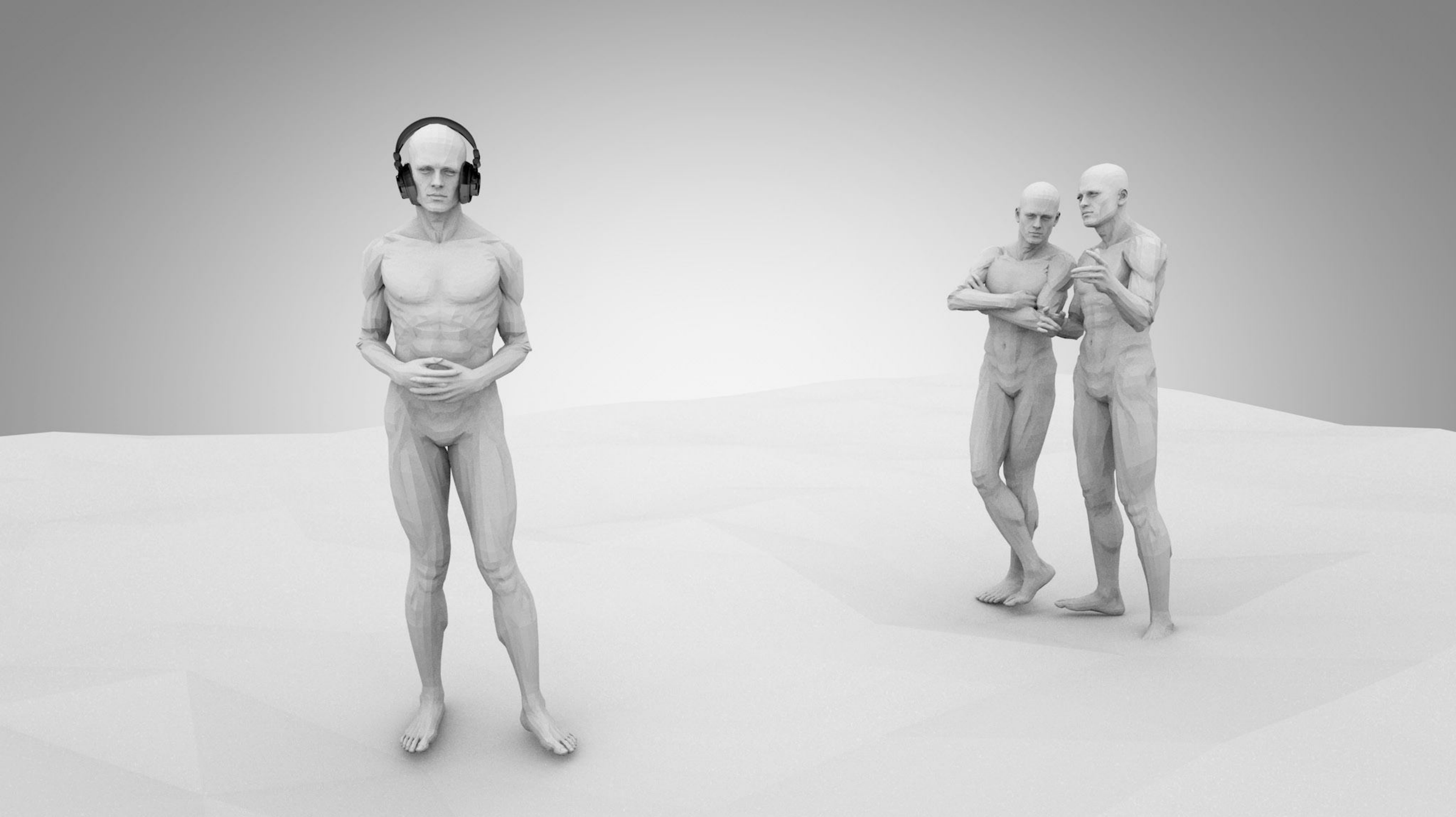
hate being recorded at all, in any form .

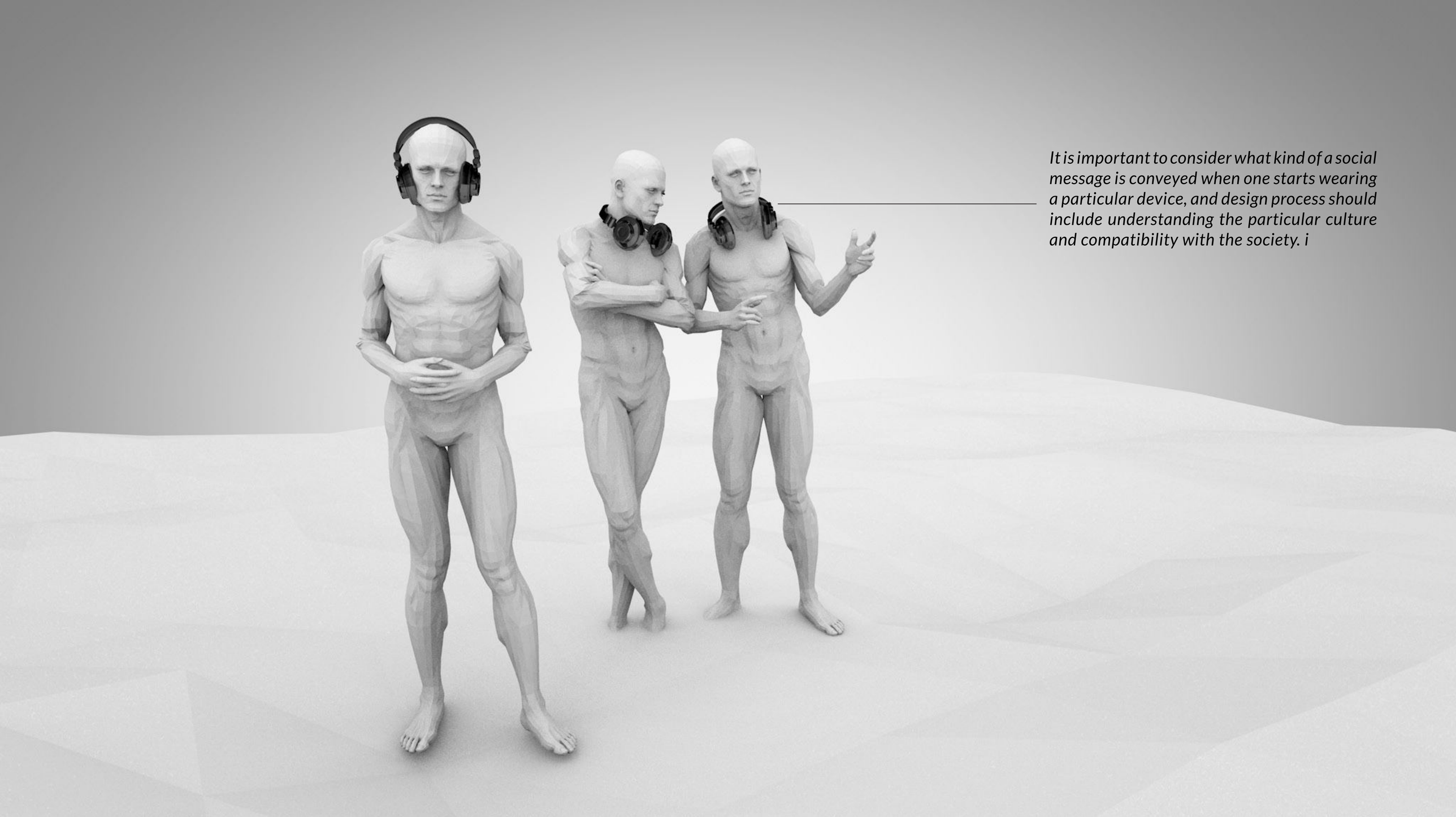
4%

i dont care



Maybe it's still too early for such advanced technological additions to our bodies, and removing just the camera from the device would have made it more acceptable or maybe its just a matter of time to adapt to them. A lot of technologies that were once considered odd were accepted by the society gradually.





It is important to consider what kind of a social message is conveyed when one starts wearing a particular device, and design process should include understanding the particular culture and compatibility with the society. i

CONCLUSIONS HOW WEARABLE COMPUTERS

Understanding problems plaguing wearable devices today, following observations and directions can be utilised for development of wearable computing devices :

// Ultimately, invisibles rather than wearables will cause mass acceptance of such products, by overcoming various stigmas that come up when a device becomes a visible addition to the body.

// Till then, Wearables need to disguise as daily wear accessories and must consider the fashion aspect, giving choices of colour, style and sizes.

// Modularity of device and clothing will help in allowing more choices with the same tech.

//Body has a limited space , wearable devices should not cater to just a few parts of the body. They need not compete but supplement each other. Selection of alternative suitable position son a body for better and easier performance should be considered.

// Durability , Price and Life Cycle of products that become a part of smart clothing should be considered

//Technology still needs to overcome a lot of factors, battery capacity needs to be improved and so are the alternative technologies for interfacing with wearable devices.

//Wearable devices need to stop using older computing interface paradigms such as touch screens. They need to enable Multi Modal, multi sensory interaction, with the device. The interactions have to be minimal, devices have to become context aware, taking attention when user wants to or it is deemed ipmortant

//Alternative interaction methods using sense of touch, audio, smell and direct brain elecrical activity (Brain Computer Interfaces) should be developed and utilised.

//Devices should communicate to each other and able to understand and colloborate with each other in order to reduce repetition of functions and also to create a more aware and repsonisve environment of use for the user.

//Wearables should stop becoming Phone Repeaters, if they had to do so, they should make the functionality so that there is no confusion of use between phone and the device, and there is perceptible advantage over the phones.

//Wearable devices gather a lot of data but doesnt make any sense of that data. This data should be put to pattern recognition and anamoly detection algorithms to discover interesting and meaningful insights which cause the user to take an Action.

//Everybody has unique charateristics and their preferences, needs and wishes which might make it really difficult to create one device that suits all. That may be possible probably only when technology matures and becomes invisible inside our clothes and skin completely. It is useful to think of specific users and target thier specialised needs. Give these users a huge relative advantage over existing tools and methods and the wearable products will see success.

//Due to the wide variety of culture and social norms, wearble devices should try to create designs that are repsonsive to these two factors. It is important to consider what kind of a social message is conveyed when one starts wearing a particular device, One product for people all around the world wont work, and before targetting the users, their social and cultural stigmas about clothing and technology needs to be understood.

// Wearable devices need to find specialised areas and scenarios which require the object to be worn on the body in order to function, and not unnecessarily burden the body.

EXPERIMENT

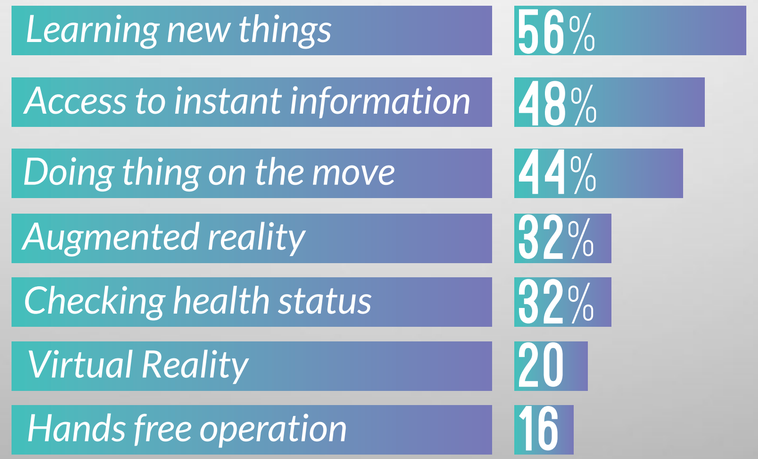
AIMS

to experiment with an idea about a product which embodies the insights from the research.

The idea should be demonstrated to a few users to guage their interest and feasability of the product.

Q1

What could be the most amazing use of the wearables?



Q2

Have you ever thought of a certain tool/object that you-wished/wanted you could have possibly carried with you all the time? Or worn it?

shoes that change according to the ground. Becomes like a trekking shoe ,floater or a rock climbing shoe or slippers when required."

i would like to wear a t shirt that changes its graphics to my own or selectable illustrations

a solar cell bag or clothes which can charge gadgets on the move

a device that can help me remember names

a portable xray/ mri scanner

something that helps me in my creativity

I wish I could carry a device which captures as I draw in my mind and then save it...

something which can capture my thoughts, ideas and colours and wildest of imagination, before it fades away from my limited accessible memory

"Something that gives me real time data of health and nutrition"

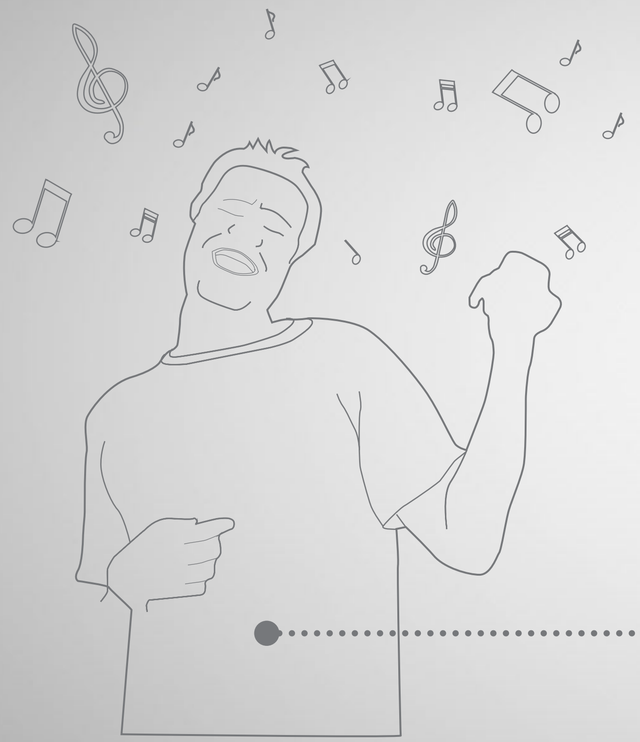
a portable piano

my camera with all the lenses

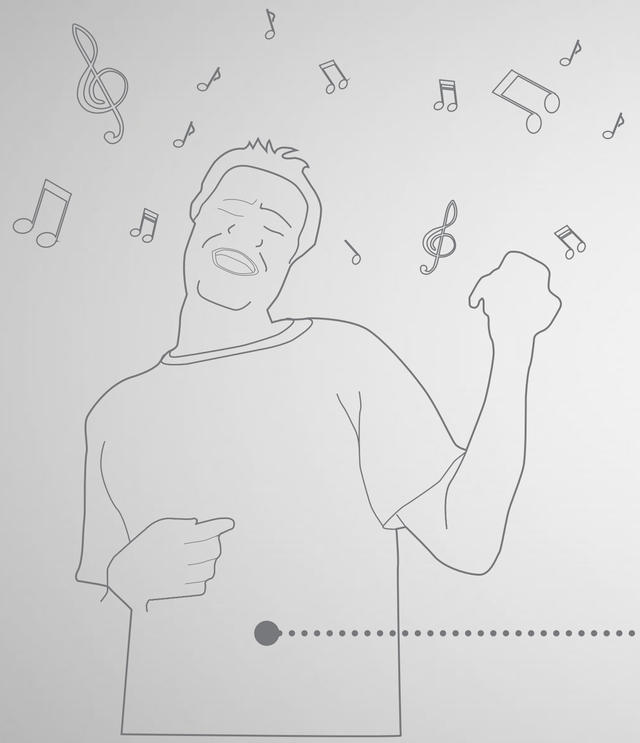
a screen that pops up anywhere so I can watch things or play games anywhere and it has to orient itself to my eyes, so that even when I lie down on bed I can enjoy watching

