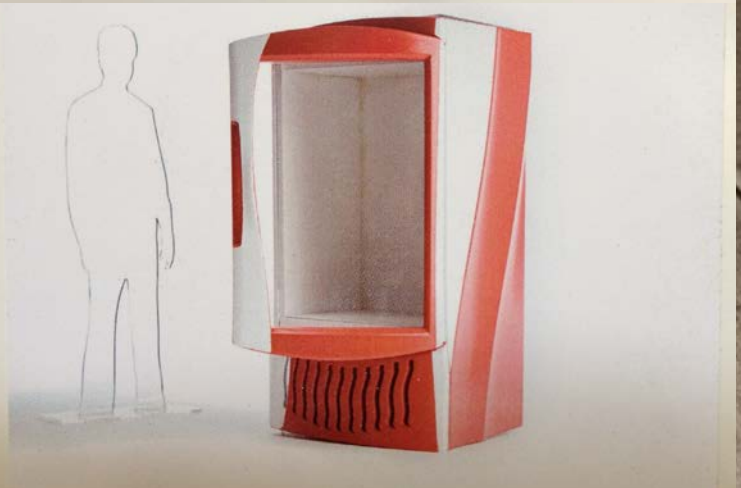
Physical Prototyping

Noah Posner

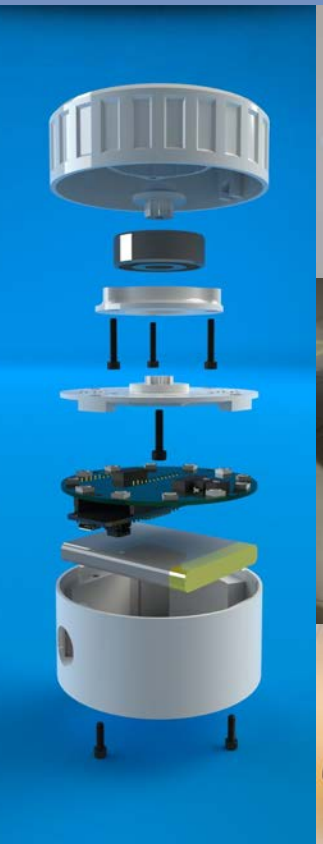
Who am I?

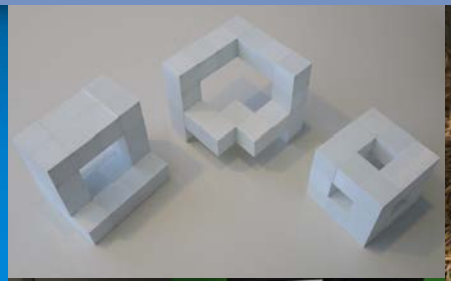
Who am I?



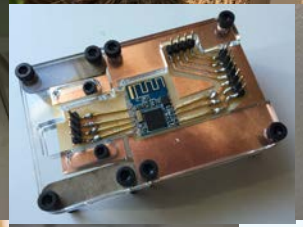
Who am I?

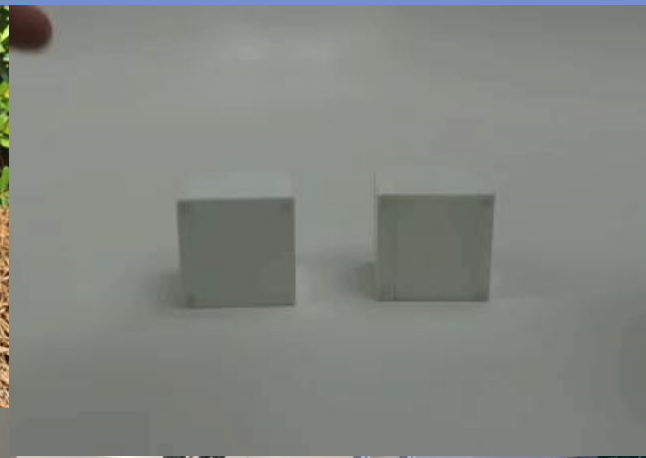
Who am I?






arboretum.gatech.edu
Fringe Tree
Chionanthus virginicus
Native to the southeastern United States including Georgia, the dried roots and bark were used by Native Americans to treat skin inflammations. The crushed bark was used in treatment of sores and wounds. The fruit provides a good food source for birds and wildlife.
Georgia Tech Arboretum





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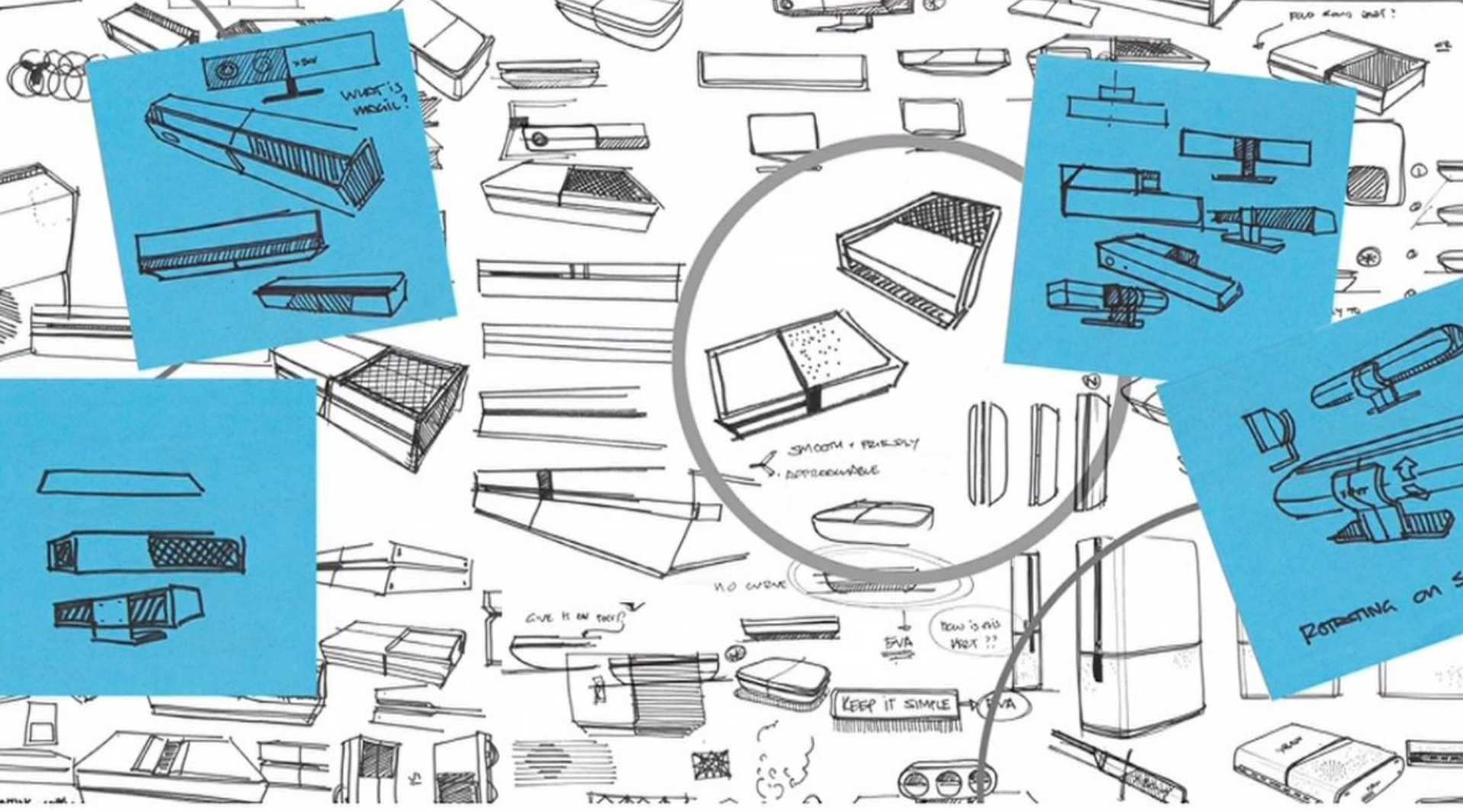
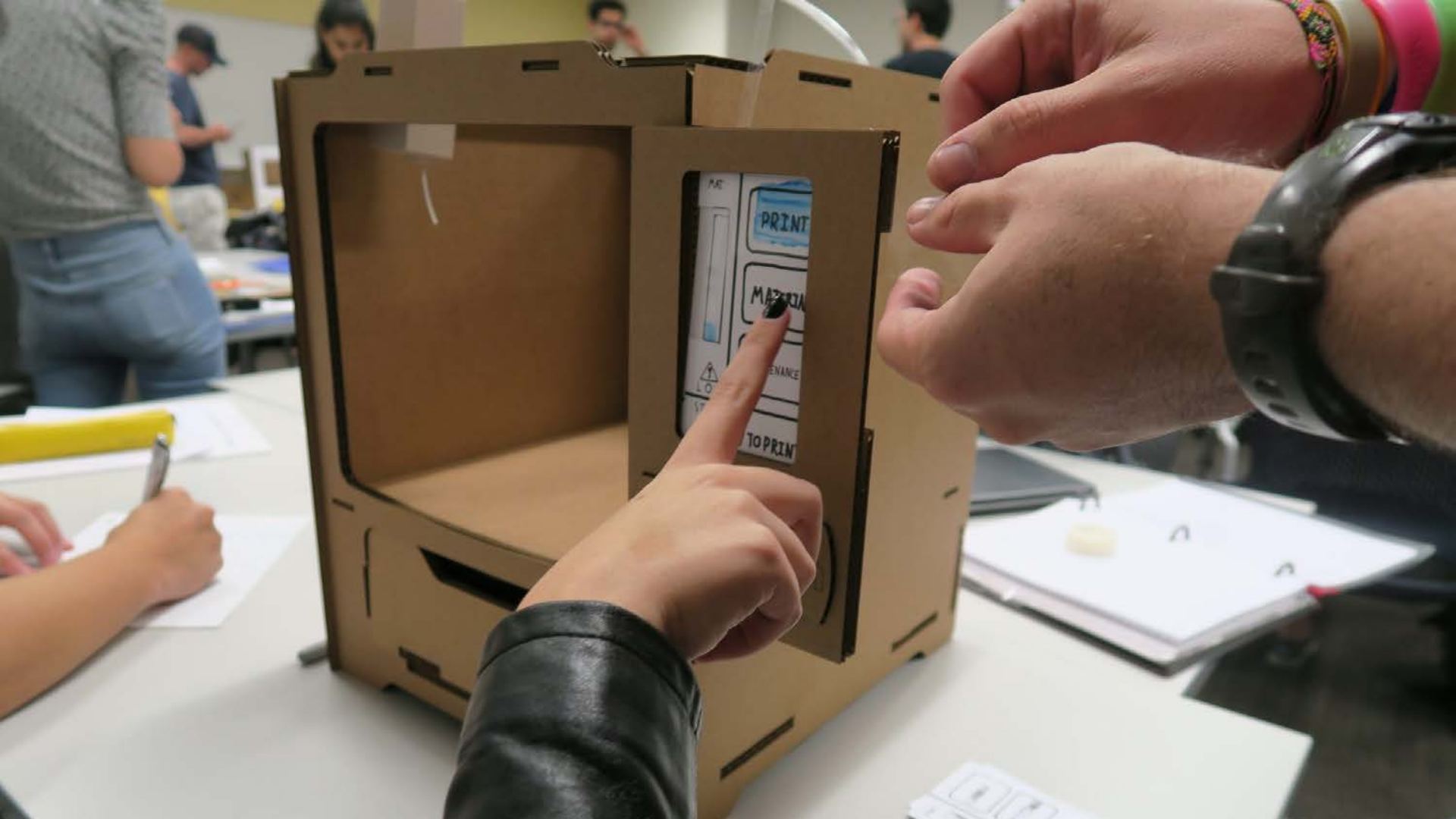

WHAT is MISSING?
SMOOTH + FRIENDLY
NO WORK
GIVE IT AN EASY?
EVA
HOW IS THIS WORK ??
KEEP IT SIMPLE
EVA
ROTATING ON


Y
X
B
A


PRINT

What are we doing?

Creation of physical prototypes

- The model making process
- Tools used to create models
- Where you can find tools at GT

What are we doing?

Creation of physical prototypes

- The model making process
- Tools used to create models

What is Model Making?

What is Model Making?