a device which can keep me scented all day

/A Journey to Memory Loss & Music



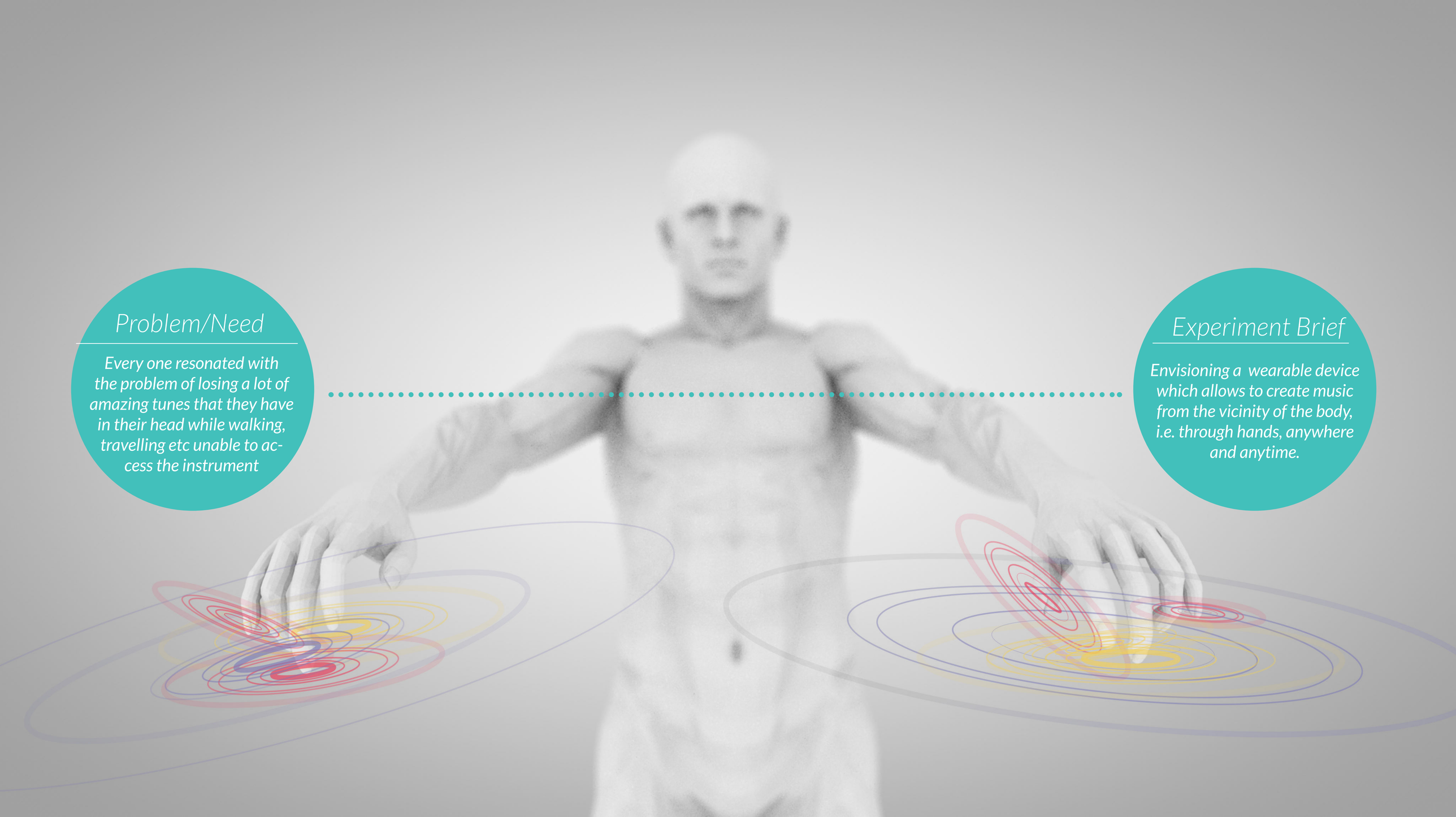
“just a few moments ago, I was humming a new tune while feeling the air passing through my hairs and body (he was standing at the train gate and now I have lost it, it was so good but I cannot just remember it, I wish I was at my piano” .



Can i make music anywhere?

Can i never miss a tune that comes to my head?

Can i perform music anywhere?



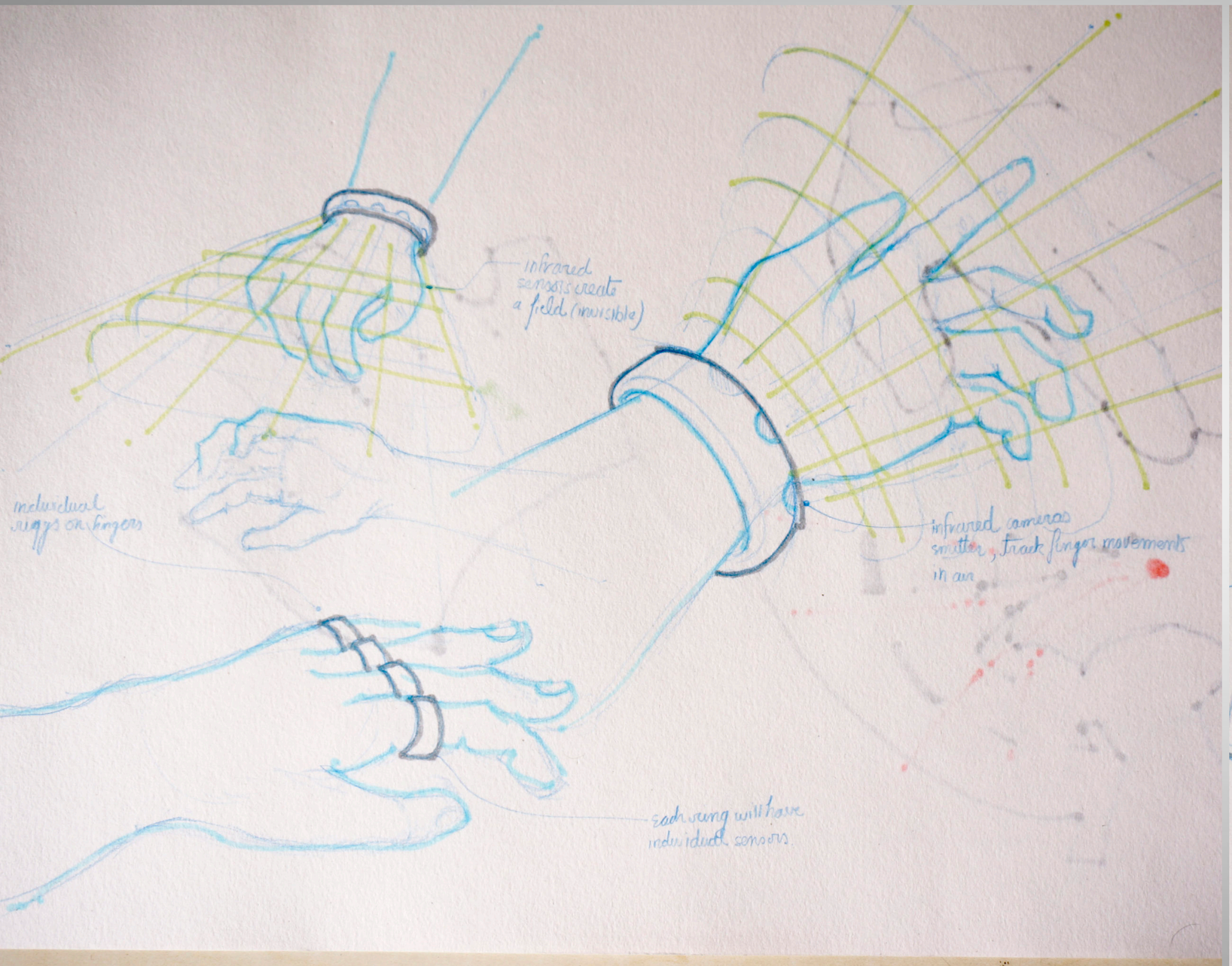
Problem/Need

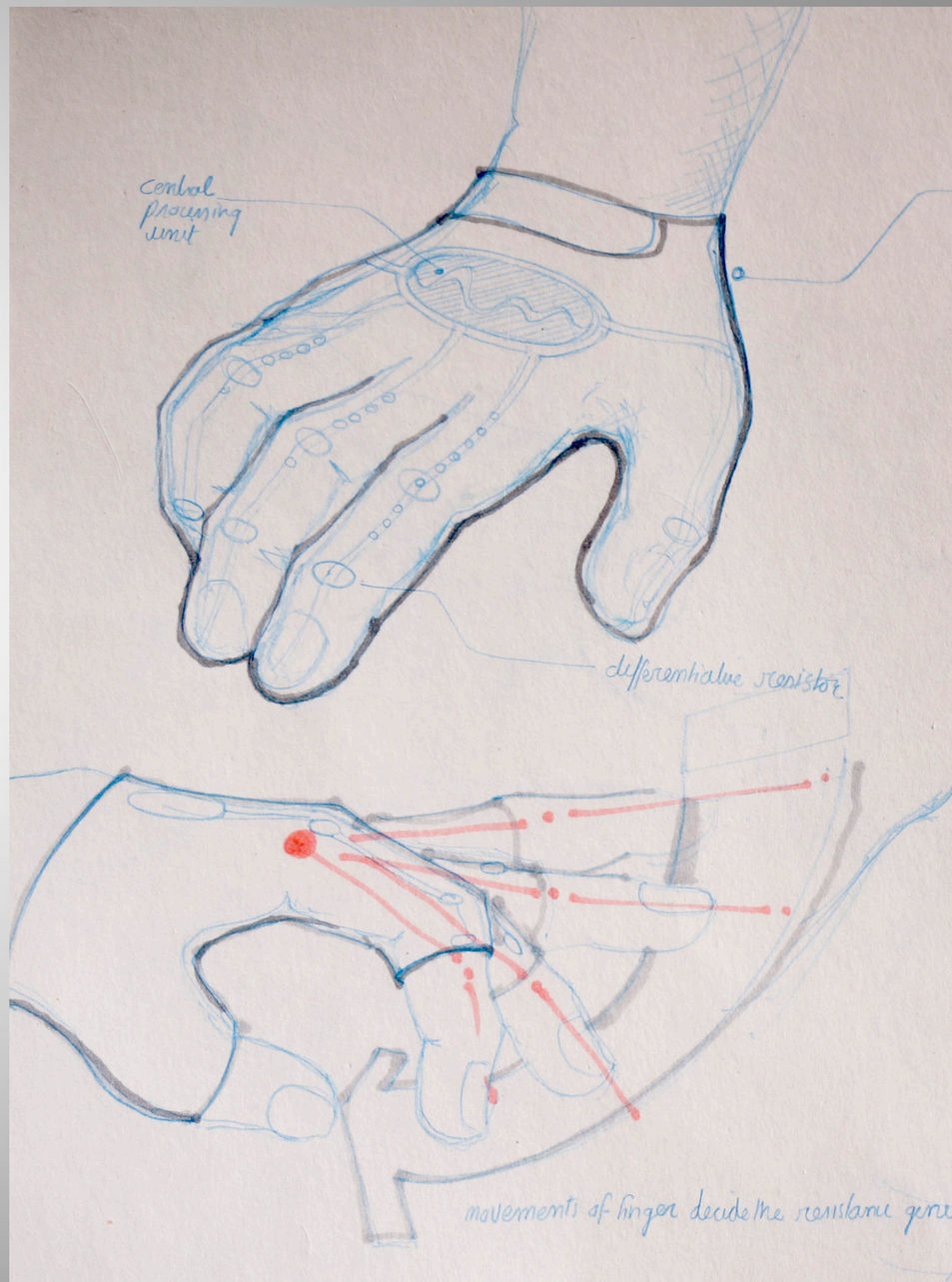
Every one resonated with the problem of losing a lot of amazing tunes that they have in their head while walking, travelling etc unable to access the instrument

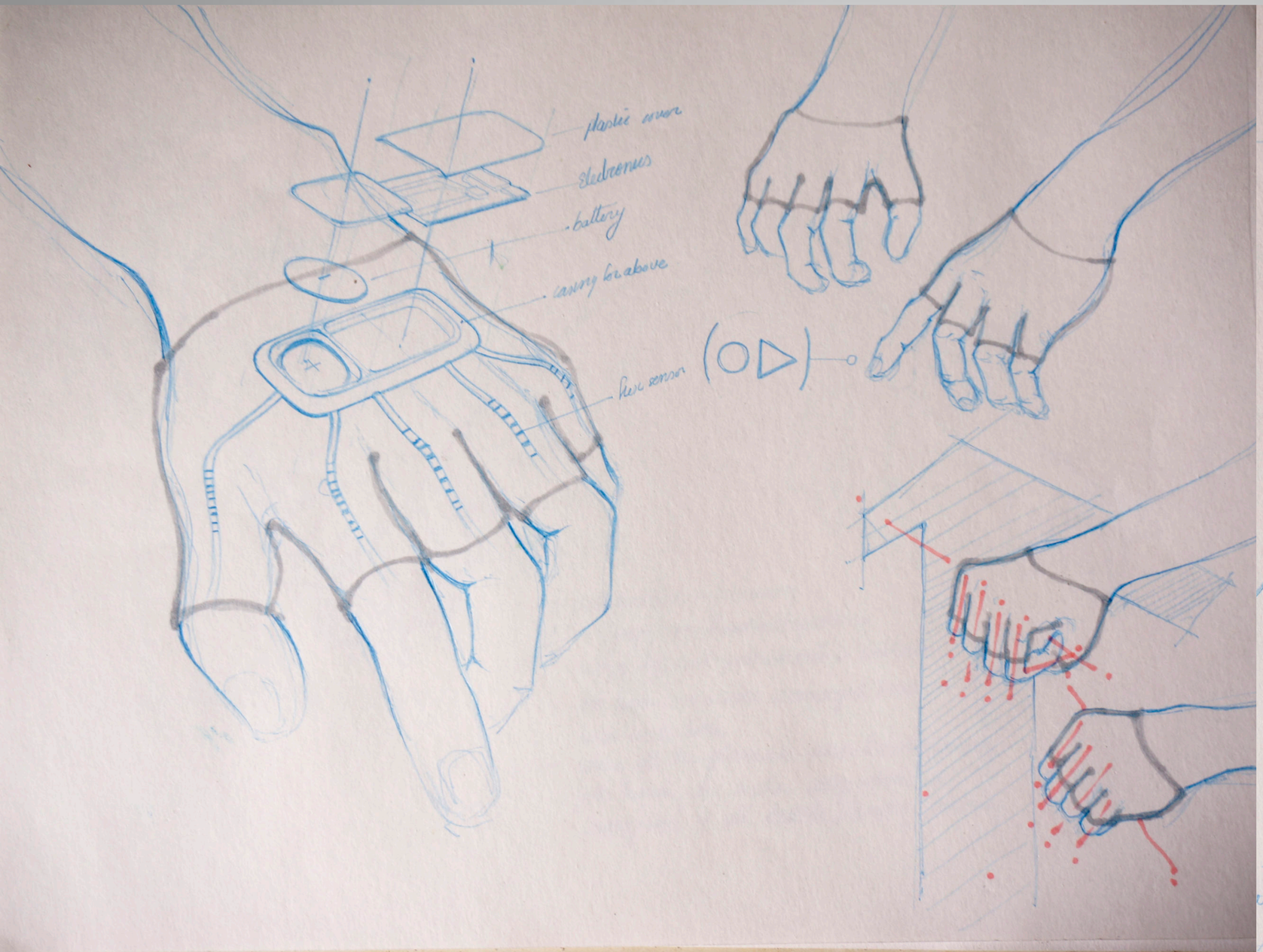
Experiment Brief

Envisioning a wearable device which allows to create music from the vicinity of the body, i.e. through hands, anywhere and anytime.

Concept Development

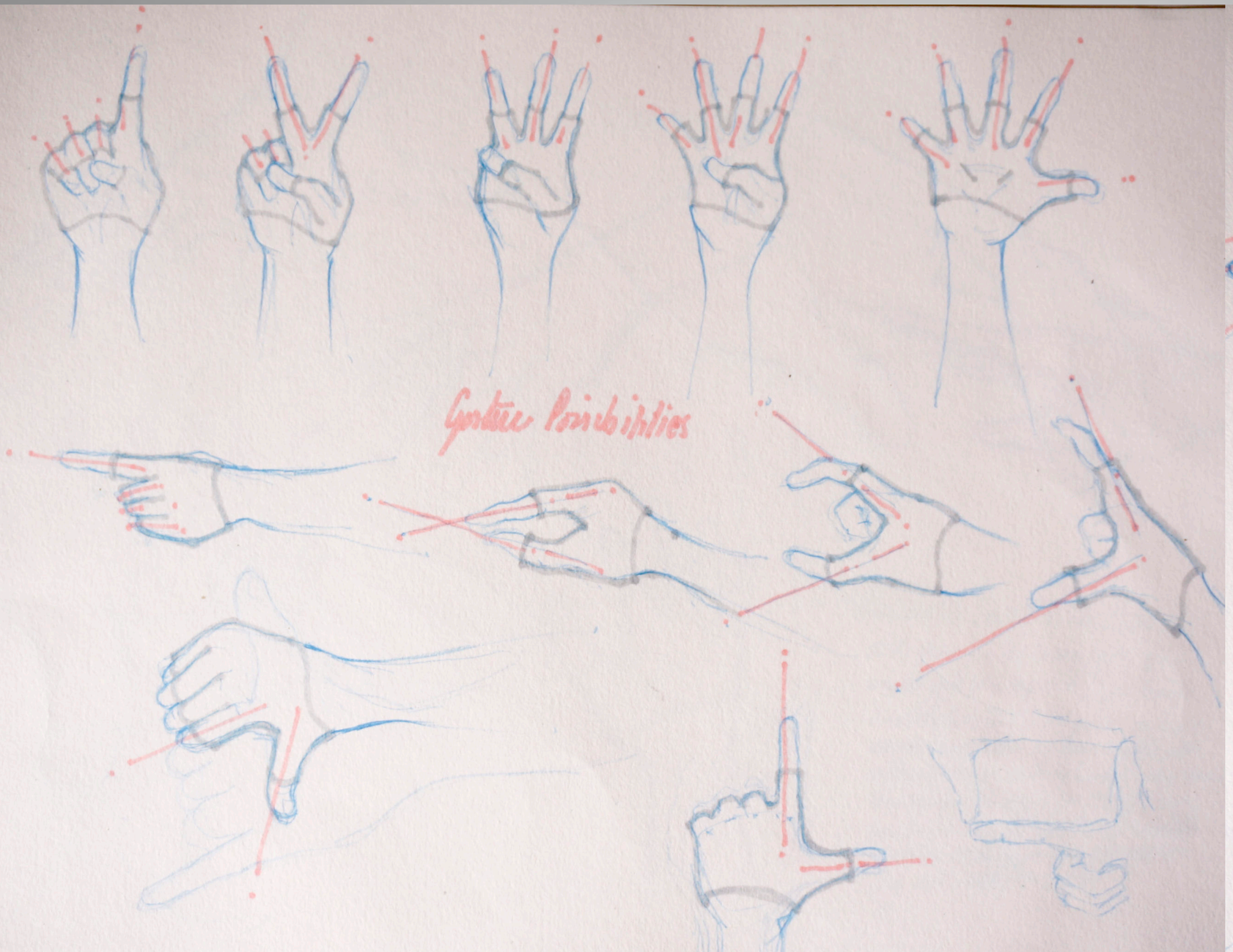


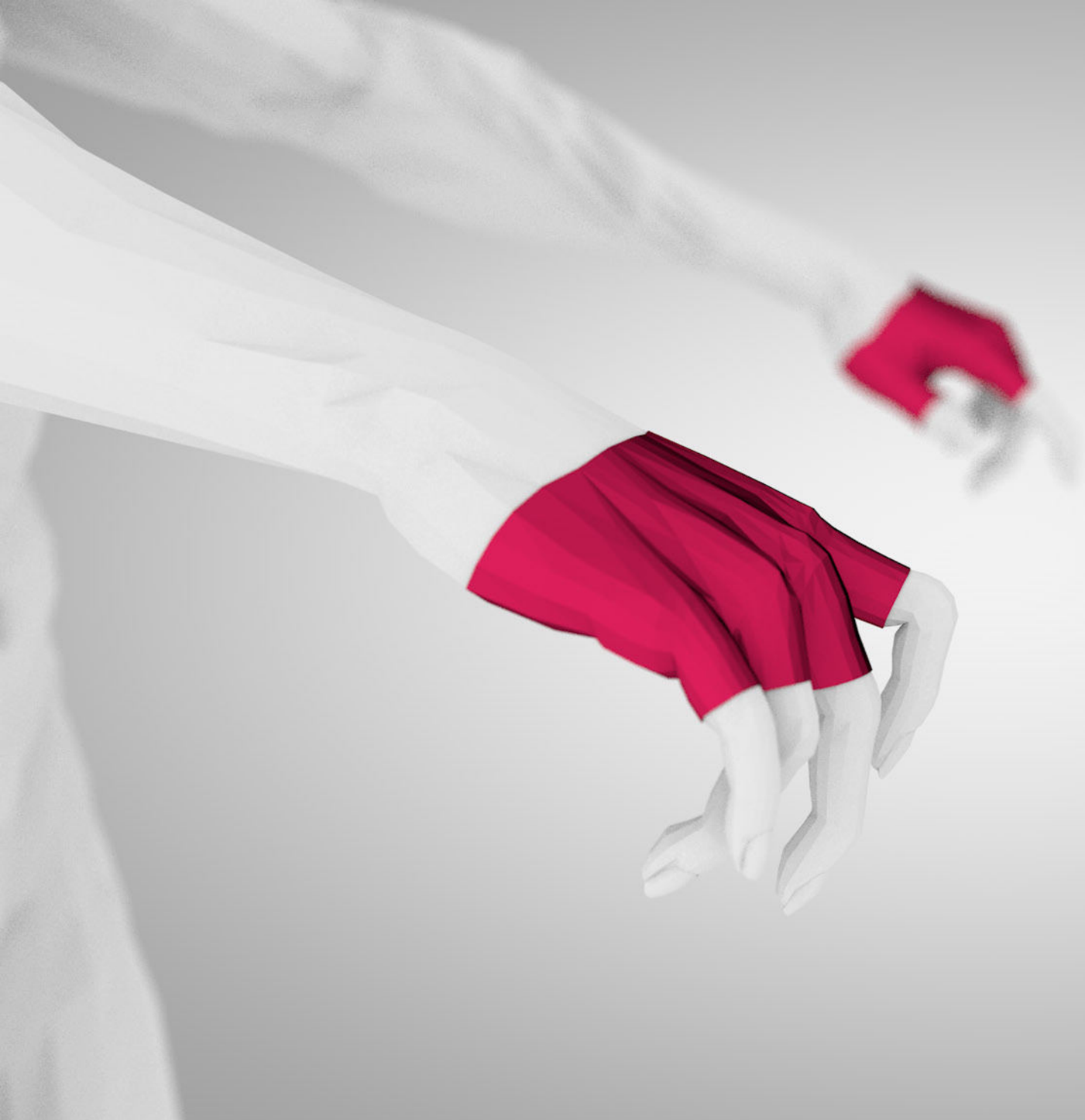



plastic cover
electronics
battery
casing breakout
fiber sensor


a full size
glove with sensors

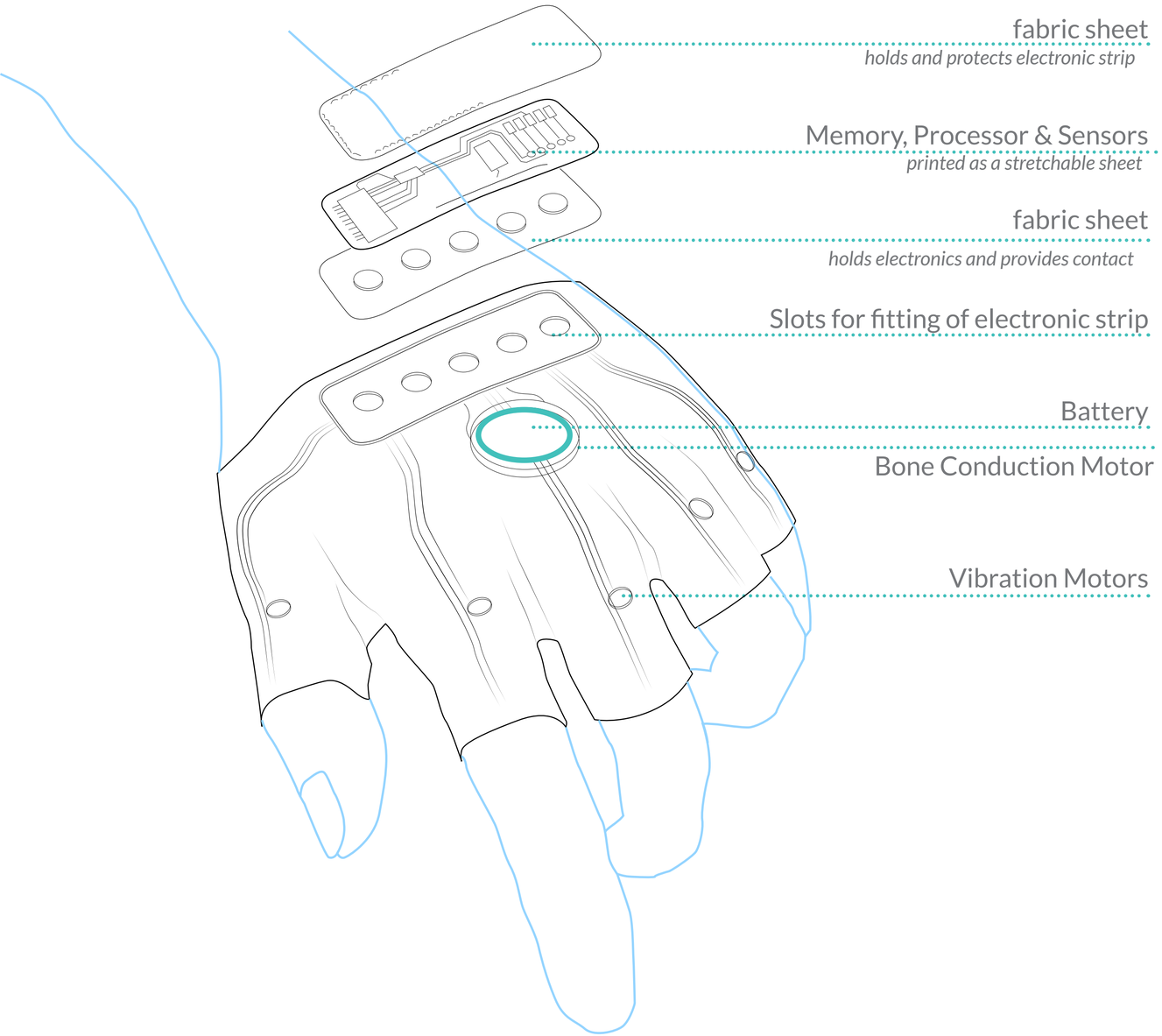
Interaction Explorations

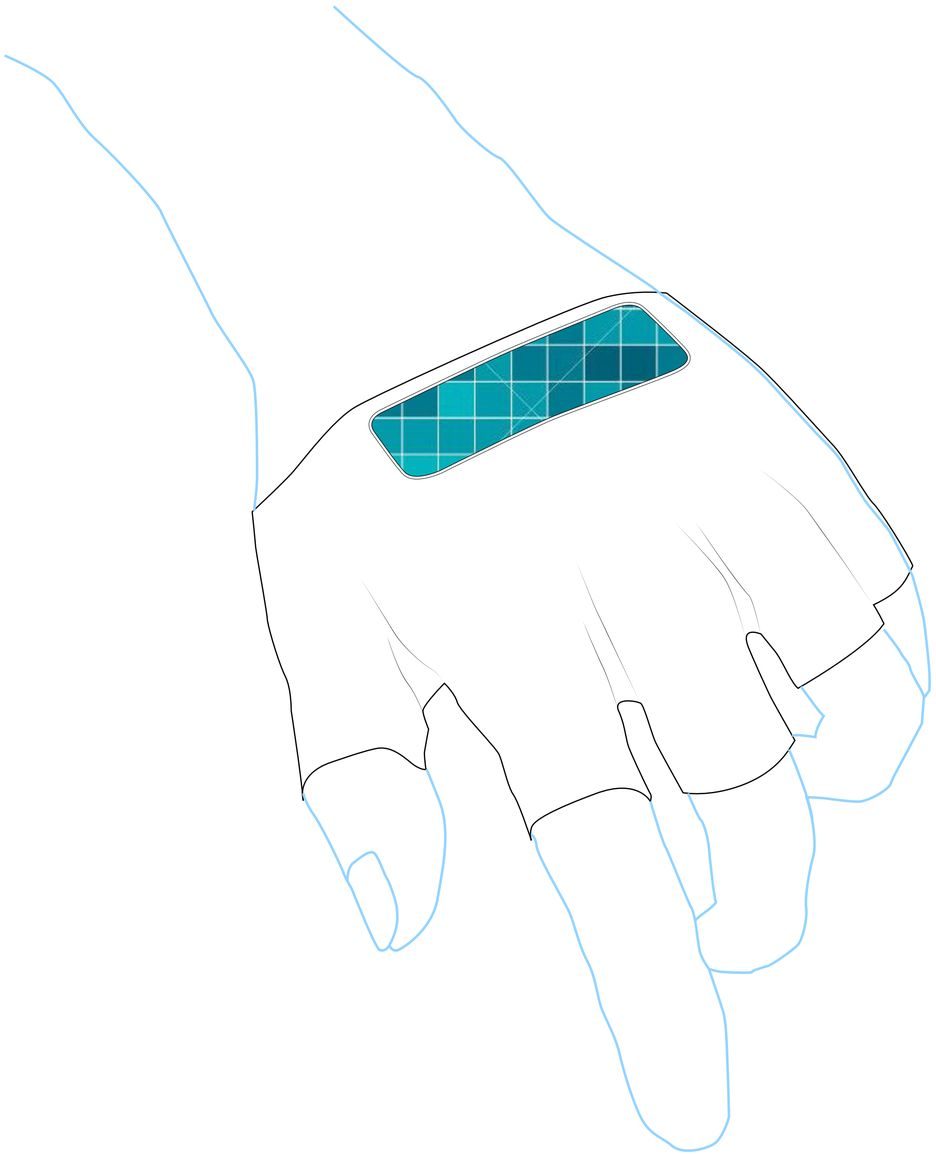




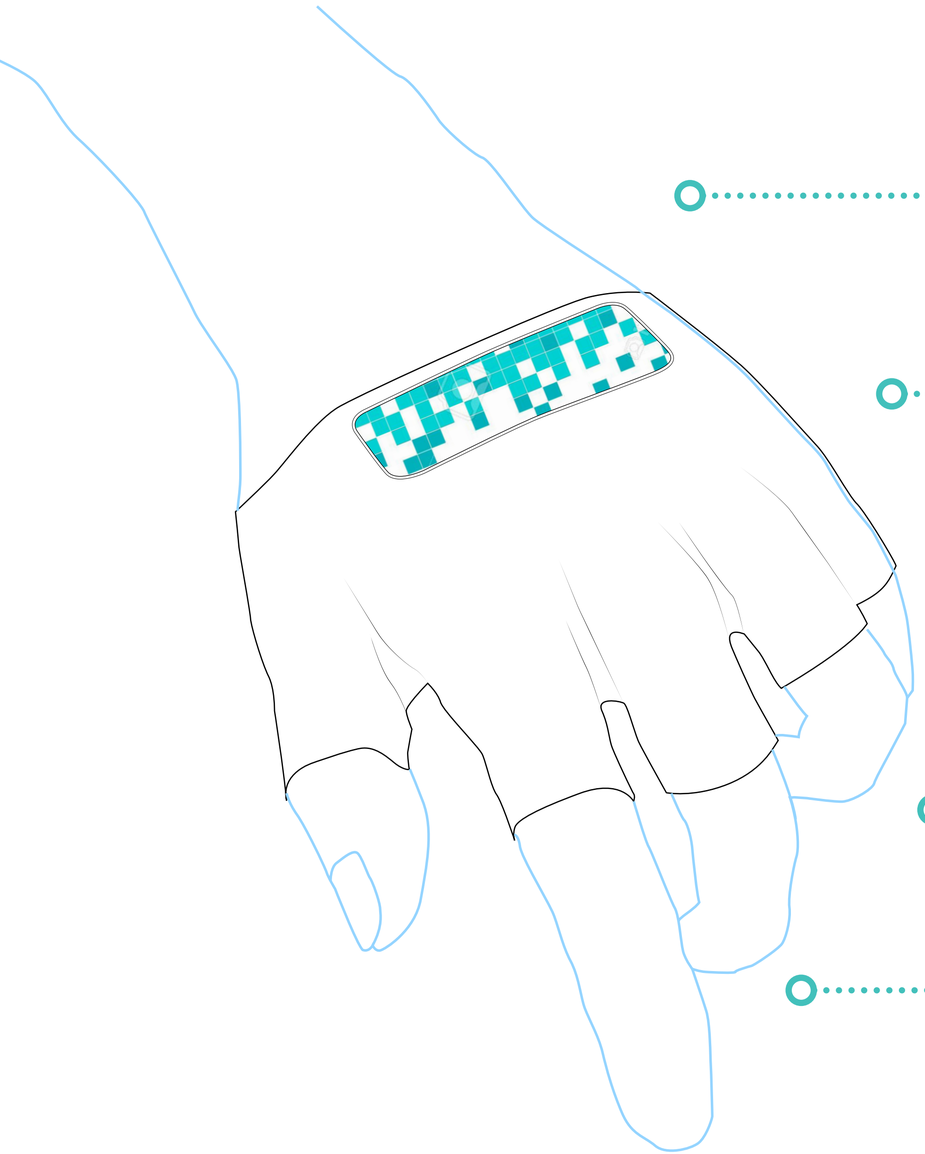
FINAL DESIGN

Design Components



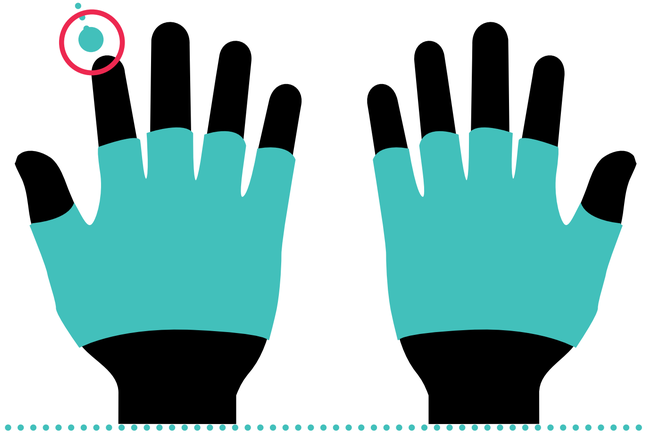


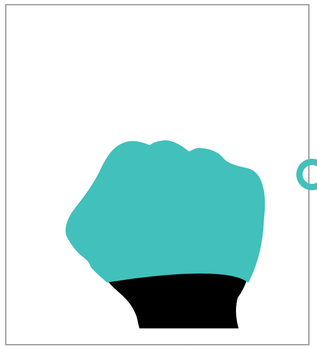
What does it do?



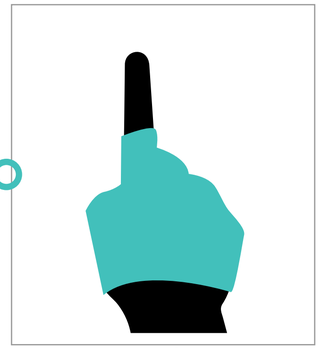
- Make music
- learn playing
- Jamming Co-ordination
- Sharing/Colloborating
- Teaching playing

Basic Gestures

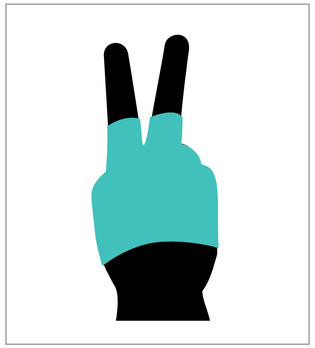




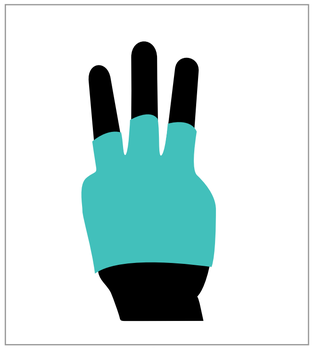