What is Model Making

Communicate

What is Model Making

Communicate

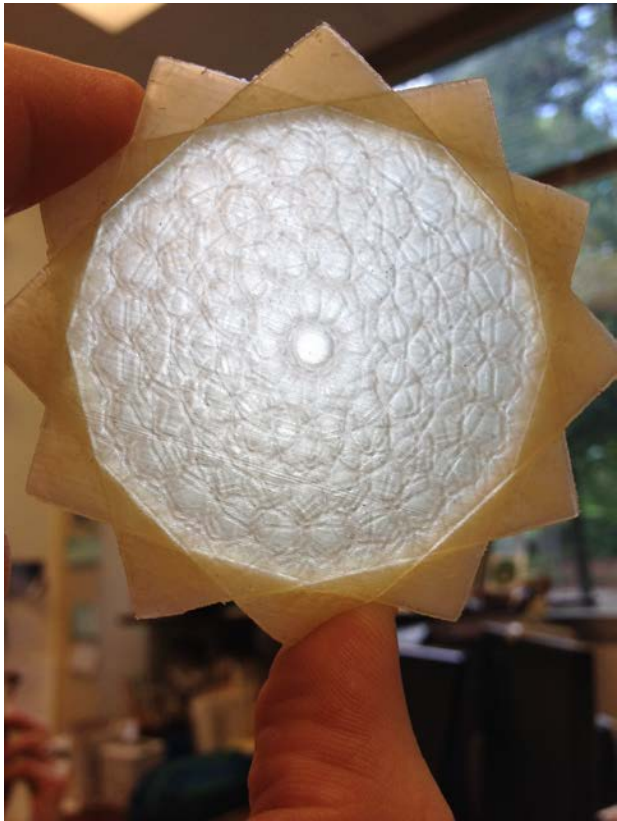
Learn

What is Model Making

Communicate

Learn

Inspire



Beaudouin-lafon M. MacKay, W. Prototyping tools and techniques, handbook of HCI

What is Model Making

Scientific

Intrinsic

What is Model Making

Scientific

Intrinsic

Extrinsic properties

Description: What is Model Making

Scientific

Intrinsic

Extrinsic properties

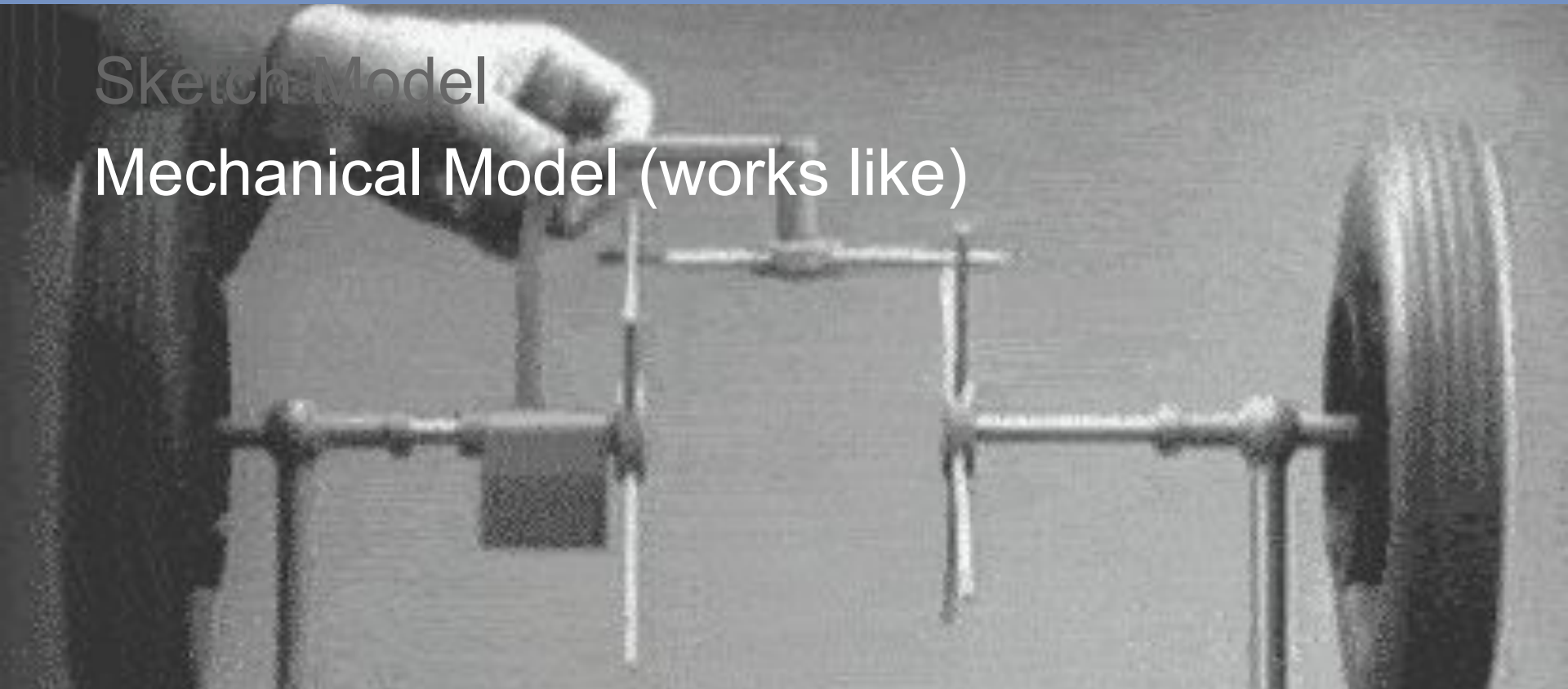
TAKE NOTES

Types of Models

Types of models

Sketch Model

Types of models



Sketch Model

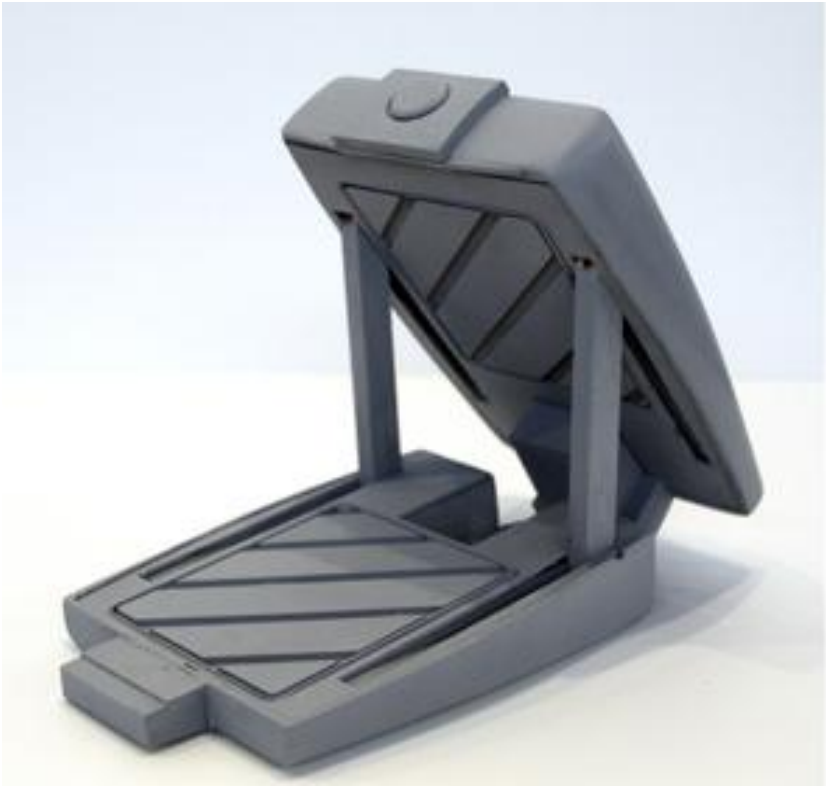
Mechanical Model (works like)

Types of models

Sketch Model

Mechanical Model

White Model



Types of models

Sketch Model

Mechanical Model

White Model

Appearance Model (looks like)

Types of models

Sketch Model

Mechanical Model

White Model

Appearance Model

Interaction Model

(acts like)

Types of models

Sketch Model

Mechanical Model

White Model

Appearance Model

Interaction Model

Prototype

What is a physical prototype in HCI?

A concrete representation of part or all of an interactive system

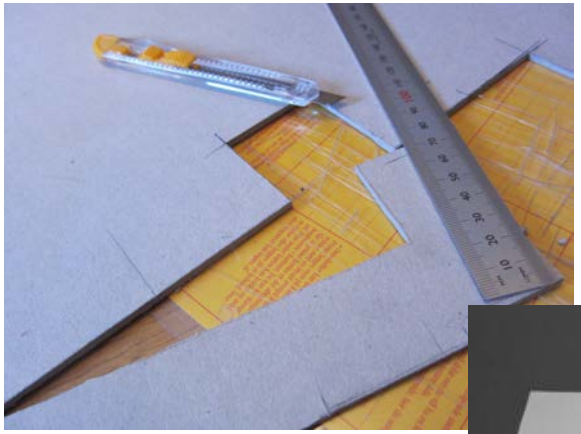
Beaudouin-lafon M. MacKay, W. Prototyping tools and techniques, handbook of HCI

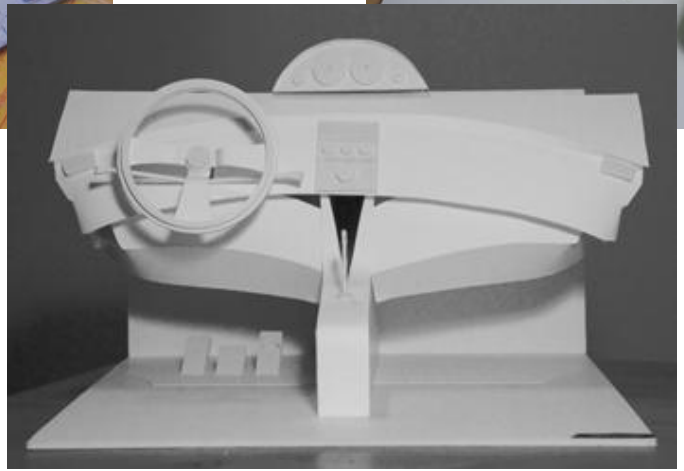
What is a physical prototype in HCI?

A representative form which allows for interaction and evaluation.

Model Making Tools & Tech

Desktop Models





Desktop Models

- Sketch Model
- No power tools
- Clean process

Desktop Models

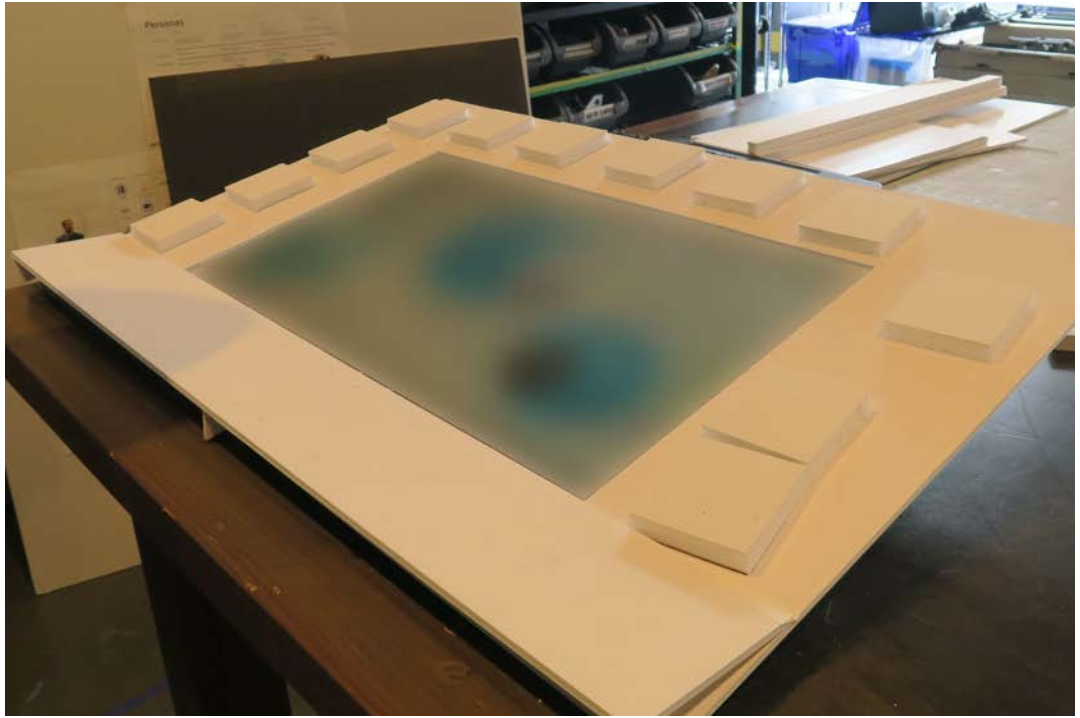
- Made of
  - Paper
  - Cardboard
  - Foamcore