All fingers closed is the device base menu. Doing this activates it, or if already playing,goes to base position to take commands



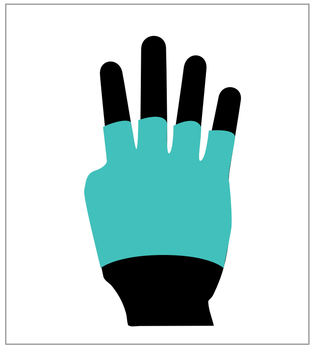
One finger open, all others closed is the command for accessing the stored sounds



Two fingers open, all others closed activates learning music function, the last synced song will run in tutorial mode

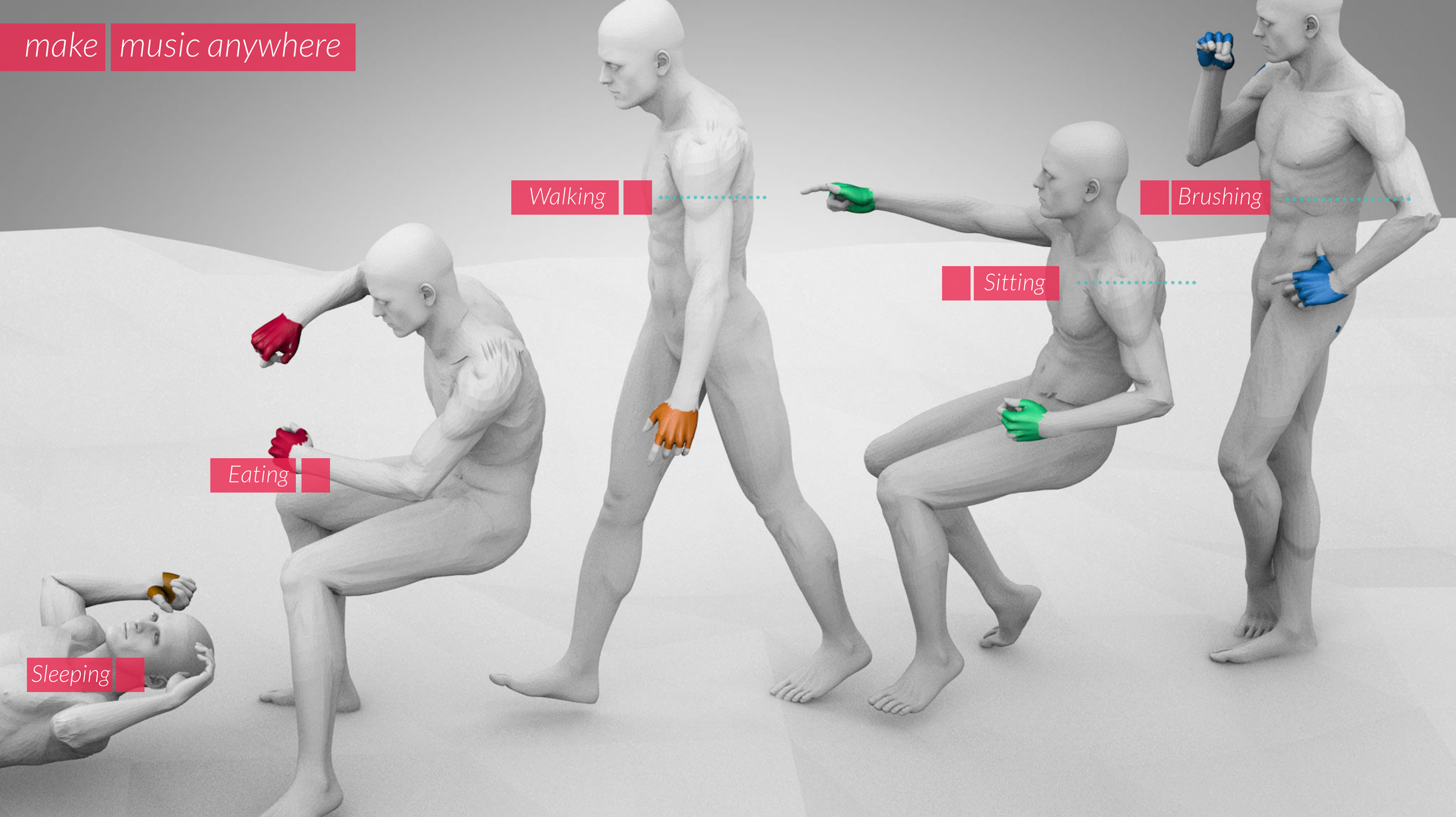


three fingers open activates jamming session

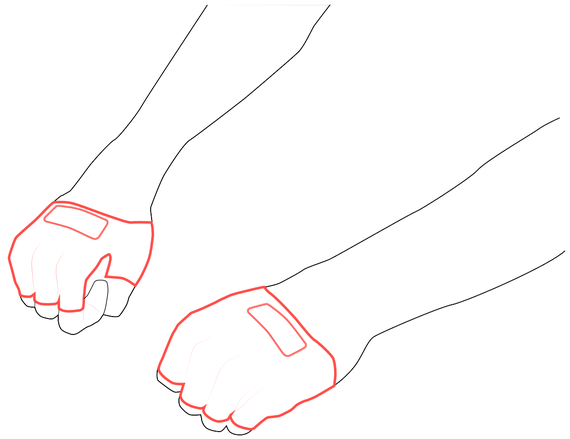


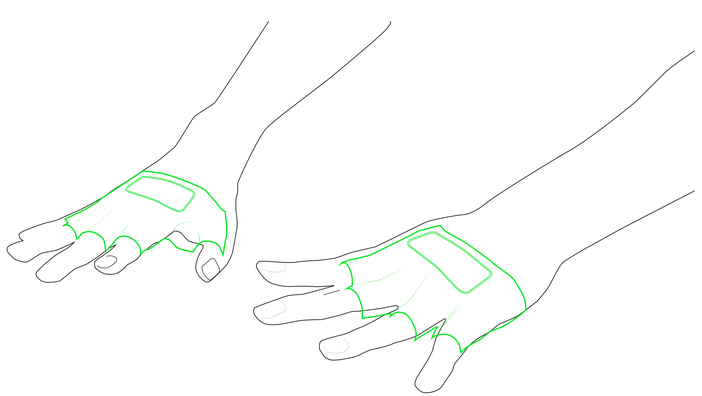
four fingers open activates live sharing/ teaching mode.

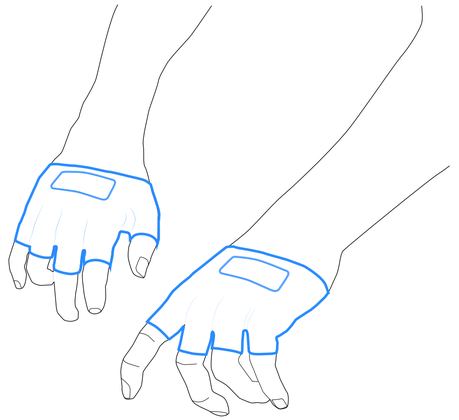
at base menu, it activates the making music function. If already recording, doing this again will allow you to restart afresh.