Desktop Models

- Made of
  - Paper
  - Cardboard
  - Foamcore

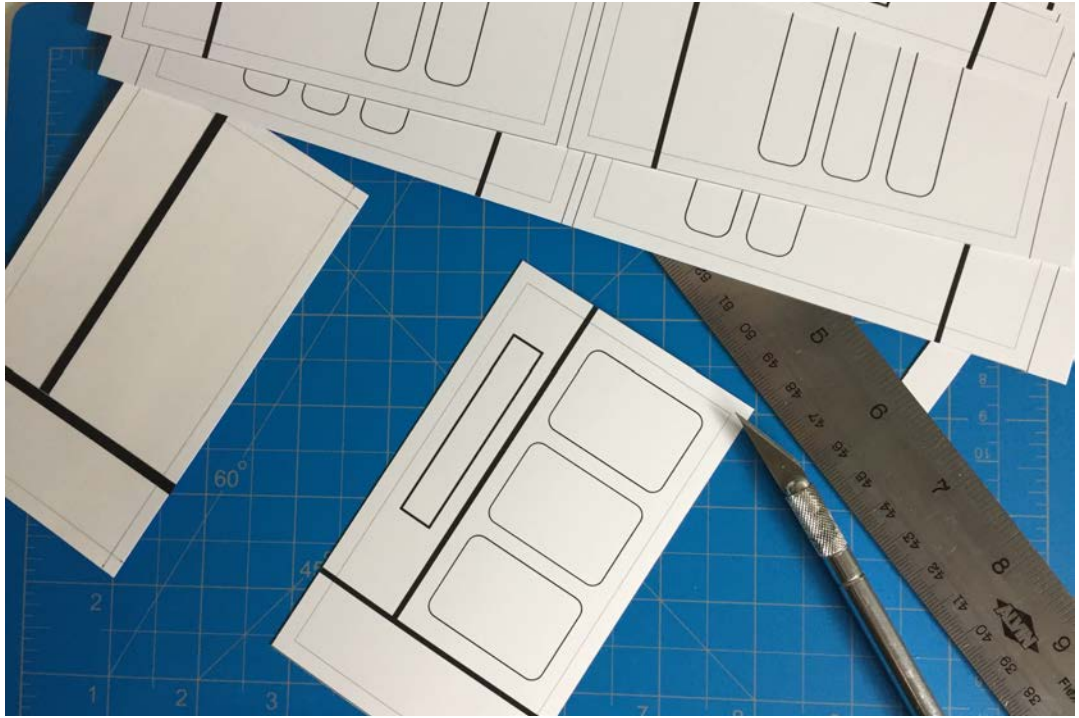
Desktop Models

- Made of
  - Paper
  - Cardboard
  - Foamcore



Desktop Models

- Made of
  - Paper
  - Cardboard
  - Foamcore
- Made with
  - Xacto knives
  - Ruler

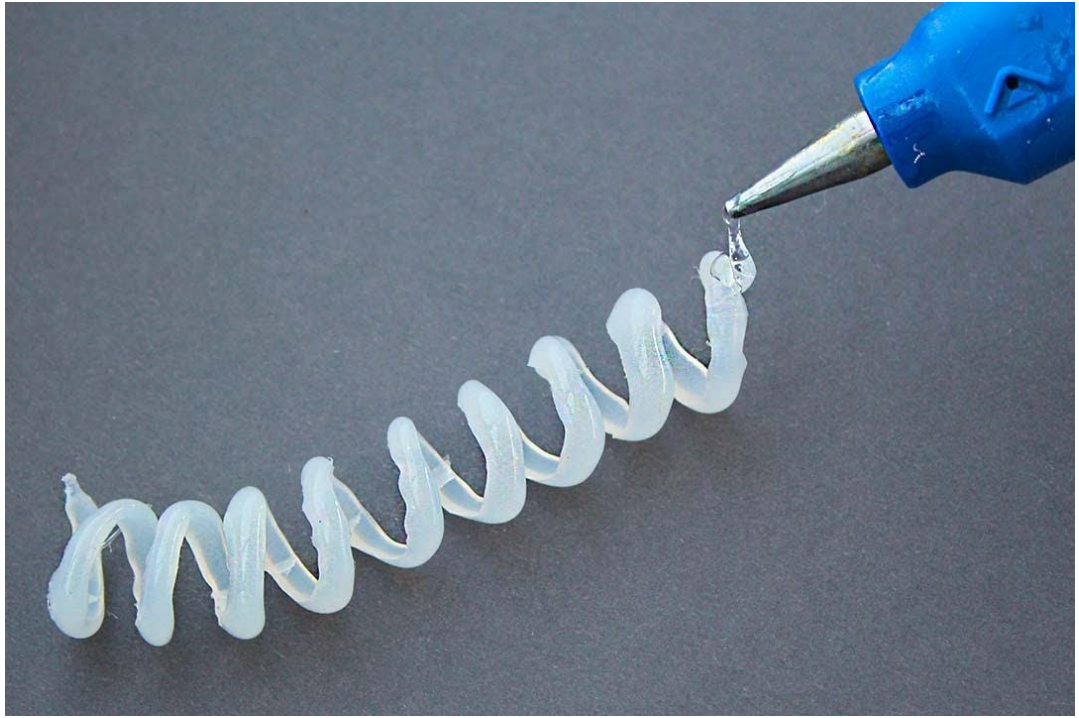


Desktop Models

- Made of
  - Paper
  - Cardboard
  - Foamcore
- Made with
  - Xacto knives
  - Ruler
  - White glue

Desktop Models

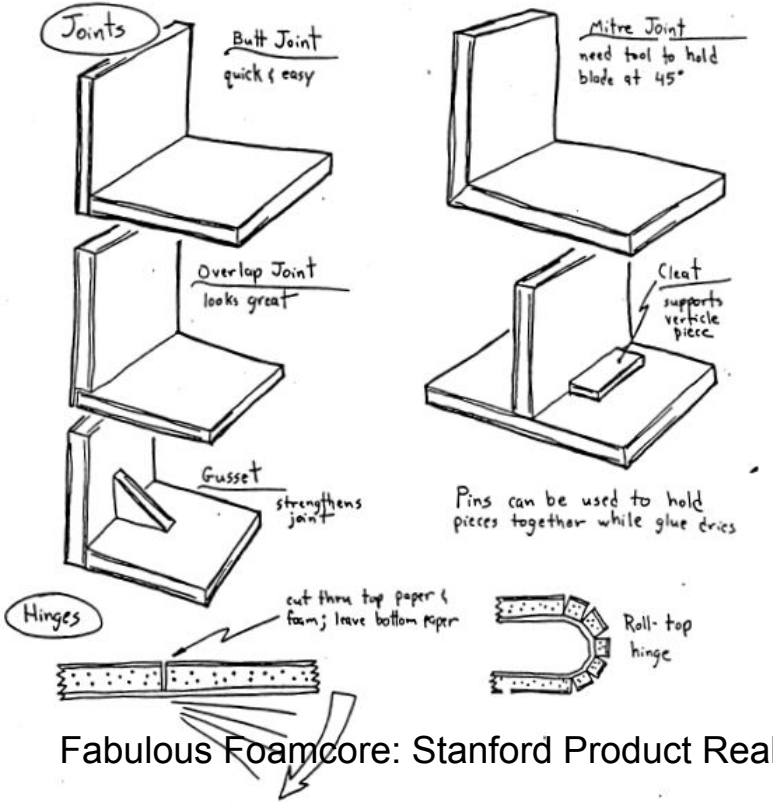
- Made of
  - Paper
  - Cardboard
  - Foamcore
- Made with
  - Xacto knives
  - Ruler
  - White glue
  - Hot glue

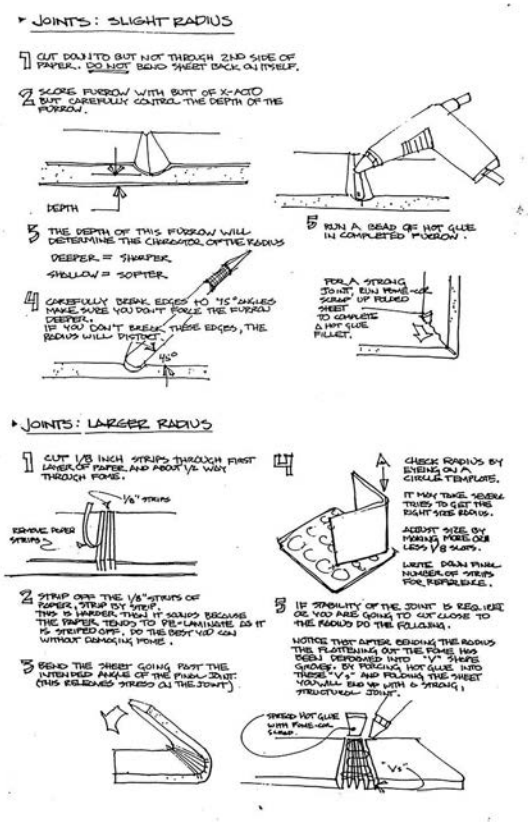


Desktop Models

- Made of
  - Paper
  - Cardboard
  - Foamcore
- Made with
  - Xacto knives
  - Ruler
  - White glue
  - Hot glue
  - Special foam tools

Desktop Models



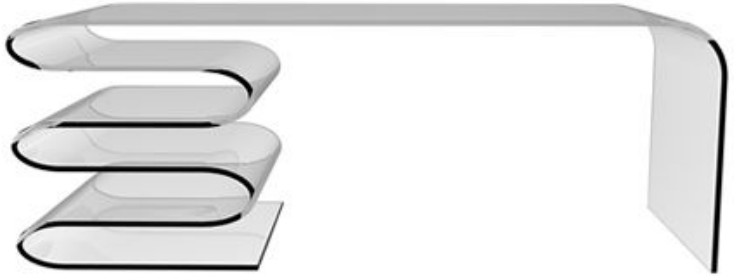


Fabulous Foamcore: Stanford Product Realization Lab

Pink Foam

Signfoam

Thermoforming



Modern Prototyping

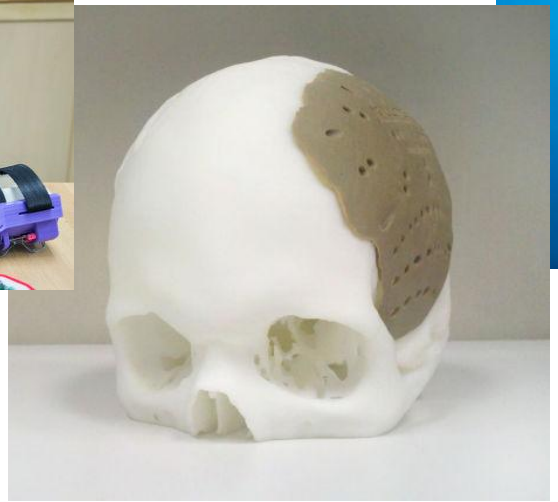
New technologies

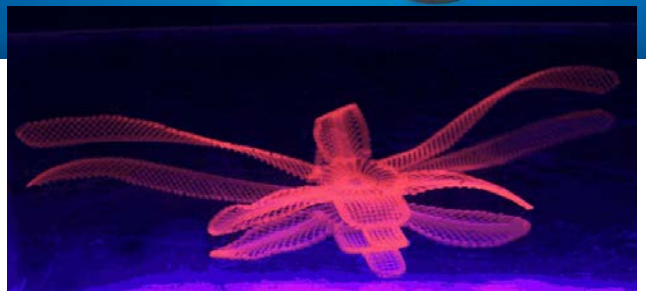
What is Rapid Prototyping

“Rapid Prototyping” (RP) refers to a class of **technologies** that can automatically construct physical models from **computer-Aided Design** (CAD) data or is a group of techniques used to “quickly” fabricate a scale model of a physical part or assembly using three-dimensional computer aided design (CAD) data.

Why is it Important

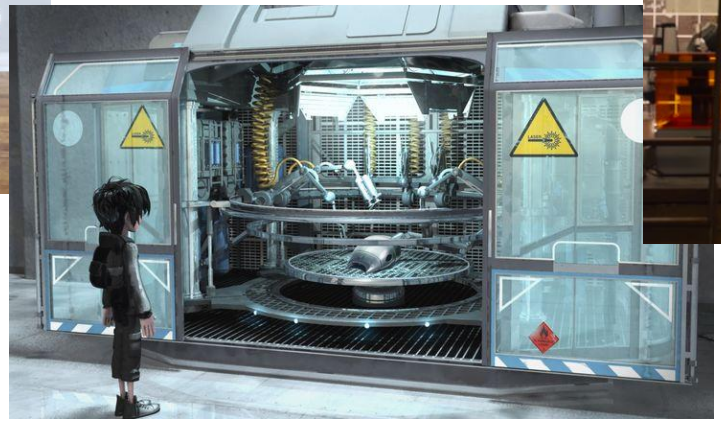
- constantly evolving





Why is it Important

- constantly evolving
- It is becoming more and more commonplace



Why is it Important

- constantly evolving
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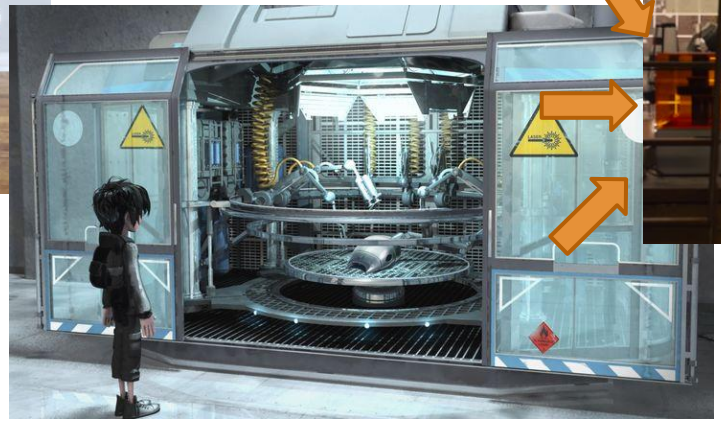


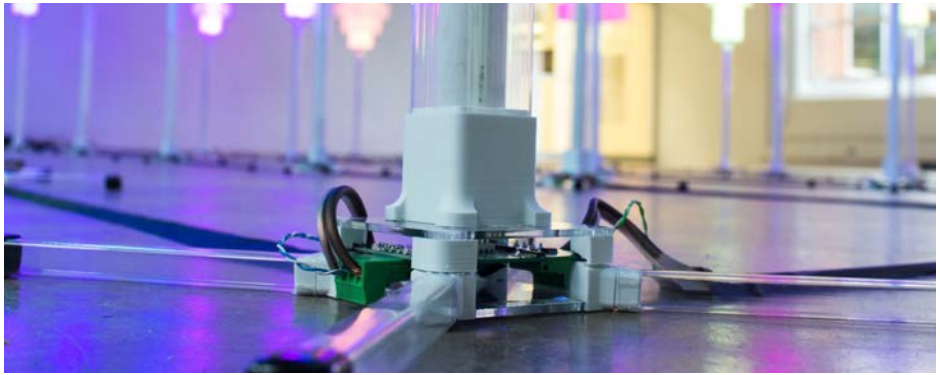
Why is it Important

- constantly evolving
- It is becoming more and more commonplace
- it is the future?

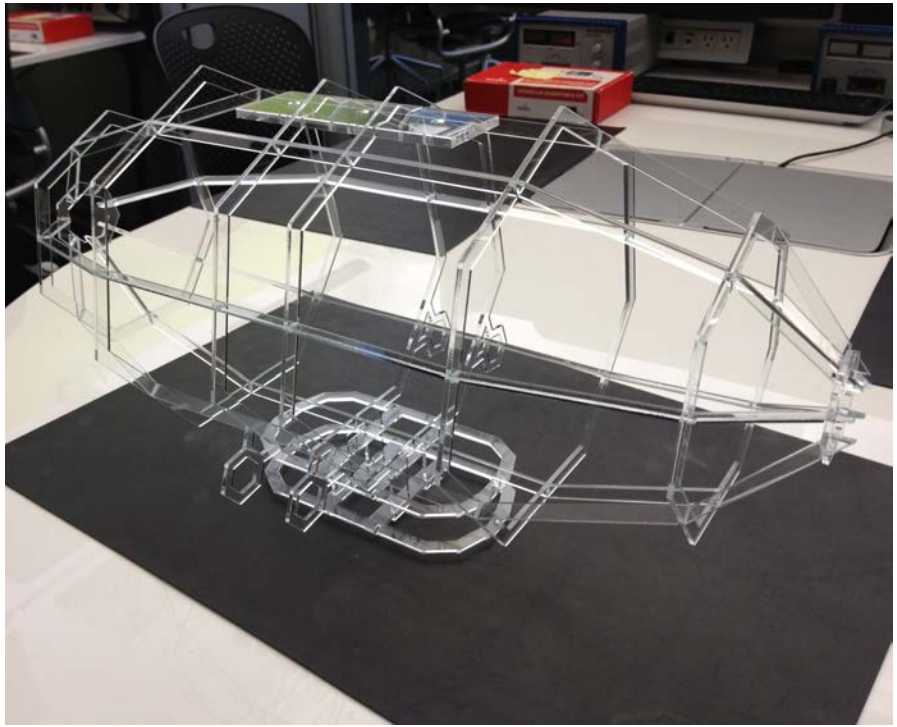
“Future engineers will need to think more like artists - people who can imagine new shapes in three dimensions.” - Lonnie Love, Group Leader, Automation, Robotics, and Manufacturing Oak Ridge National Labs

Why is it Important

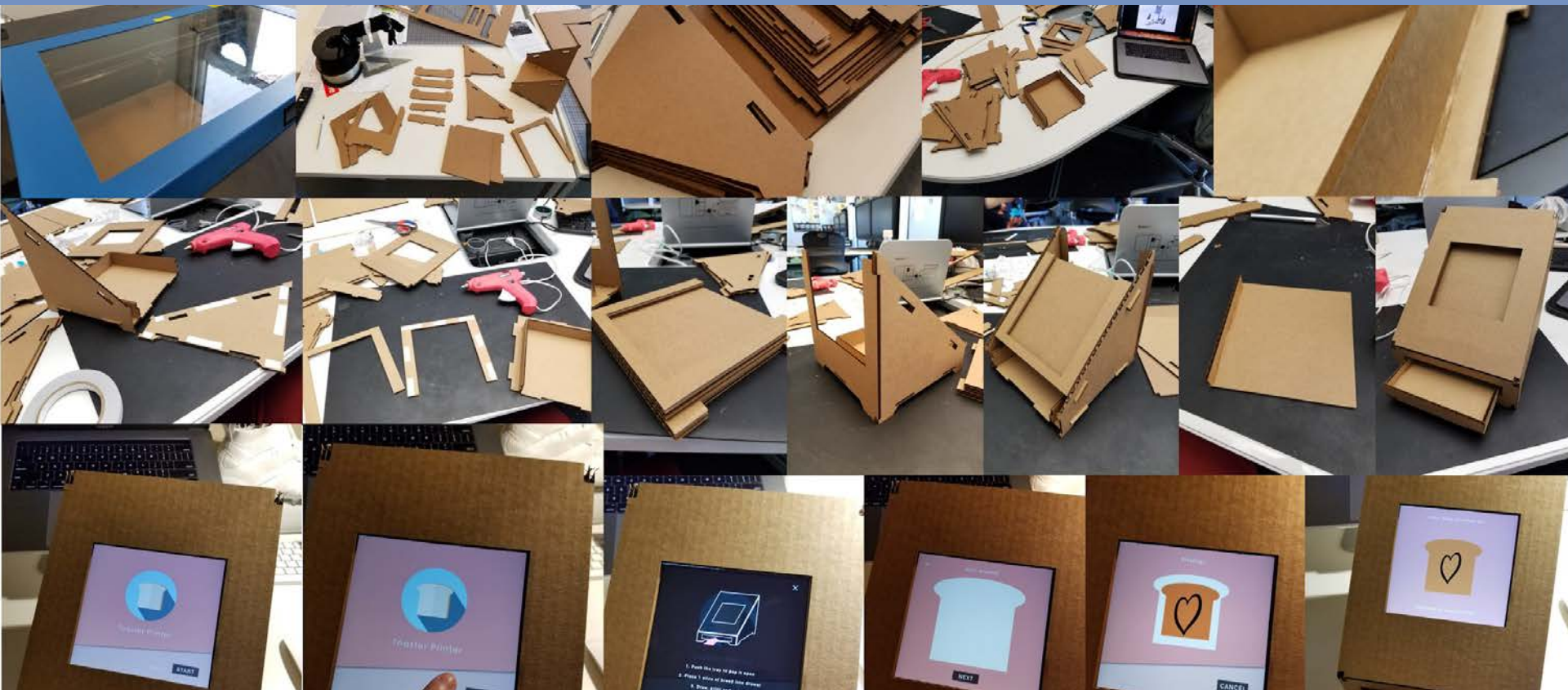
- constantly evolving
- It is becoming more and more commonplace
- it is the future?
- Allows for rapid iteration of useable parts