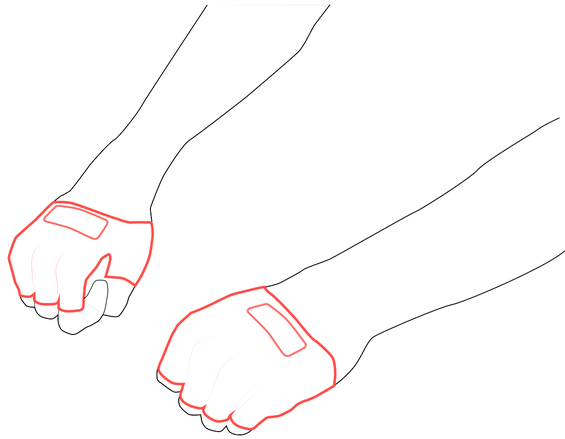

make music anywhere
Walking
Brushing
Sitting
Eating
Sleeping

make music









Clench your hands to go to the base menu and then make the choice.

Open all the fingers flat (5 fingers) which registers as making music command.

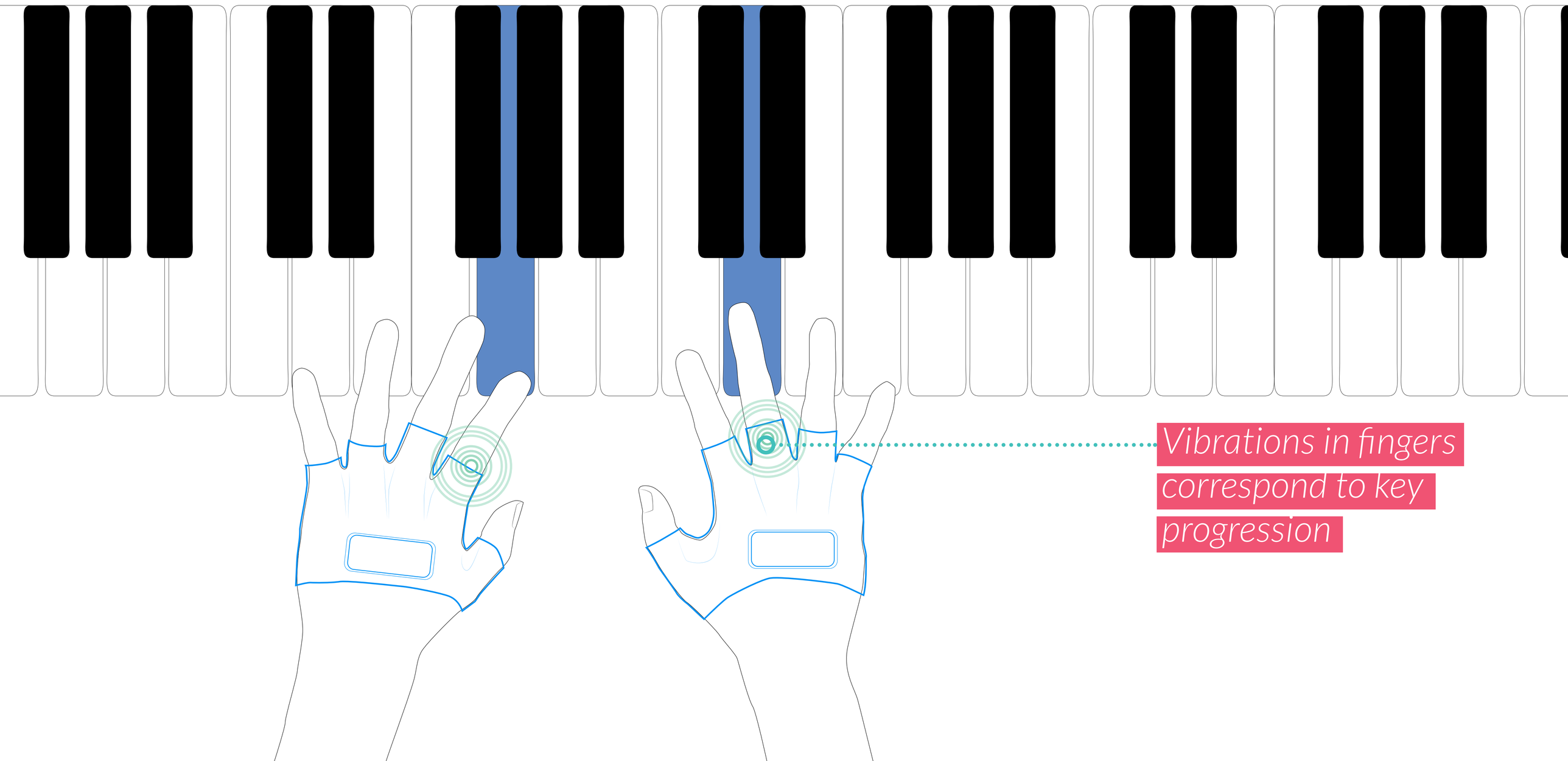
start playing the music and it will start recording

Clench your hands again when you are done recording the tune and the device will save it automatically.

Next time you hold the phone with gloves on, the nfc will allow the devices to get n sync automatically and all the songs will be transferred to the phone.

With a companion app you can browse through the compositions, play them, edit them, delete them etc.

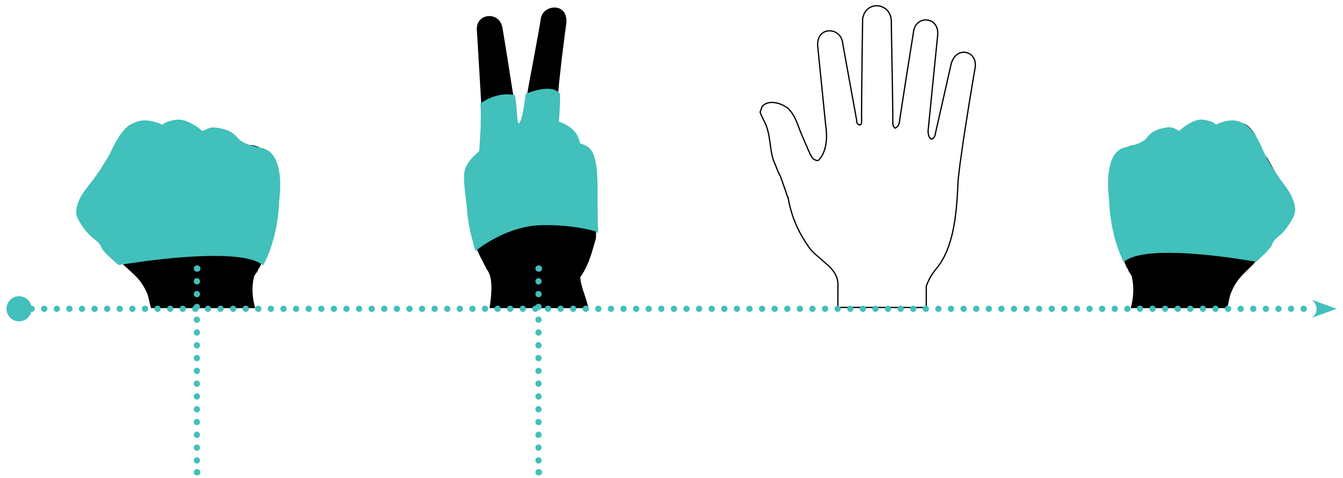
learn music



Vibrations in fingers correspond to key progression

learn music

Sync the song/tune to be learned and sync it with the device. All the midi notes are transformed into key and finger combinations.



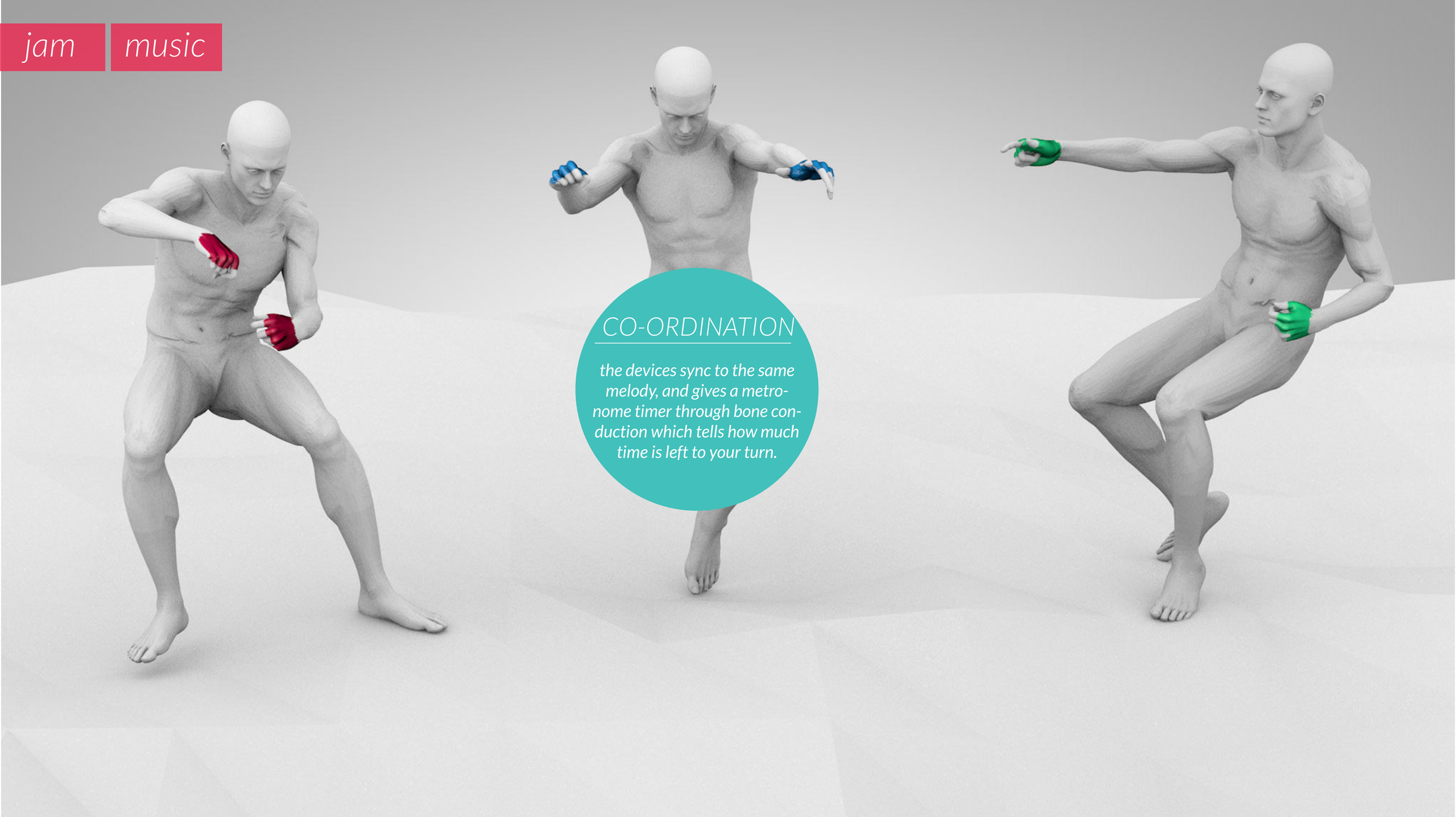
base menu/ device activation

selecting second funci-ton i.e. learning music

use this to restart practising the tune afresh

base menu/hold for 3 seconds to turn off the device. (all vibratons indicate that)

jam music

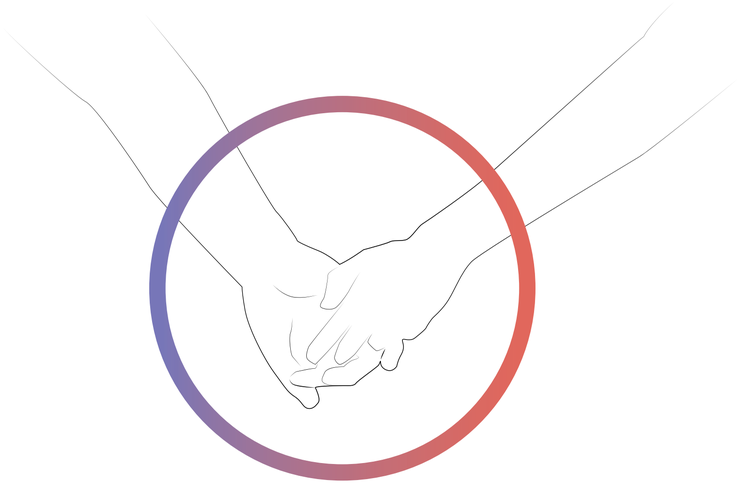


CO-ORDINATION

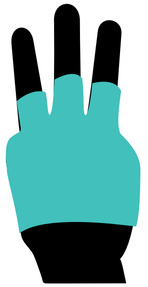
the devices sync to the same melody, and gives a metro-nome timer through bone con-duction which tells how much time is left to your turn.

jam music

The song /composition to be jammed is synced with the glove, by one member. Each jammers' part is designated and tagged with proper timing information.

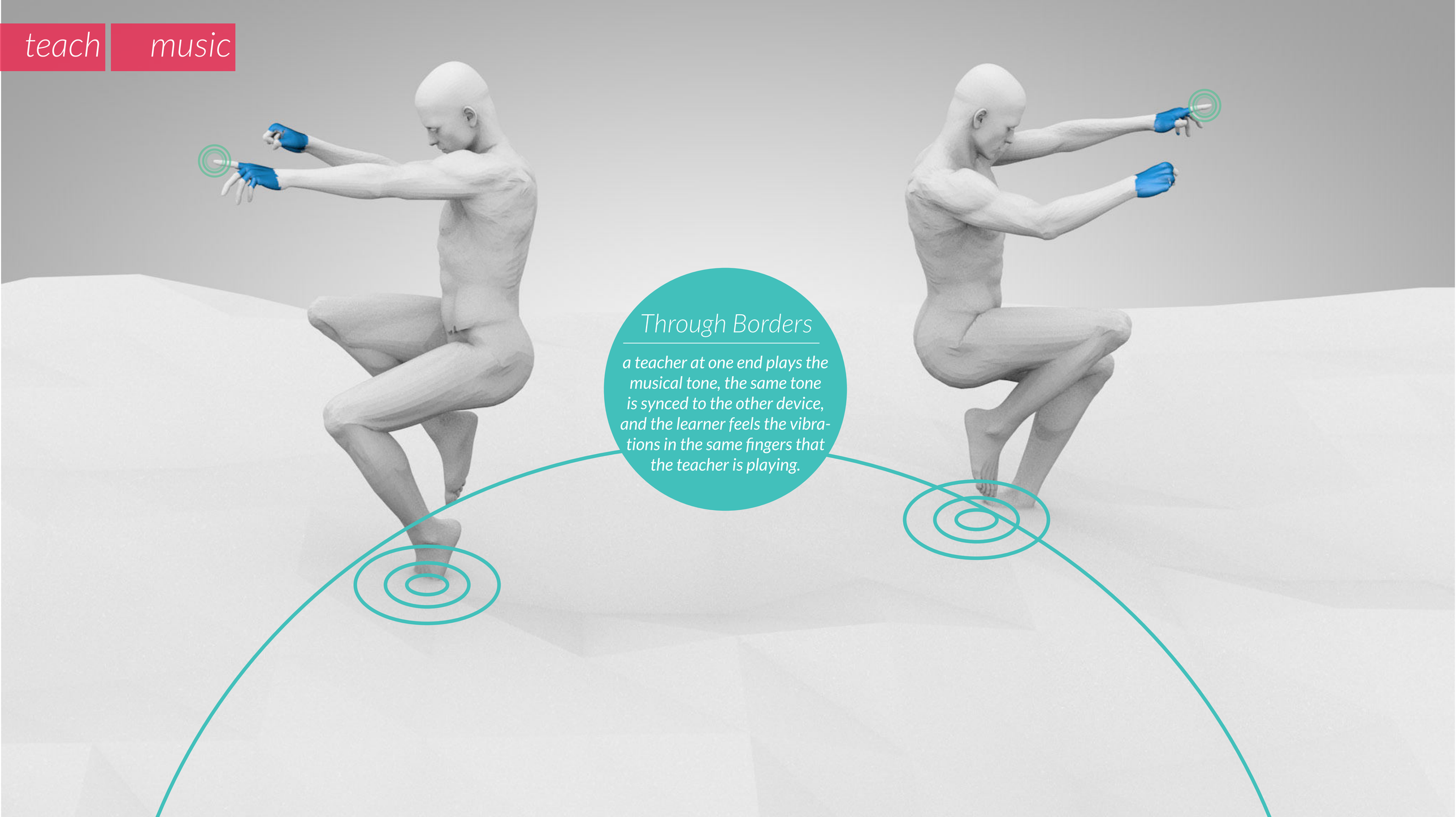


All the members who are going to jam, hold their hands, to sync the song and start jamming the session together.



members do this gesture as a way to show everything is ready and good to go, when the last member has done this gesture, jamming starts

base menu/hold for 3 seconds to turn off the device. (all vibratons indicate that)



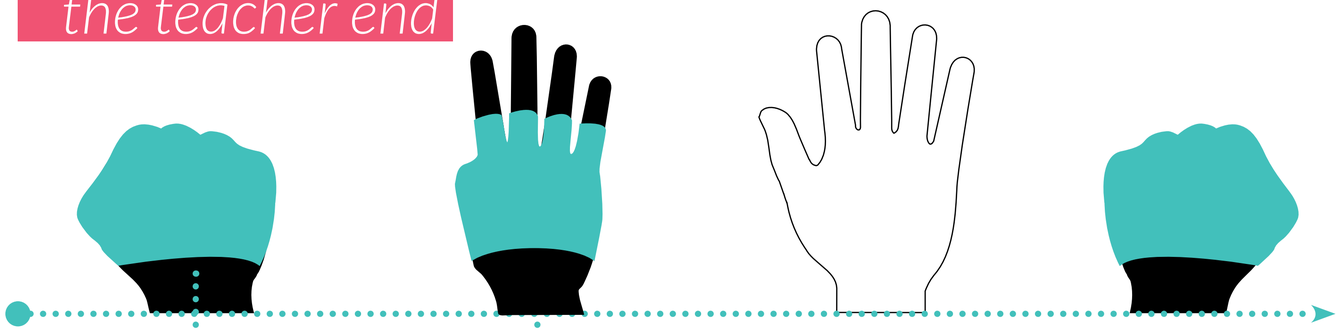
Through Borders

a teacher at one end plays the musical tone, the same tone is synced to the other device, and the learner feels the vibrations in the same fingers that the teacher is playing.

learn music

The connection between two users is achieved through smartphone.

the teacher end



base menu/ device activation

four fingers to start live, real time sharing mode

use this to restart practising the tune afresh

base menu/hold for 3 seconds to turn off the device. (all vibratons indicate that)

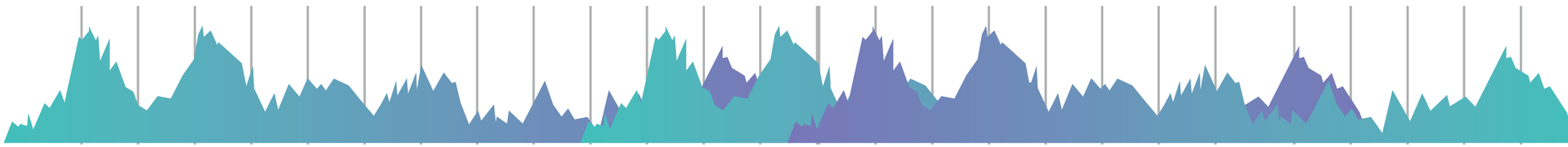
the student end

base menu/ device activation

the student does this gesture to send a alert to the teacher that its ready

the teacher controls the refreshing and other things

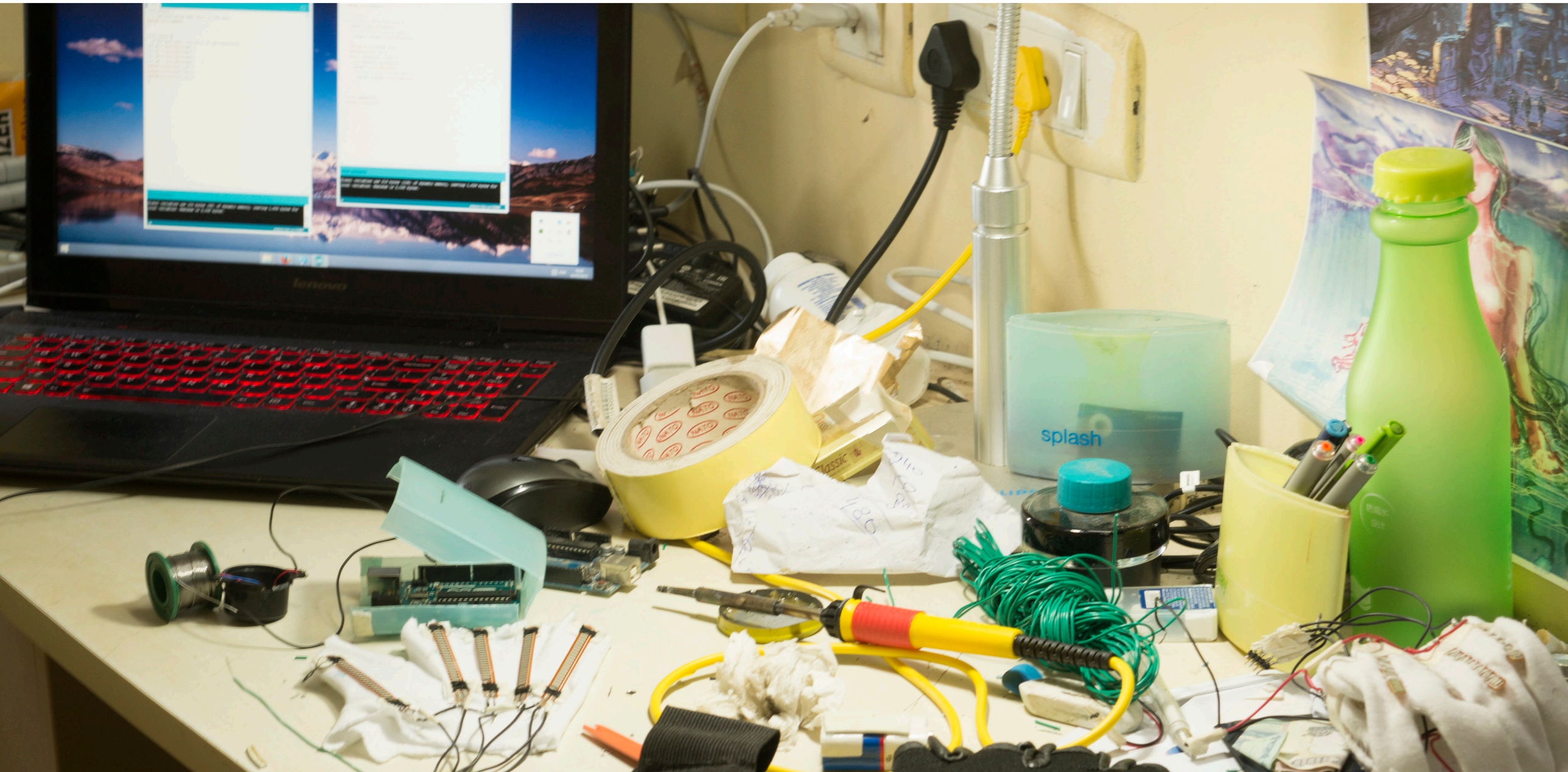
learn music



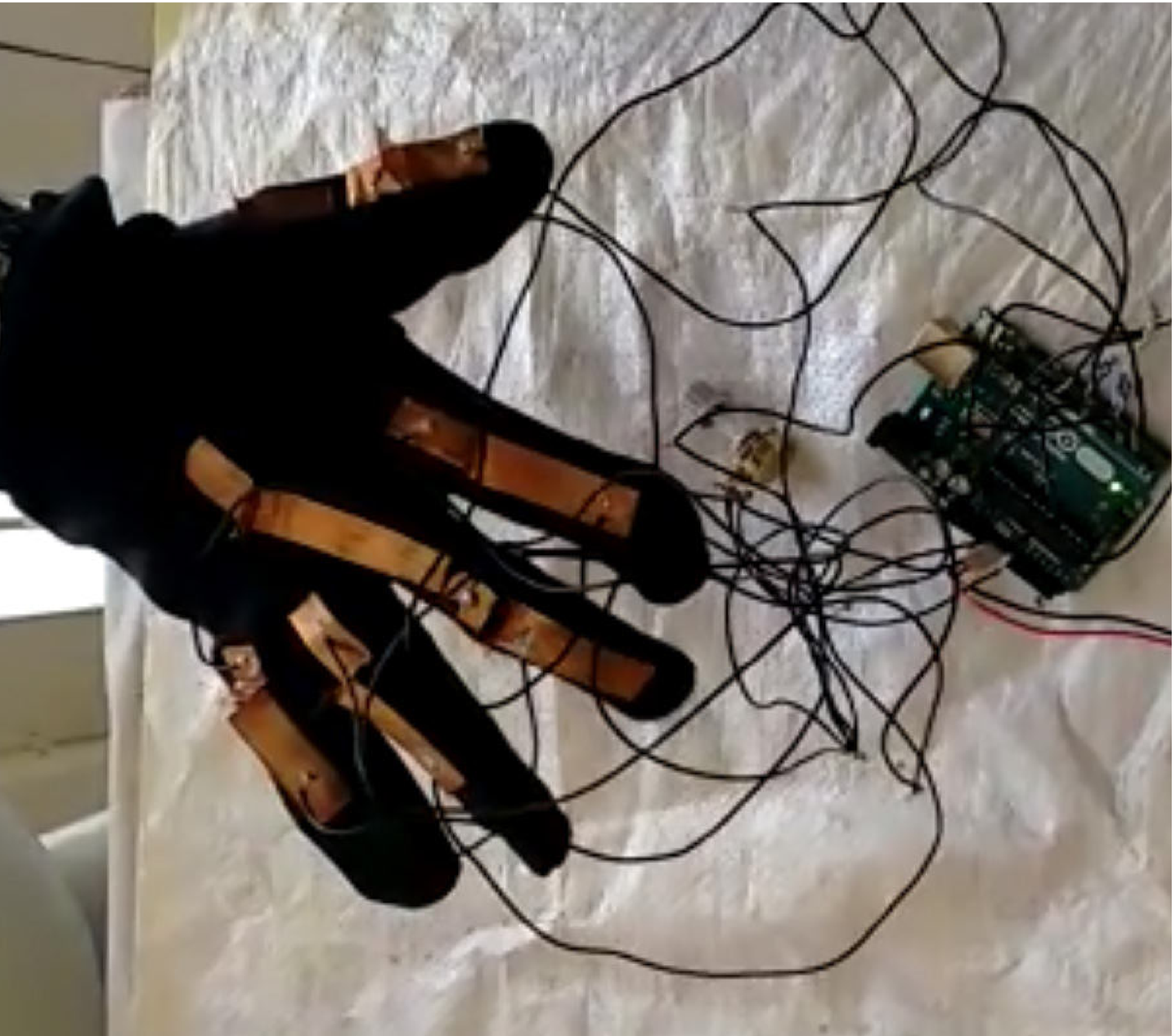
The connection between two users is achieved through smartphone.

the device records all the keystrokes and your playing data, based on which it can show you where are your weak points while playing, by analysisng hours and days of playing data, patterns may be detected which can tell your weaknesss and stregths during playing.