Lasercut

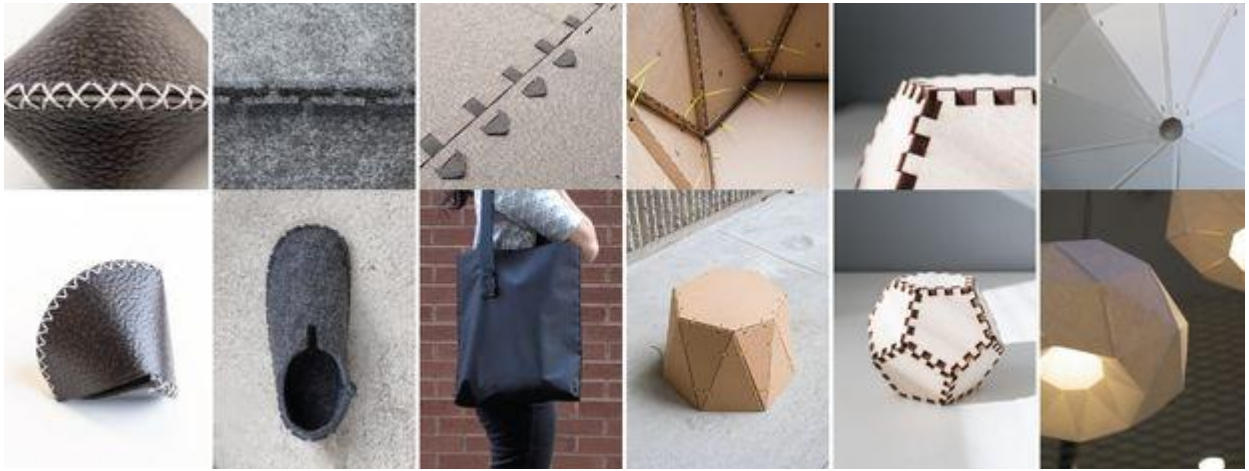


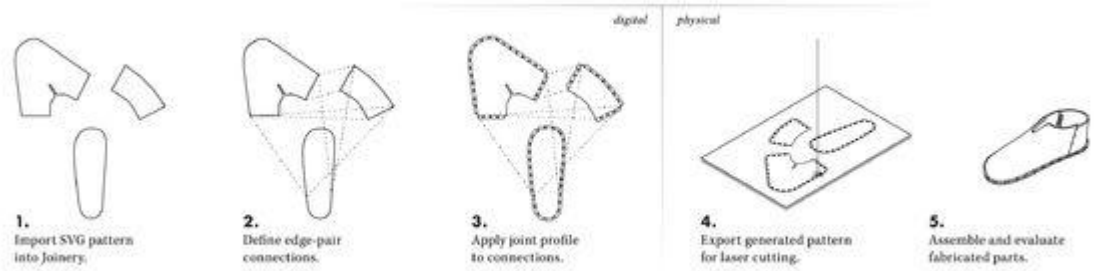
Lasercut



Lasercut

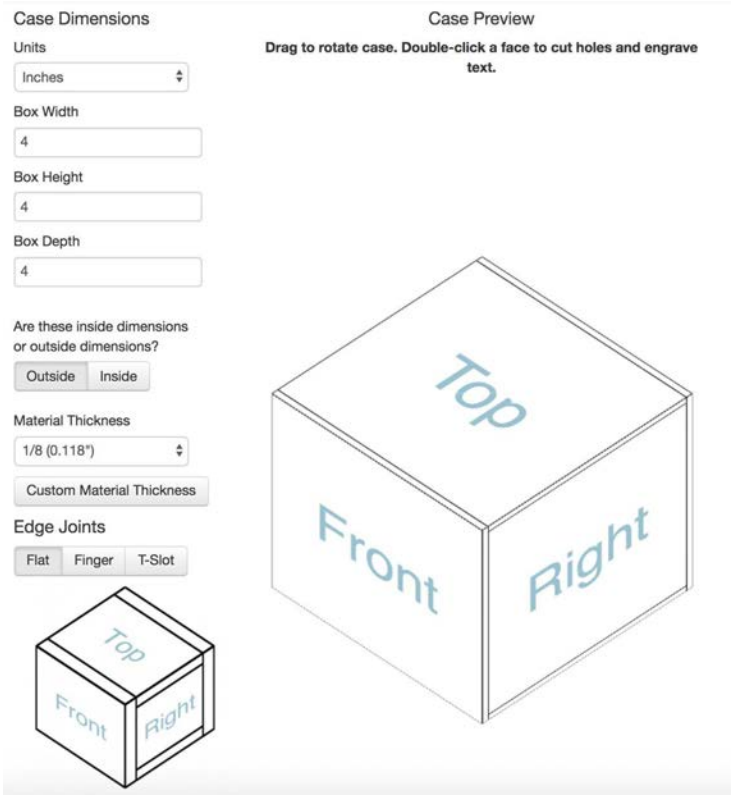
Lasercut Software Tools





Joinery
by Clement Zheng

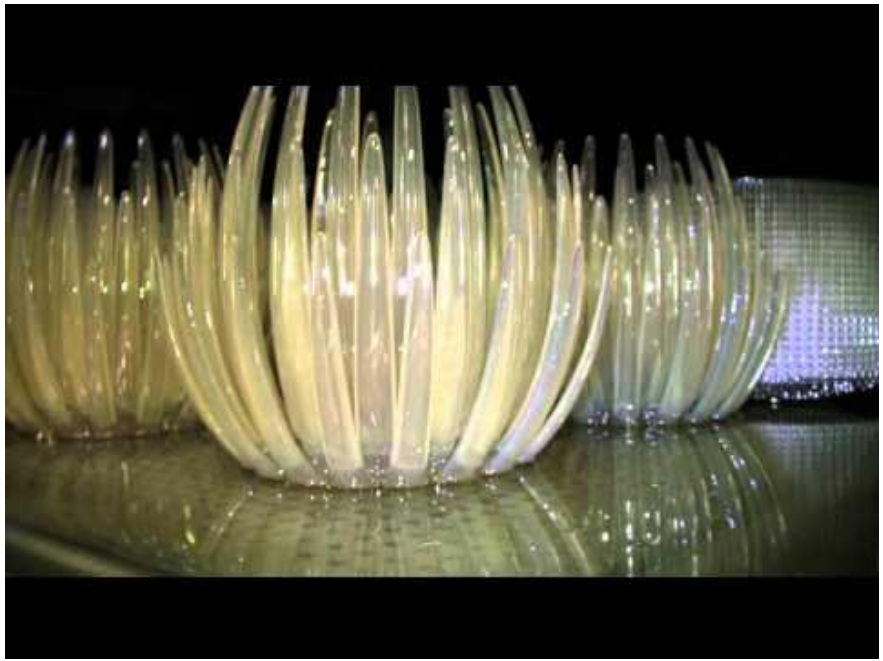
Lasercut Software Tools

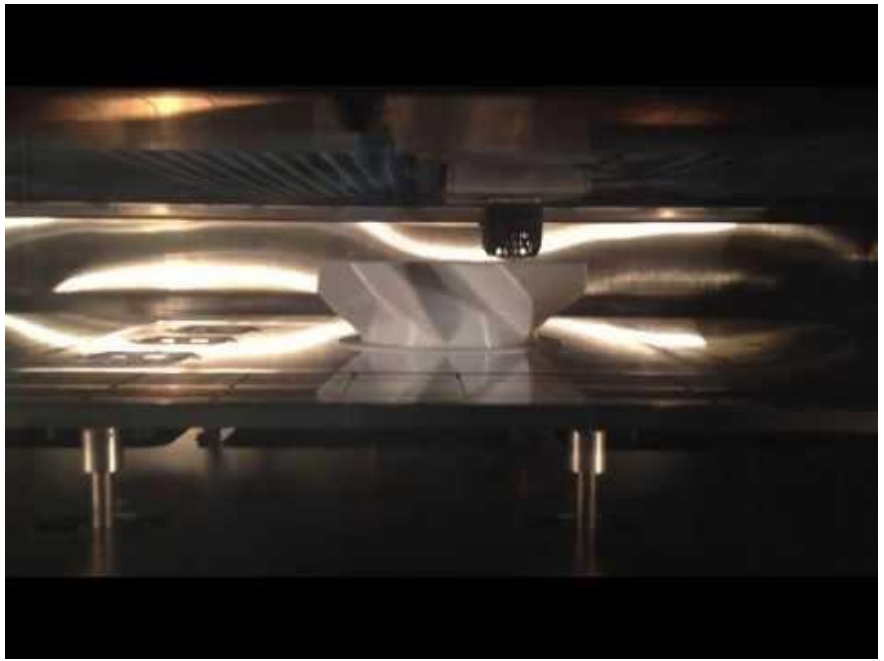


3D Printing

3D Printing

3D Printing



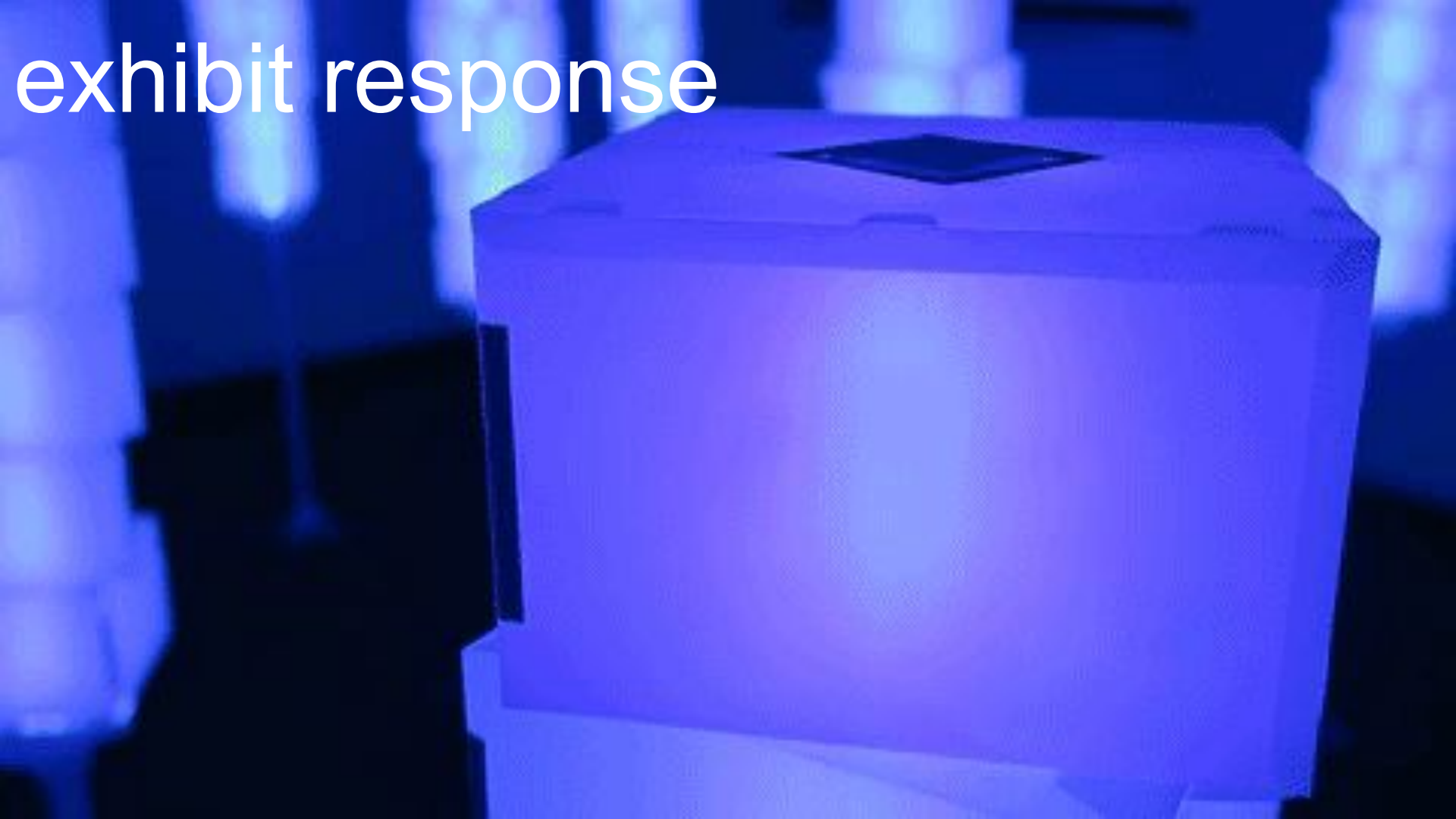


Prints with hardware

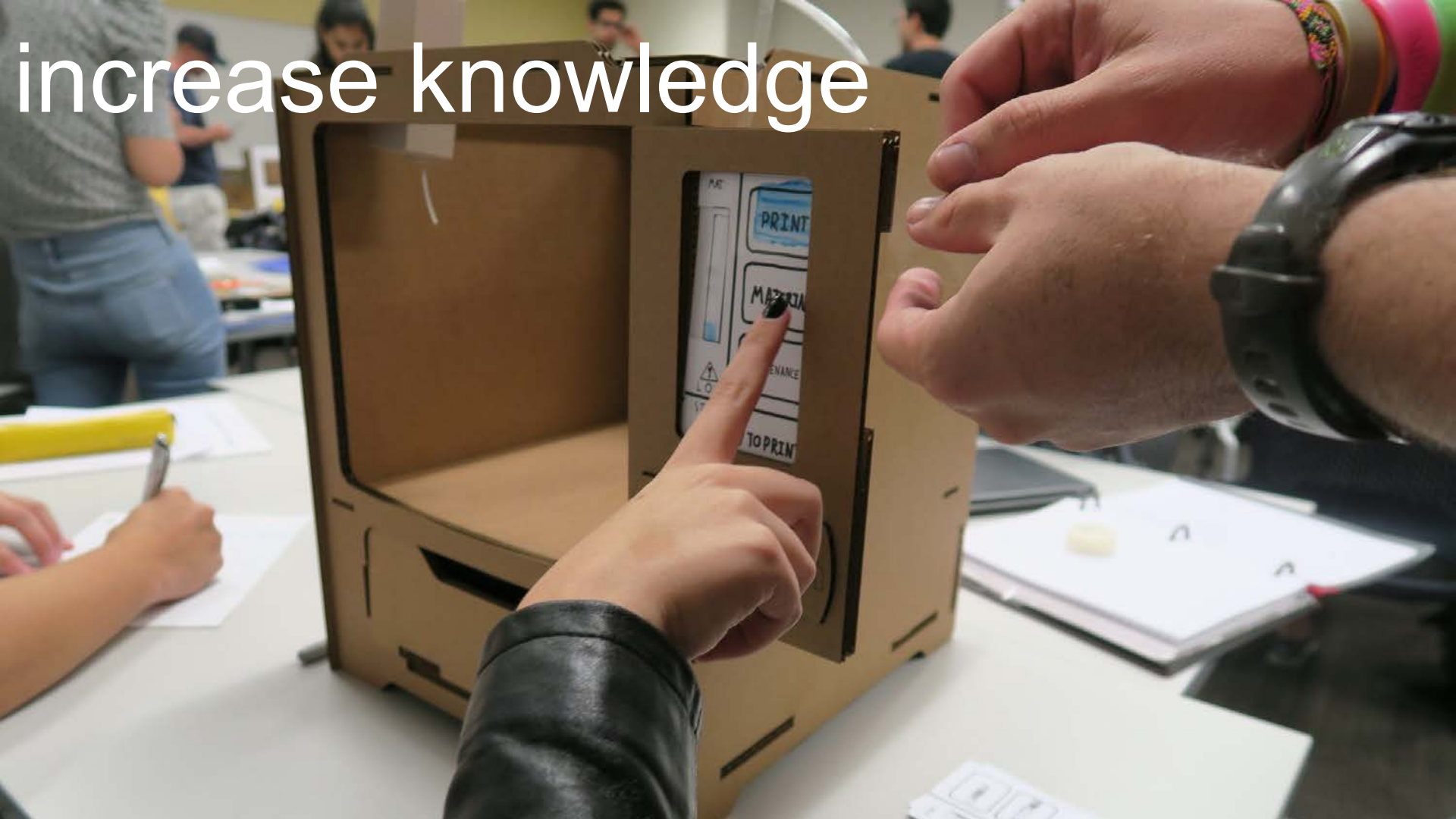
What is an interactive prototype?

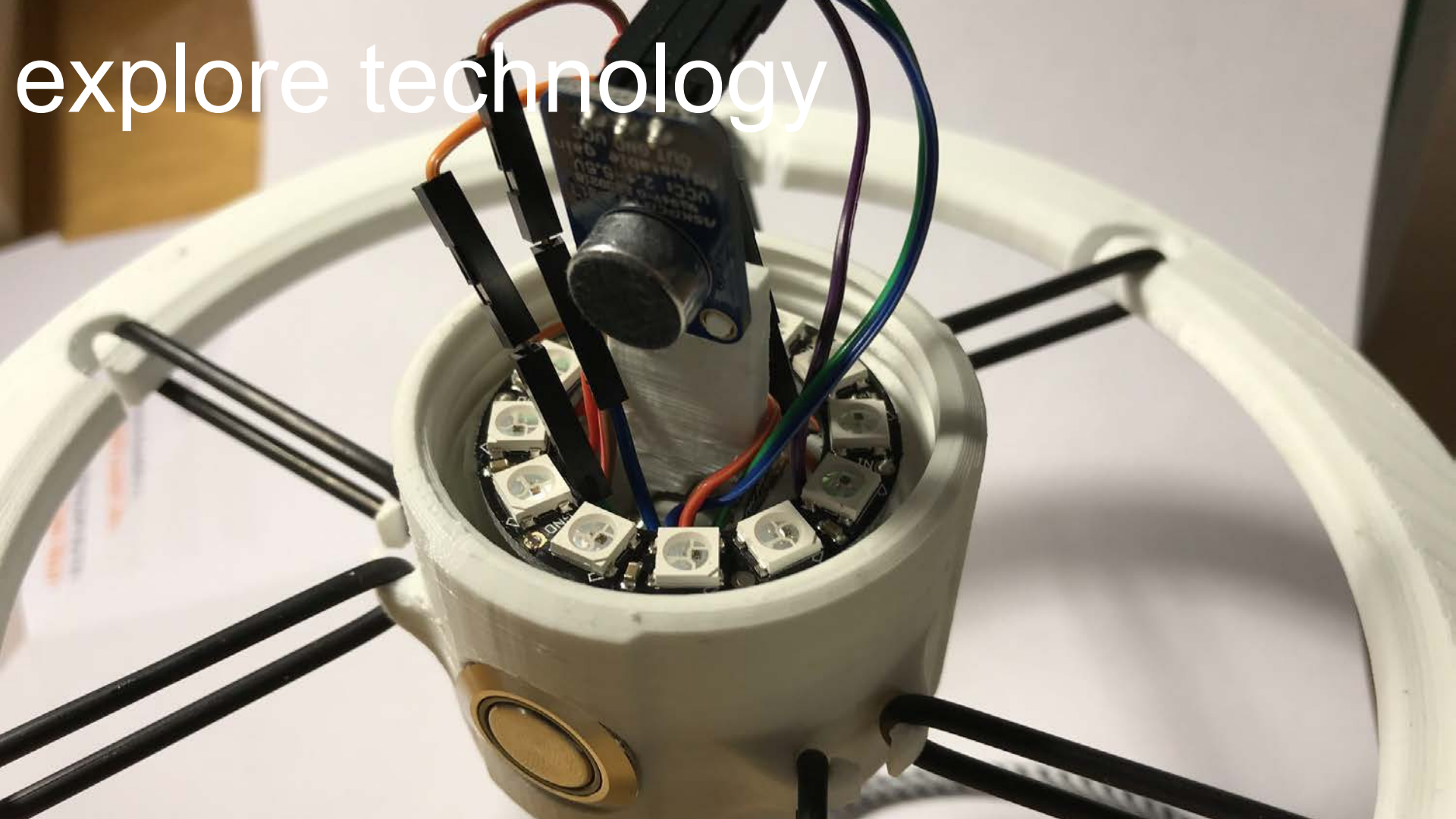
support interaction

exhibit response



increase knowledge

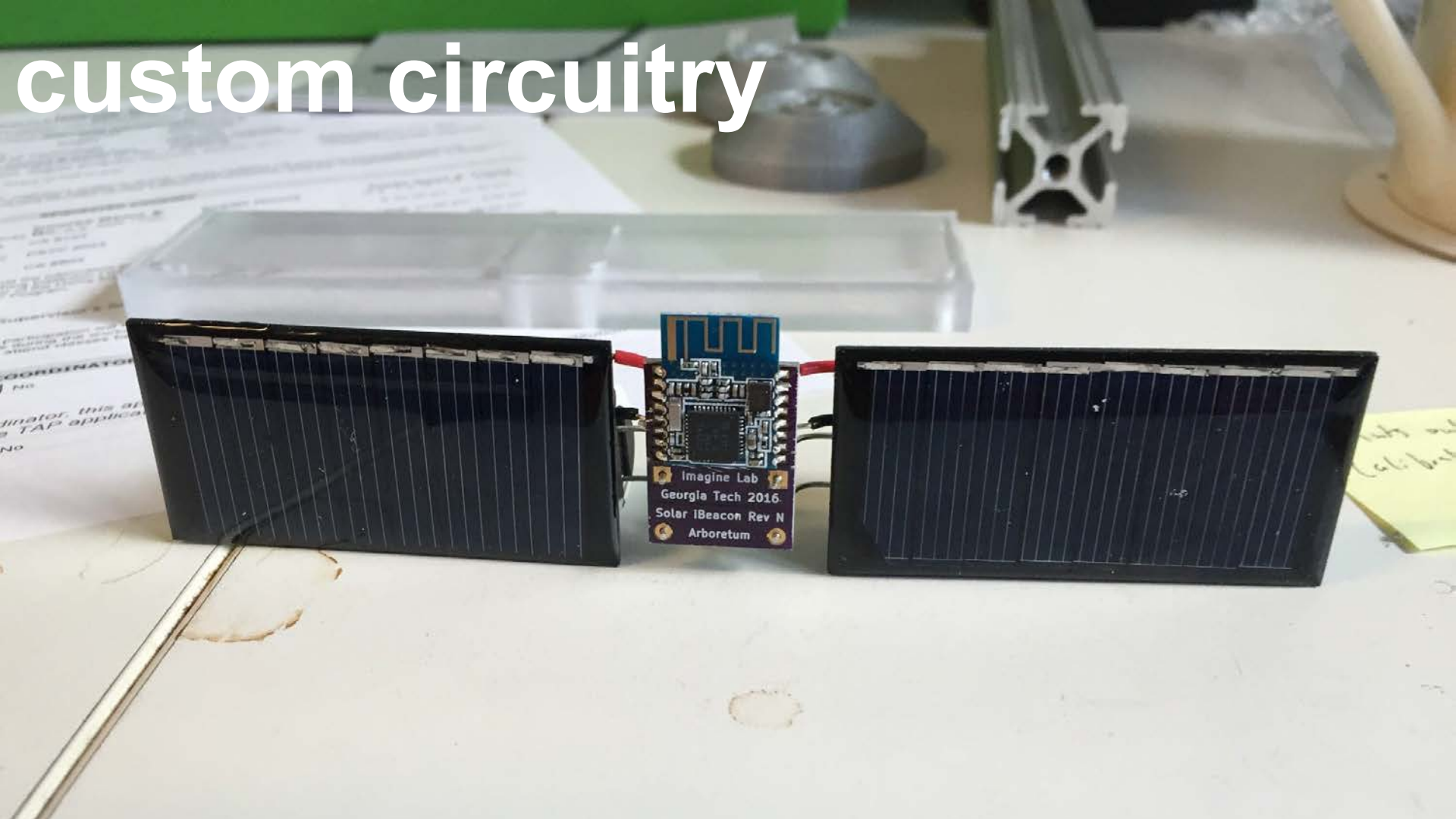



explore technology

Let’s talk “technology”