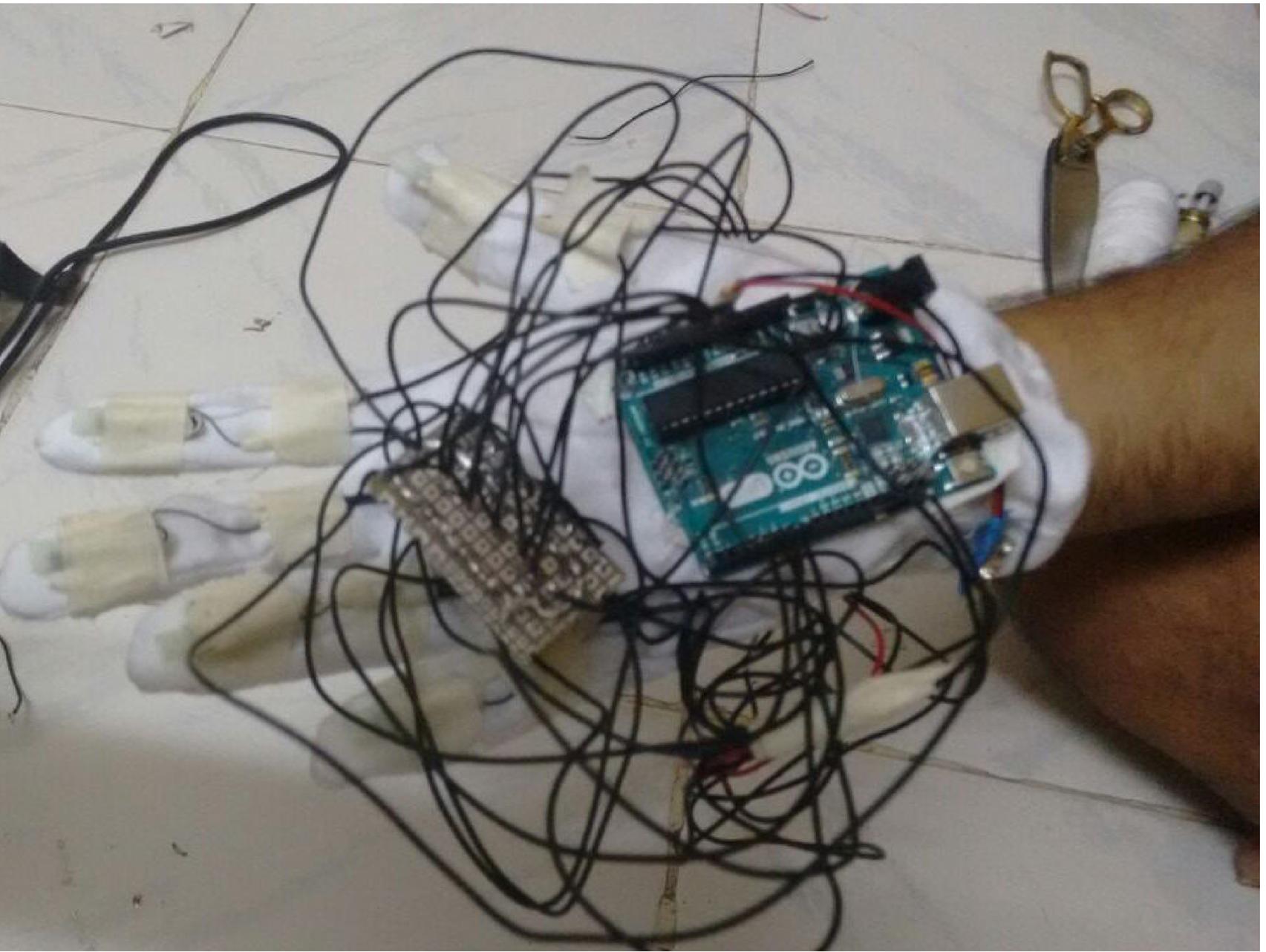
prototype develpoment

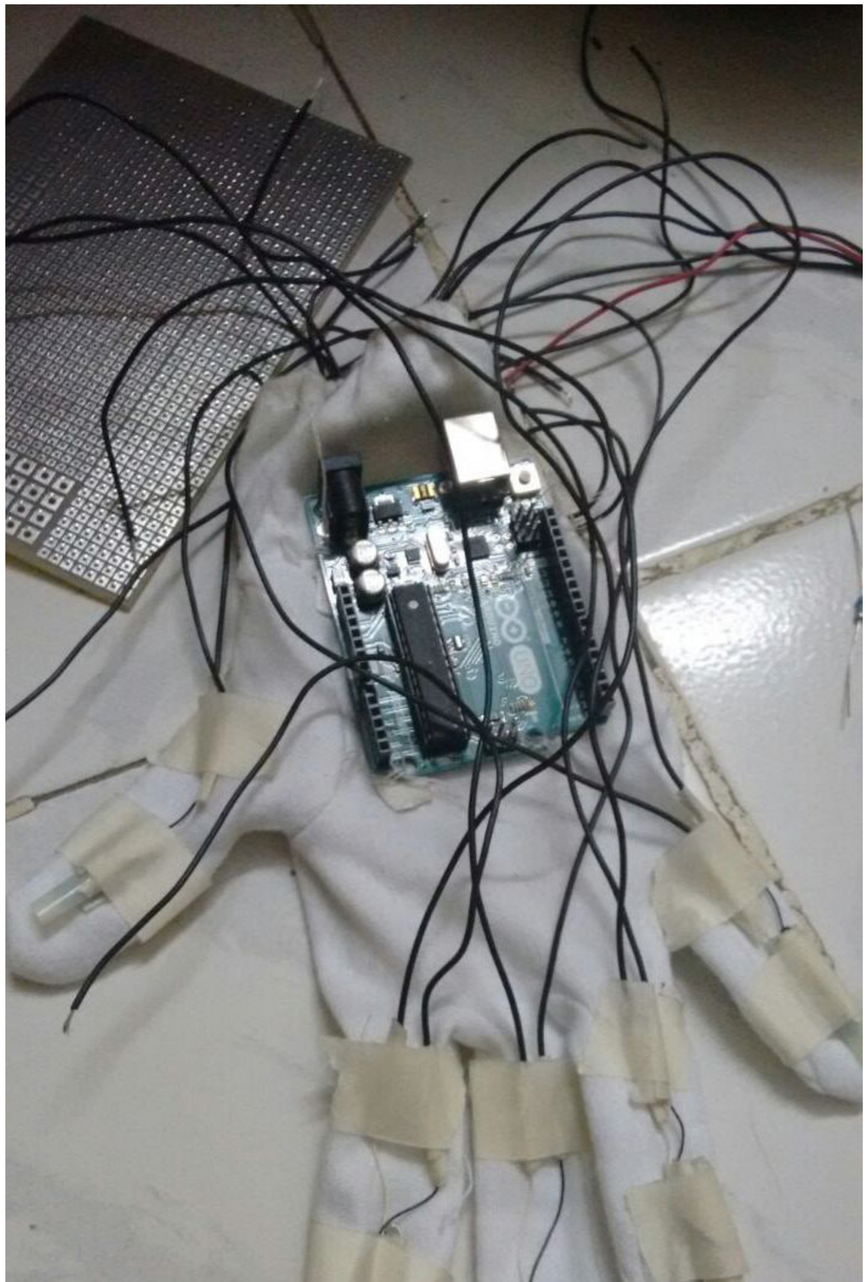


prototype one

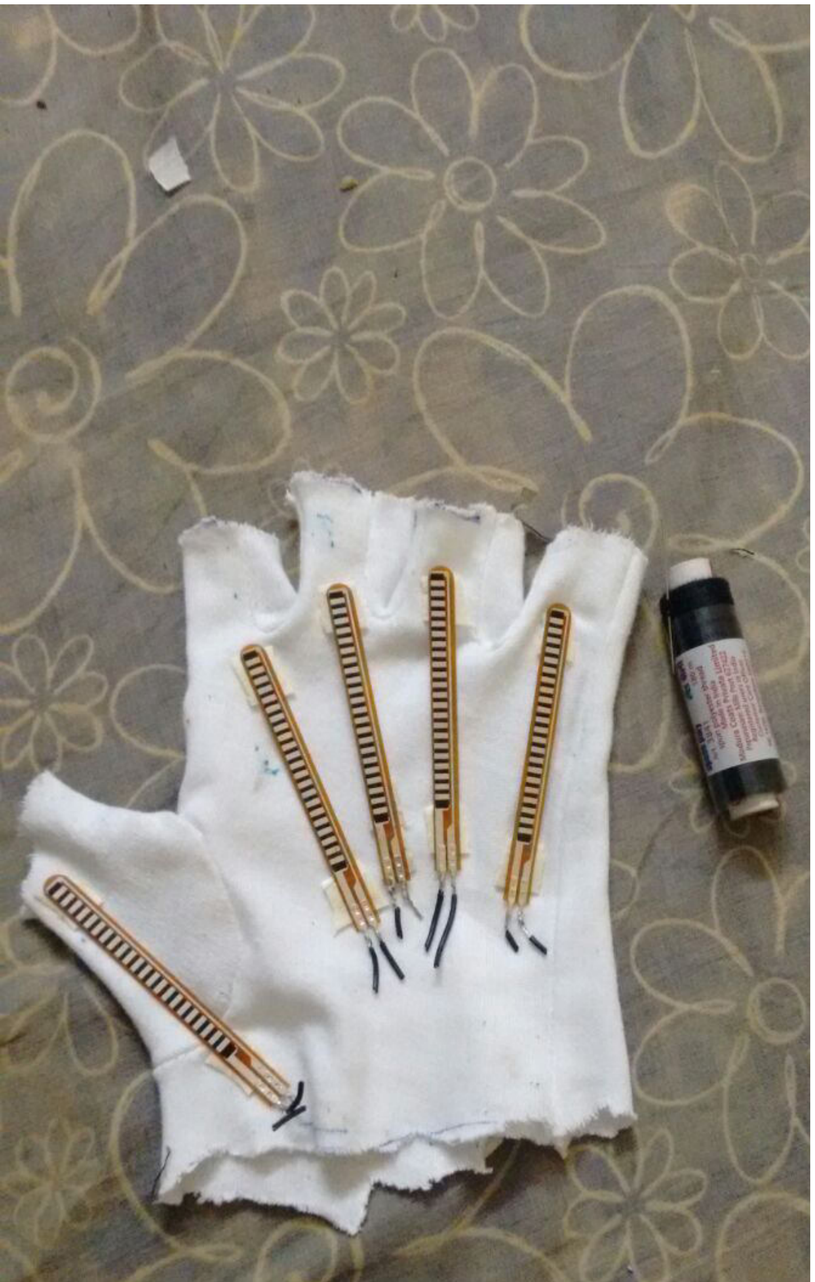


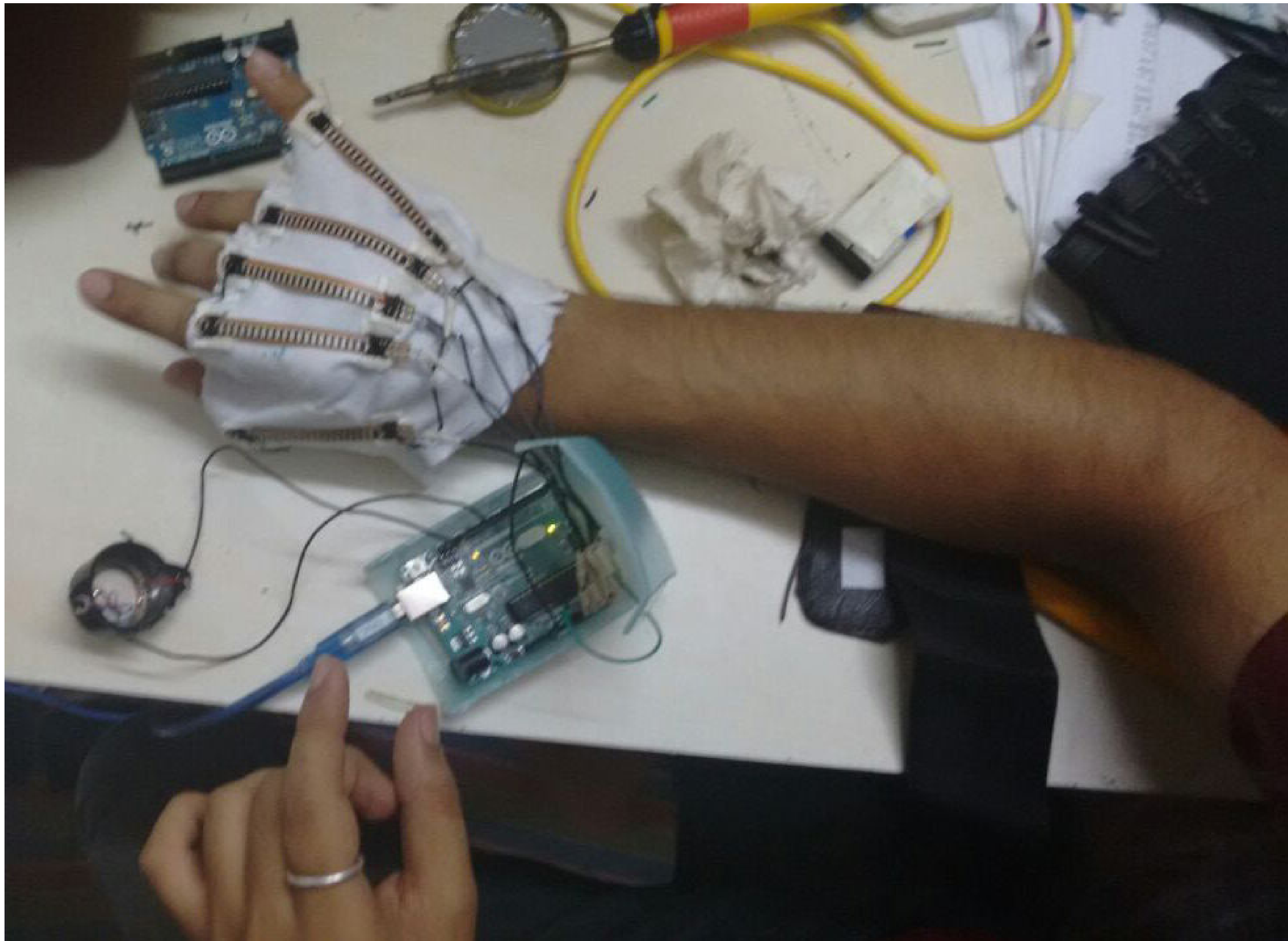
prototype two



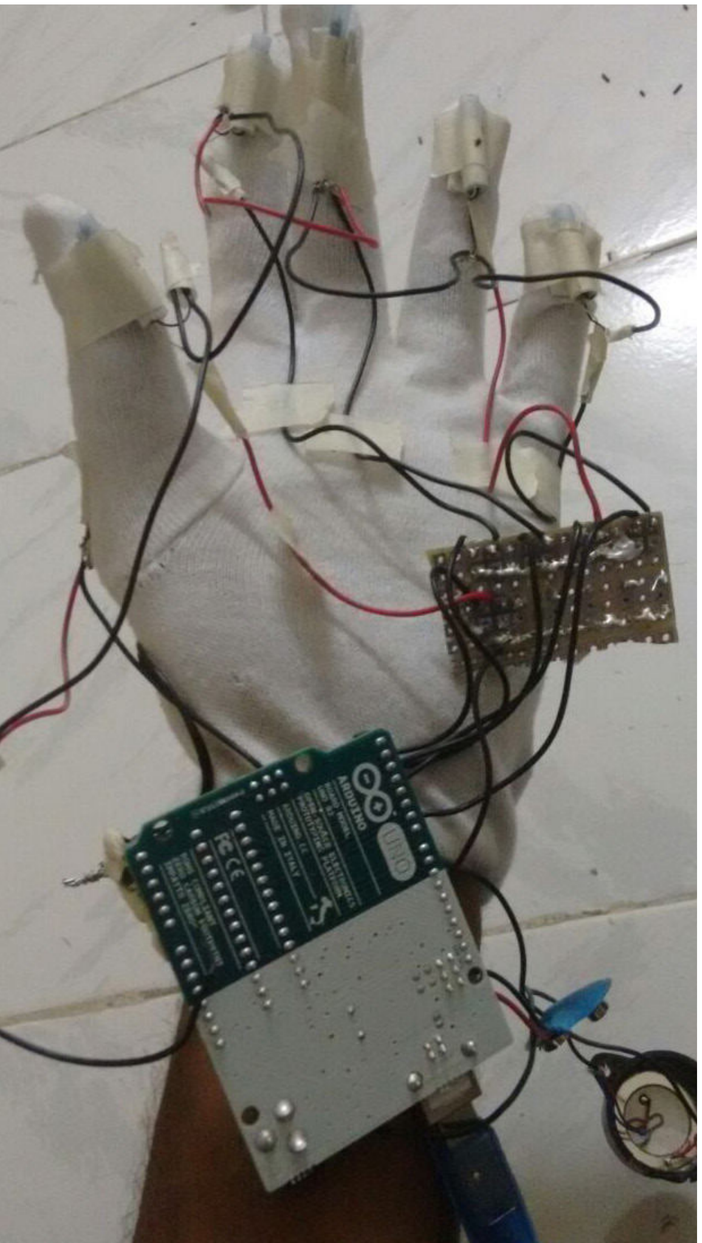


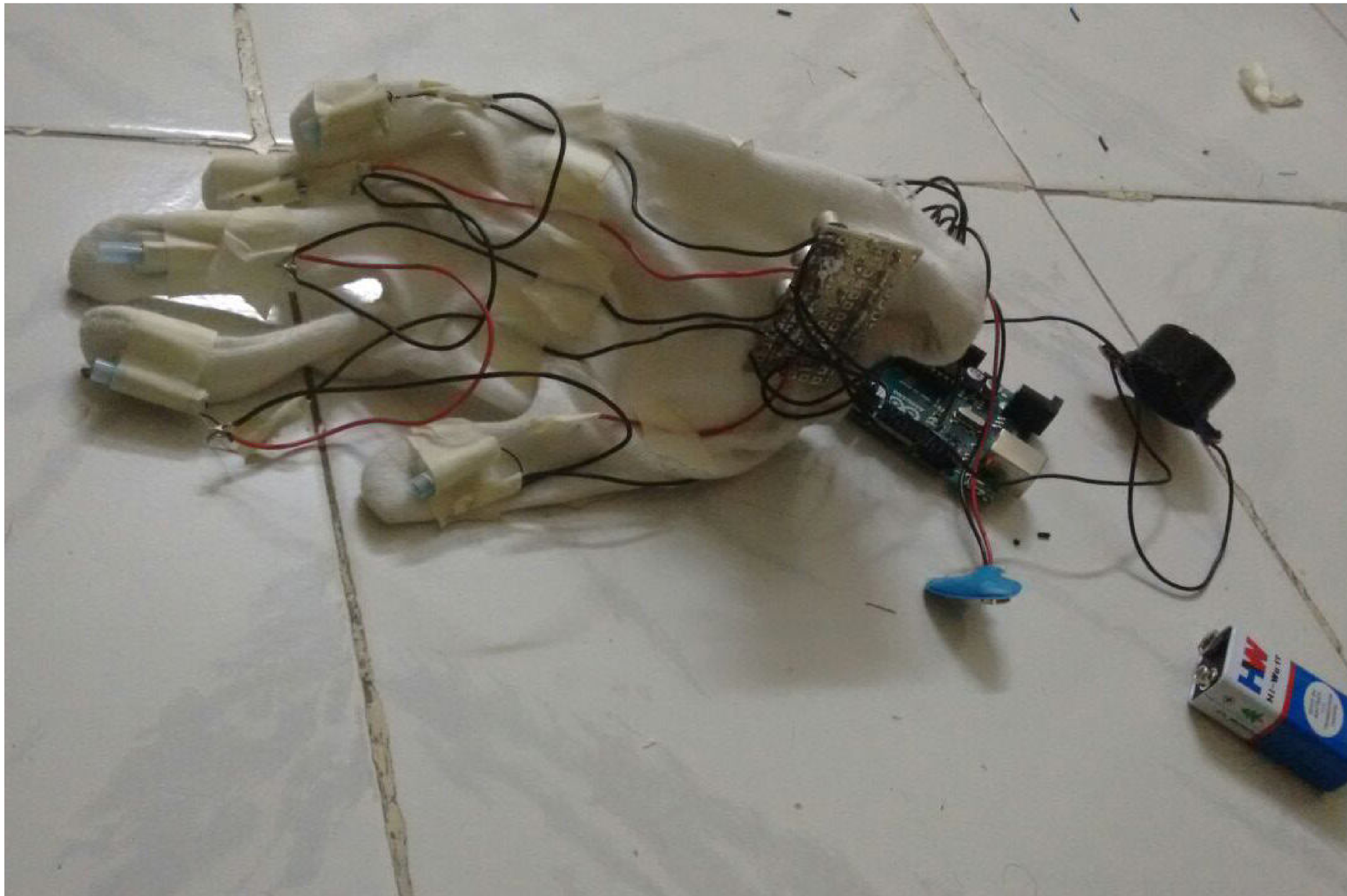
prototype two.one





prototype three





Expert Users

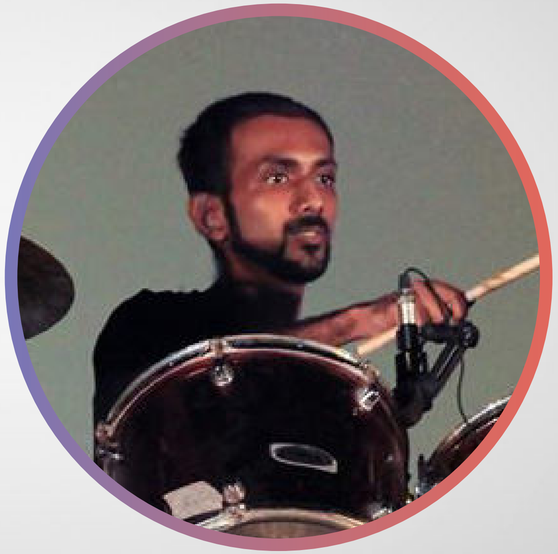
Ram Prasad Sedouram

Semi-Professional Musician
Prefers Keyboard

https://soundcloud.com/ramprasad-sedouram

Zash Ansari

Hobbyist Guitarist and Keyboard player



Joshua Mathew

Multi Instrument hobbyist
Prefers Guitar

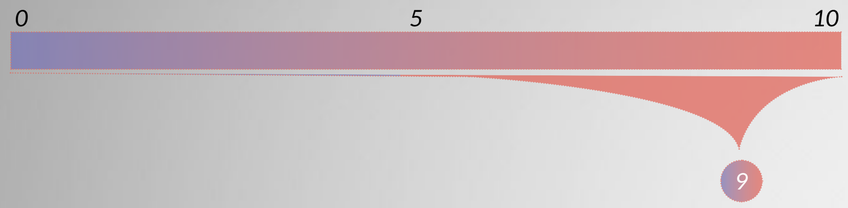
Akshay Murthy

Professional Musician
Prefers Keyboard

https://soundcloud.com/amtracks

Users | A survey

How much relatively useful is this device than what you are using right now?



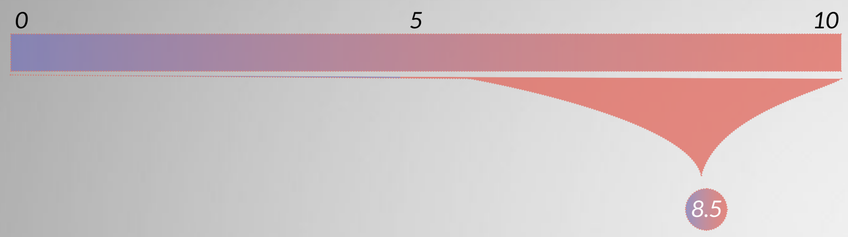
Which of the following functions you like about the device?

Would you like to buy it?

Do you think wearing this device will make you feel uncomofrtable ?

Users | A survey

On a scale of 1 to 10 rate the ease of use:



How much price would you like to pay for it?

What are your comments about it?

“how i wish, how i wish, this glove was there...
inumerous times when i lost my hair...
over tunes that were forever lost in air....”

Akshay Murthy

“i would gift this to my brother, i have always wanted to teach him piano all by myself, but being always in different cities it has been difficult. Now with this glove i can do that in a human way, a lot more connected way.”

Hamza Ansari

The idea is wonderful, and i have never seen such an implementation of musical glove, it will be interesting to see how it develops in reality, on paper and idea is interesting, if it works well, i am sold.

Ram Prasad Sedouram

Refrences

Neil MacGreggor
A brief History of the world in 100 Objects
C.2010
Penguin Books

The future Of Wearable technology
PFSK labs ,Intel Corp.
C.2014
Web Publish

Lucy Dunne
The design of Wearable Technology:understanding
the human device interface through funcitonal apparel design
C.2004

Chris Baber
Wearable Computers: A Human Factors review
C.2001
International Journal Of HCI

Ana Viseu
Simulation & Augmentation :issues of wearable Computers
C.1994
Journal Of Ethics & Information technology

Melanie Swan
Sensor Mania, the internet of things, Wearable computing, objective matrix and quantified self 2.0
C.2011
Journal of Sensors & Actuators Network

Edward O. Thorpe
The Invention of the first Wearable Computer
C.1990

Steve Mann
Wearable Computing: A first step towards personal computing
C.1995
Towards Humanistic Intelligence
C.2001
IEEE Intelligent Systems

Mark Wieser
The Computer for the 20th Century
C.1991
Scientific American

Jaron Lanier :
You Are Not A Gadget : a manifesto
C.2010
Web Publish

Thad Starner & Steve Mann
Augmented Reality Through Wearable Computing
MIT

D.C. Engelbart
Augmentin Human Intellect : A conceptual framework
1961-62
Stanford Research Institute

J.C.R. Licklider
Man Computer Symbiosis
1960

Gilsoo Choo
Smart Clothings : technology and applications
CRC Press

Dave Evans
The Internet of Things : How the Next Evolution of the Internet Is Changing Everything
C.2011

Cherrylyn Buenaflor and Hee-Cheol Kim
Six Human Factors to Acceptability of Wearable Computers
2013
International Journal of Multimedia and Ubiquitous Engineering

JOANNA BERZOWSKA
Electronic Textiles: Wearable Computers, Reactive Fashion, and Soft Computation

Ray Kurzwiel
The Age of Spiritual Machines
1999
Viking Penguin Publishers

Bertalan Mesko
The Guide to the future of Medicine
2014

Refrences

<http://www.media.mit.edu/wearables/lizzy/timeline.html#1665>

<http://wcc.gatech.edu/exhibition>

http://www.bigfishgames.com/blog/google-wear-history-wearable-technology/

http://www.theverge.com/2012/6/26/2986317/google-project-glass-wearable-computers-disappoint-me

<http://www.engadget.com/2012/12/21/our-augmented-selves-the-promise-of-wearable-computing/>

http://www.wired.com/2013/12/wearable-computers/all/

http://makezine.com/2011/06/21/is-the-rise-of-wearable-electronics-finally-here/>

http://gizmodo.com/what-comes-after-click-a-crash-course-in-tangible-user-815532137>

https://www.interaction-design.org/encyclopedia/wearable_computing.html>

http://en.wikipedia.org/wiki/Wearable_computer
http://en.wikipedia.org/wiki/Ambient_intelligence
http://en.wikipedia.org/wiki/Wearable_technology
http://en.wikipedia.org/wiki/User_interface
http://en.wikipedia.org/wiki/Augmented_reality

http://www.thestudymaterial.com/presentation-seminar/computer-presentation/65-presentation-wearable-computers.html?tmpl=-component&print=1&layout=default&page=

http://gizmodo.com/soldiers-describe-how-darpa-smartphones-save-lives-in-b-1626669065

http://computer.howstuffworks.com/brain-computer-interface.htm/printable>

http://www.wareable.com/wearable-watch-list/50-best-wearable-tech>

http://gizmodo.com/the-best-fitness-tracker-for-every-exercise-1673000514>

http://www.fastcoexist.com/1680025/no-more-needles-a-crazy-new-patch-will-constantly-monitor-your-blood>

<http://www.popsci.com/article/technology/stick-monitoring-patch-moves-and-stretches-skin

http://www.medgadget.com/2014/01/zio-wireless-patch-may-be-better-option-than-holter-monitors-for-cardiac-arrhythmia-diagnosis.html>

<http://www.proteus.com/technology/frequently-asked-questions/>

<http://mobihealthnews.com/37784/proteus-digital-health-quietly-launches-consumer-facing-wearable-for-athletes/>

http://bits.blogs.nytimes.com/2012/09/07/big-data-in-your-blood/?_r=0>

http://bionicly.com/sensor-innovations-in-digital-health/>

http://www.wareable.com/headgear/the-best-ar-and-vr-headsets>

http://electronics.howstuffworks.com/oculus-rift2.htm/printable>

http://www.gizmag.com/jins-meme-smart-glasses-energy-levels/35317/>

ner-designer-syd-m>

<http://www.digitaltrends.com/wearables/smart-clothing-garments-at-ces-2015-and-beyond/>

http://www.digitaltrends.com/wearables/wearables-for-women-are-coming/>

http://bionicly.com/10-examples-of-where-jewelry-meets-wearable-tech/>

http://www.bloomberg.com/news/articles/2015-01-05/the-two-wearables-worth-seeing-at-ces-arent-worth-wearing>

<http://www.wired.com/2014/08/ralph-lauren-polo-tech-shirts/

http://iq.intel.com/creating-the-worlds-first-open-source-3d-printed-dress/>

http://www.fastcoexist.com/3036390/how-i-wore-a-brainwave-reading-headset-for-a-week-and-learned-to-calm-my-mind>

http://www.fastcodesign.com/3036532/wearables-week/the-problem-with-wearable-technology-according-to-blade-run

<http://www.media.mit.edu/wearables/lizzy/timeline.html#1665>

<http://wcc.gatech.edu/exhibition>

http://www.bigfishgames.com/blog/google-wear-history-wearable-technology/

http://www.theverge.com/2012/6/26/2986317/google-project-glass-wearable-computers-disappoint-me

<http://www.engadget.com/2012/12/21/our-augmented-selves-the-promise-of-wearable-computing/>

http://www.wired.com/2013/12/wearable-computers/all/

http://makezine.com/2011/06/21/is-the-rise-of-wearable-electronics-finally-here/>

http://gizmodo.com/what-comes-after-click-a-crash-course-in-tangible-user-815532137>

https://www.interaction-design.org/encyclopedia/wearable_computing.html>

http://en.wikipedia.org/wiki/Wearable_computer

http://en.wikipedia.org/wiki/Ambient_intelligence

http://en.wikipedia.org/wiki/Wearable_technology

http://en.wikipedia.org/wiki/User_interface

http://en.wikipedia.org/wiki/Augmented_reality

http://www.thestudymaterial.com/presentation-seminar/computer-presentation/65-presentation-wearable-computers.html?tmpl=component&print=1&layout=default&page=

http://gizmodo.com/soldiers-describe-how-darpa-smartphones-save-lives-in-b-1626669065

http://computer.howstuffworks.com/brain-computer-interface.htm/printable>

http://www.wareable.com/wearable-watch-list/50-best-wearable-tech>

http://gizmodo.com/the-best-fitness-tracker-for-every-exercise-1673000514>

http://www.fastcoexist.com/1680025/no-more-needles-a-crazy-new-patch-will-constantly-monitor-your-blood>