human

custom circuitry



the wizard

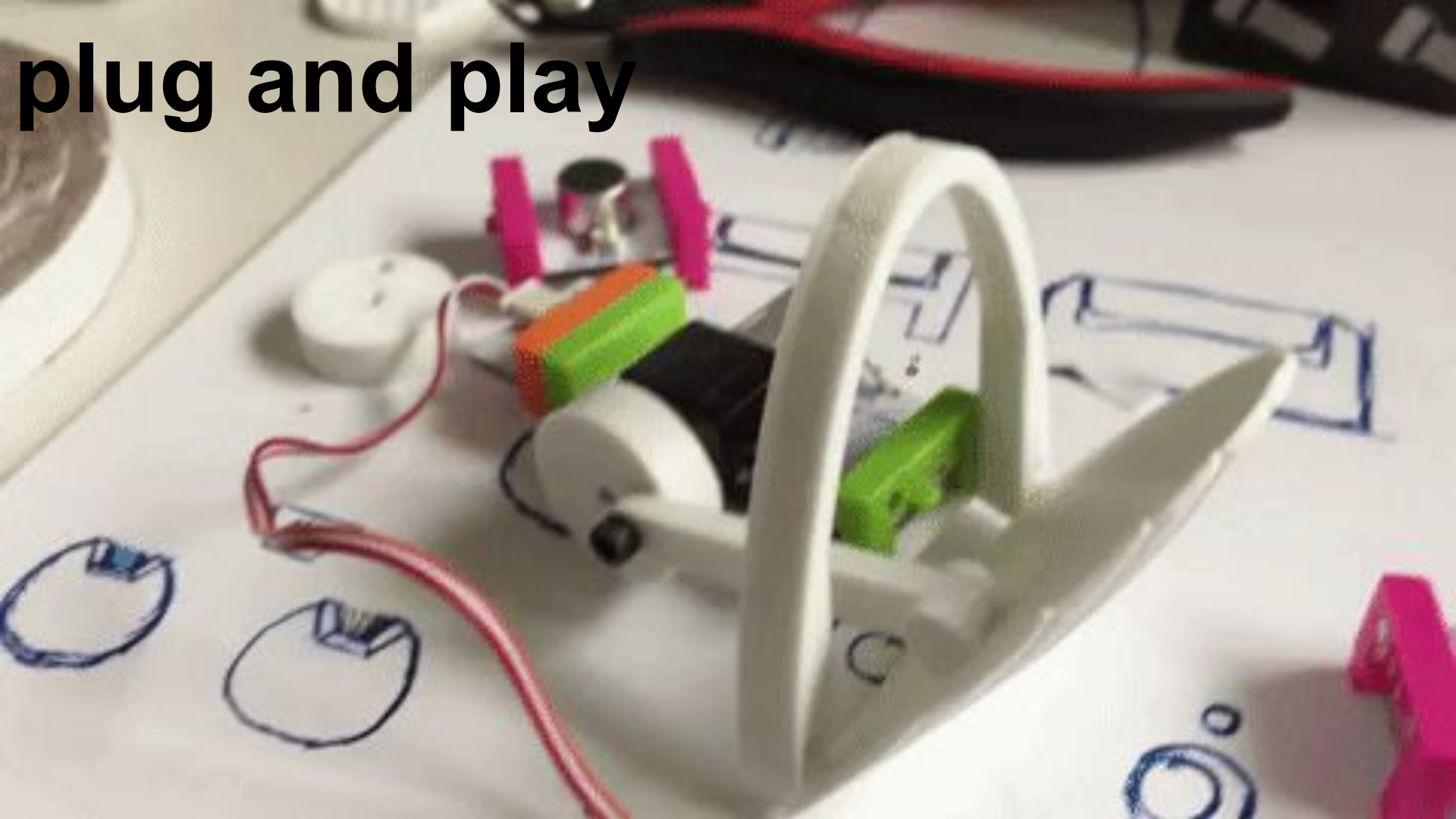
the wizard

Body Storming

using existing systems

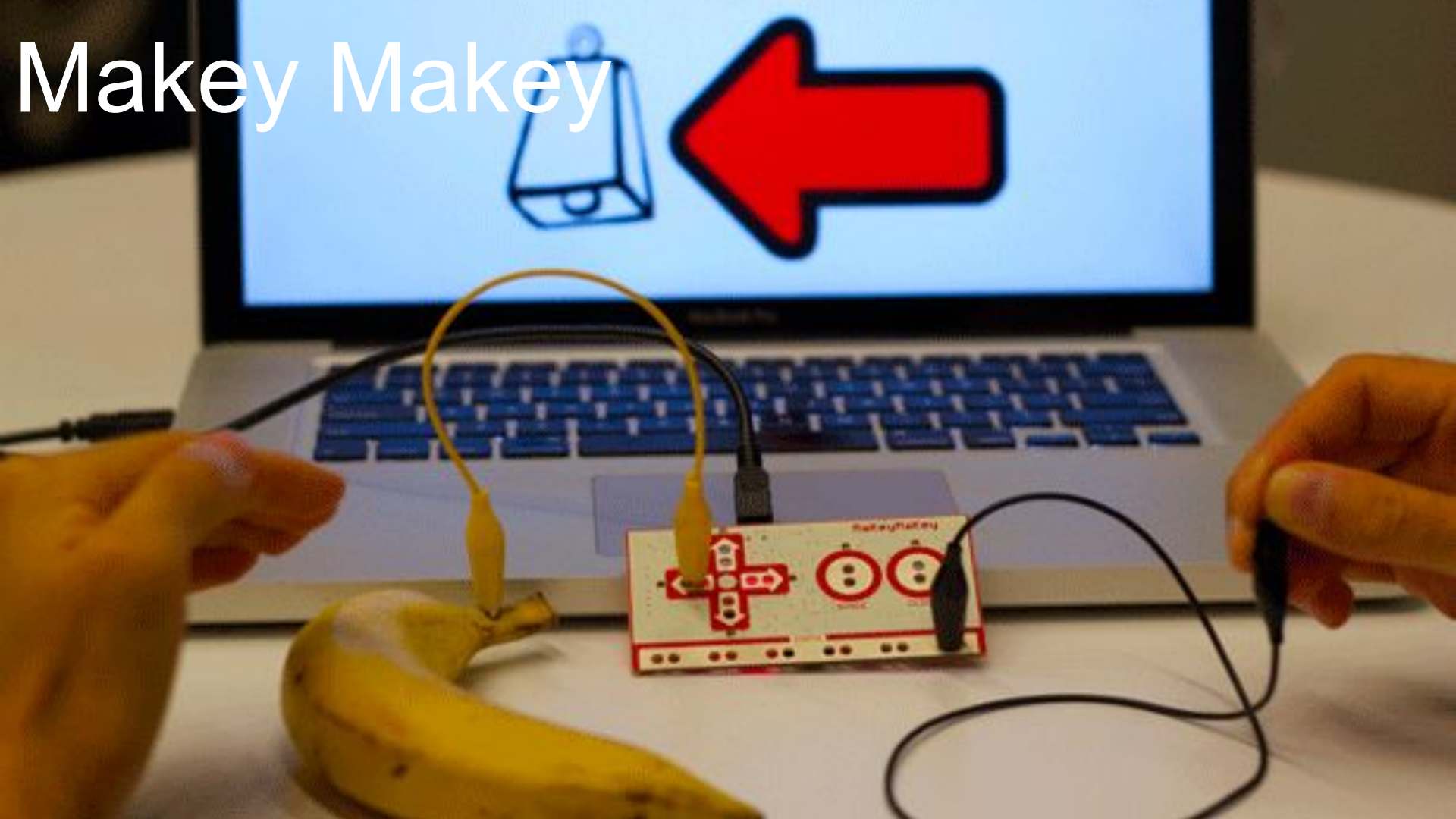
interactive screens

plug and play

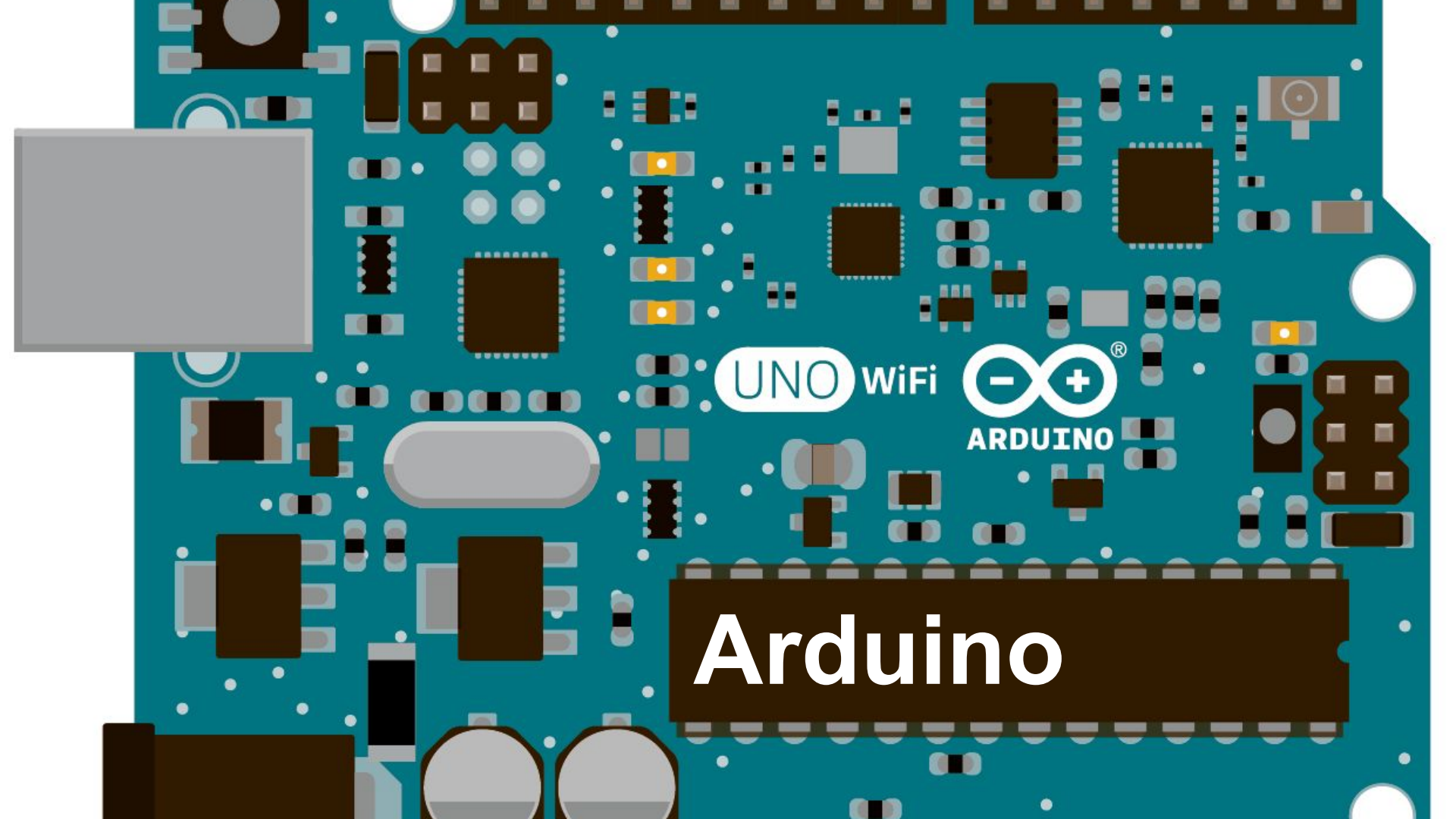


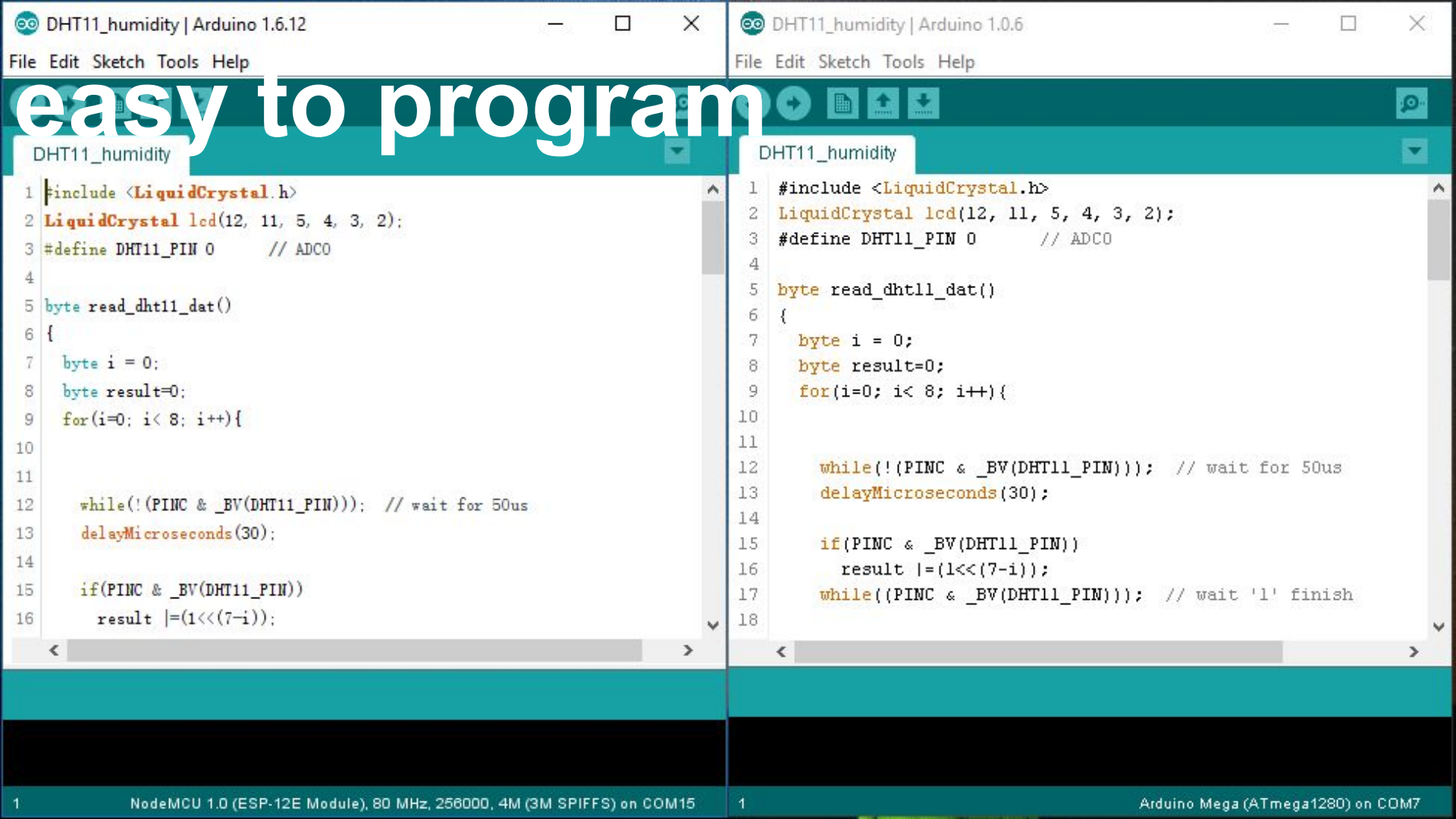
plug and play

Makey Makey



Xbox adaptive controller


UNO WiFi
ARDUINO
Arduino


DHT11_humidity | Arduino 1.6.12
File Edit Sketch Tools Help
easy to program
DHT11_humidity
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
#define DHT11_PIN 0 // ADC0
byte read_dht11_dat()
{
byte i = 0;
byte result=0;
for(i=0; i< 8; i++){
while(!(PINC & _BV(DHT11_PIN))); // wait for 50us
delayMicroseconds(30);
if(PINC & _BV(DHT11_PIN))
result |=(1<<(7-i));
NodeMCU 1.0 (ESP-12E Module), 80 MHz, 256000, 4M (3M SPIFFS) on COM15
DHT11_humidity | Arduino 1.0.6
File Edit Sketch Tools Help
DHT11_humidity
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
#define DHT11_PIN 0 // ADC0
byte read_dht11_dat()
{
byte i = 0;
byte result=0;
for(i=0; i< 8; i++){
while(!(PINC & _BV(DHT11_PIN))); // wait for 50us
delayMicroseconds(30);
if(PINC & _BV(DHT11_PIN))
result |=(1<<(7-i));
while((PINC & _BV(DHT11_PIN))); // wait '1' finish
Arduino Mega (ATmega1280) on COM7

SIK Experiment Guide for Arduino - V3.3

CONTRIBUTORS: HELLOTECHIE, TONI_K

Introduction: Hardware

The SparkFun Inventor's Kit is your map for navigating the waters of beginning embedded electronics. This kit contains all the information and parts you will need to create 16 circuits that cover the basics of programming and hardware interactions. At the center of this kit is one core philosophy – that anyone can (and should) experiment with electronics. When you're done with this guide, you'll have the know-how to start creating your own projects and experiments.

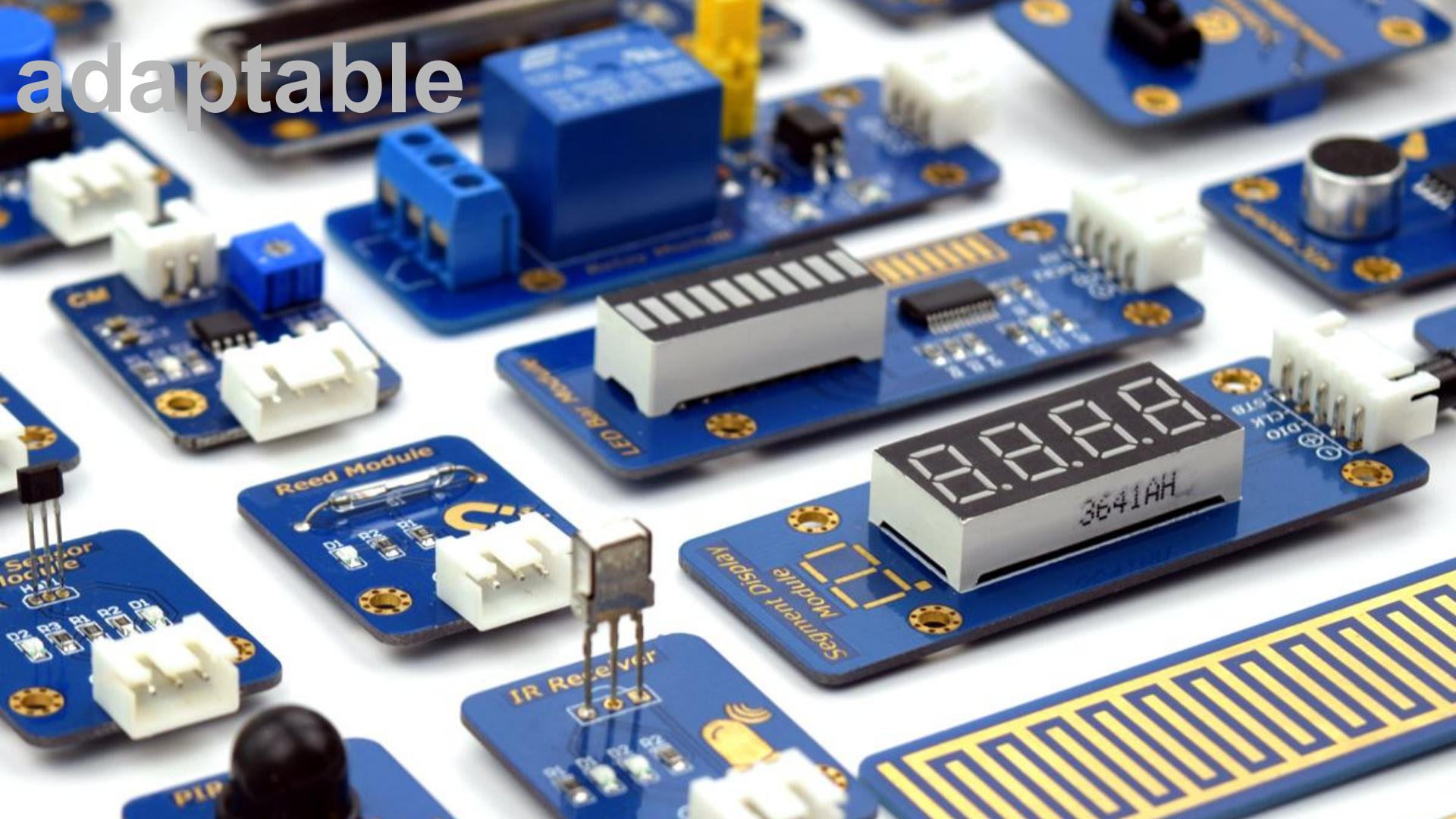
This guide is also available as a downloadable PDF, if you prefer.

SIK GUIDE DOWNLOAD

SparkFun Inventor's Kit - V3.3

You should have one of the two following versions of the SIK. If you need a overview of the parts included in your kit, please click on the product link below.

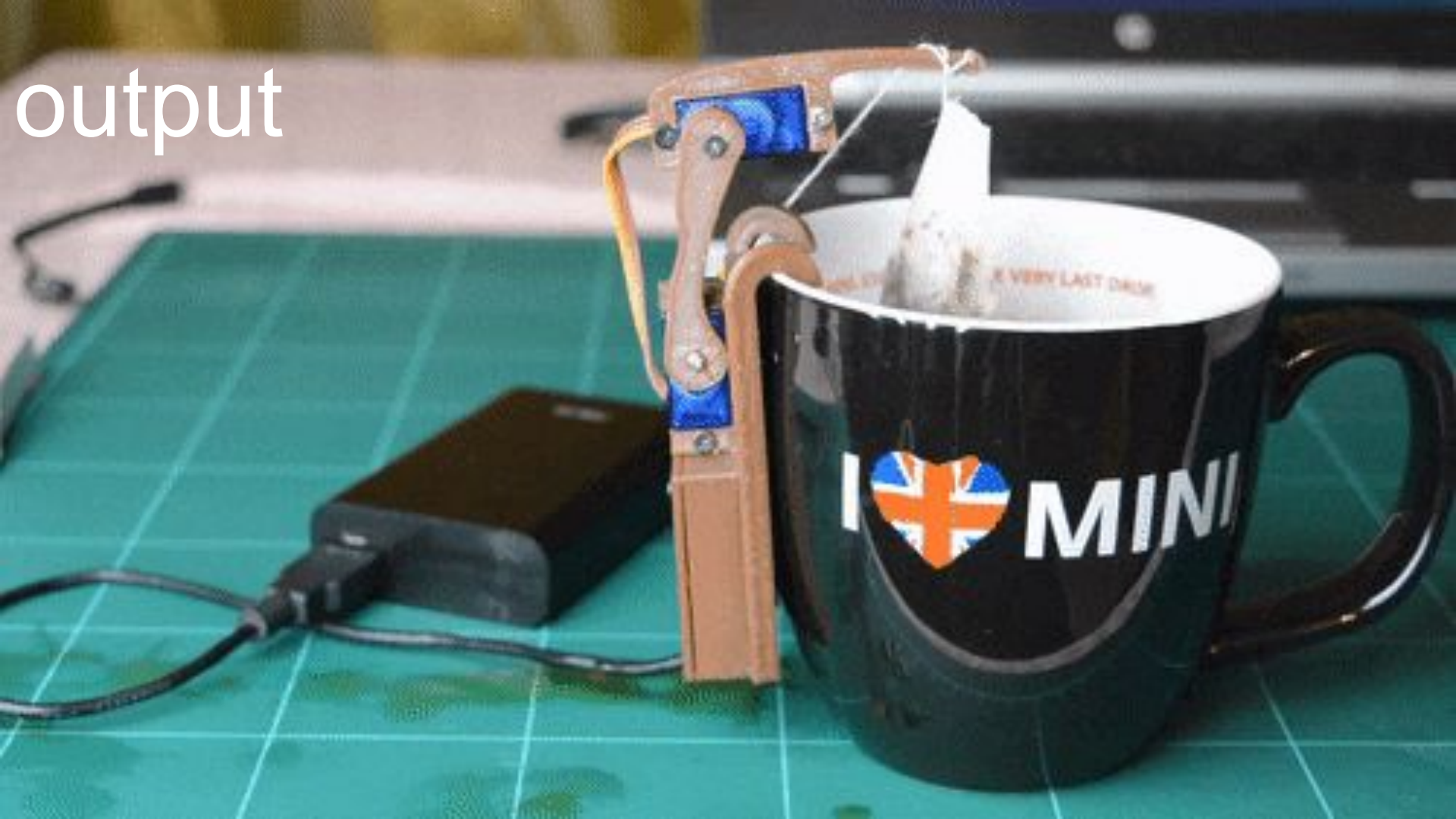
Pages


adaptable
Reed Module
JR Receiver
Segment Display Module
3641AH


staggering variety

input


perature
Passive buzzer
Sound Sensor
Active buzzer
Infrared-Receiver
Reed Switch
LED
Photo-interrupter
Switch Hall
Button module
Laser Transmitter
RGB LED
nsor
Photoresistor
Thermistor module
ADDA Converter
Tilt Switch
Rotary Encod
ensor
Potentiometer
Joystick PS2 module
Color Sensor
Obstacle Avoidance
RTC-DS130


output
I MINI

How we talk about prototypes?

How have you heard prototypes described?

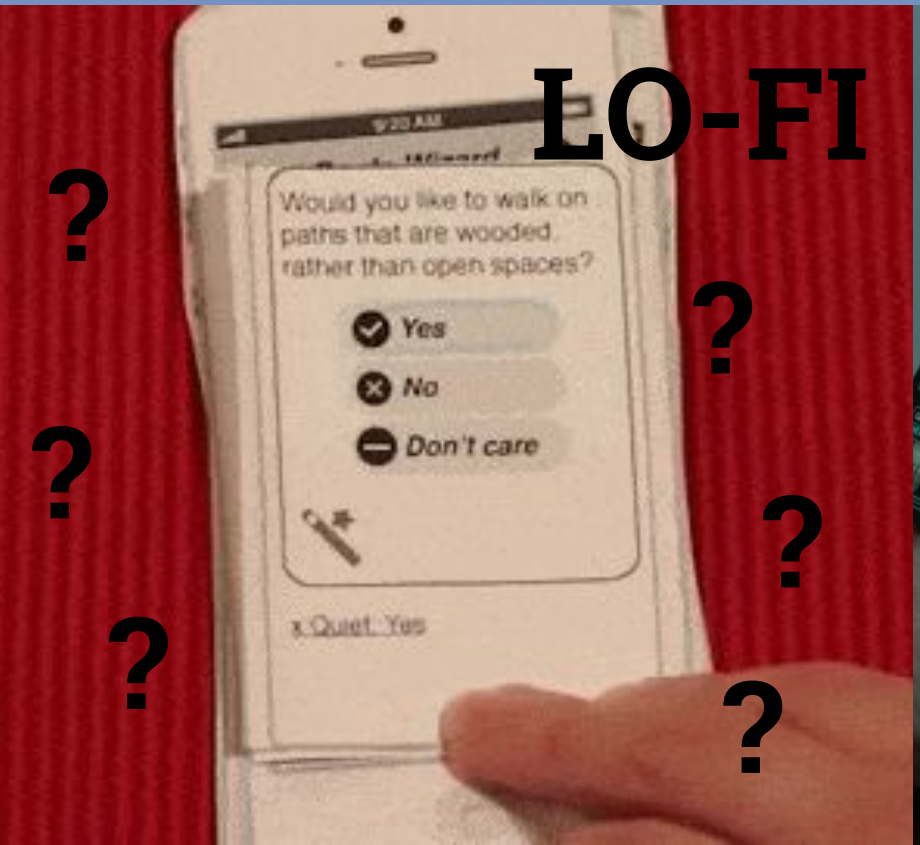
What is Fidelity?

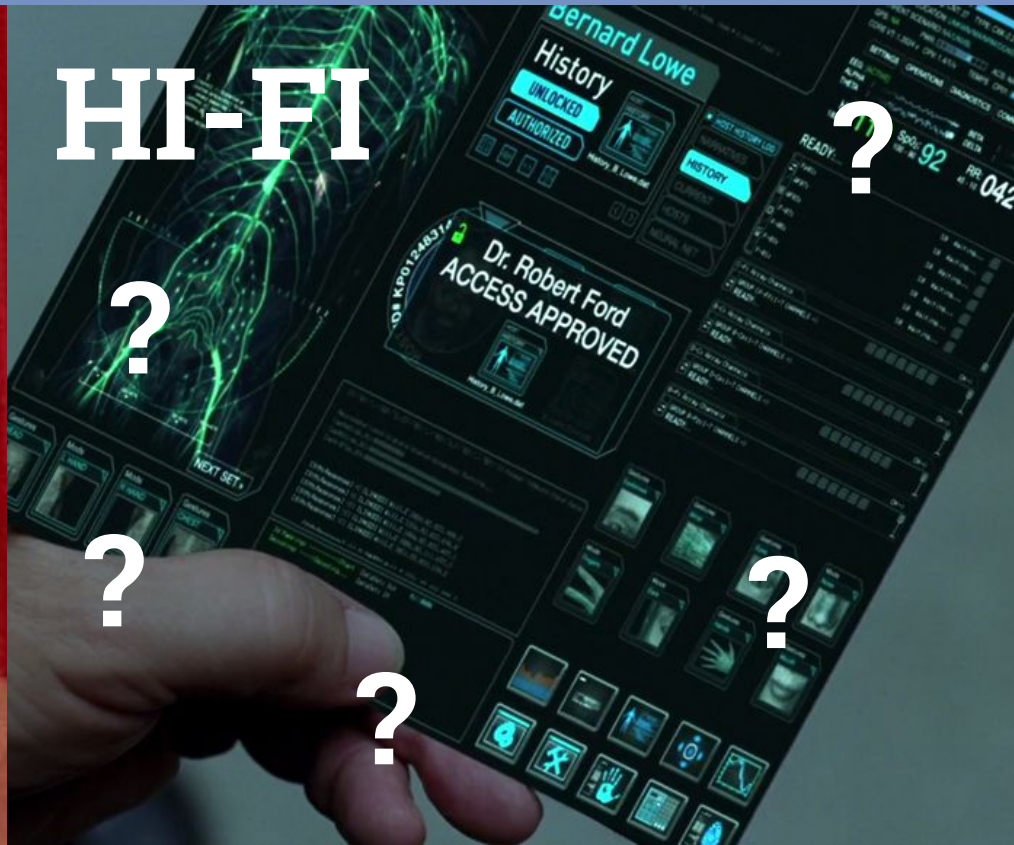
What is Fidelity?

LO-FI

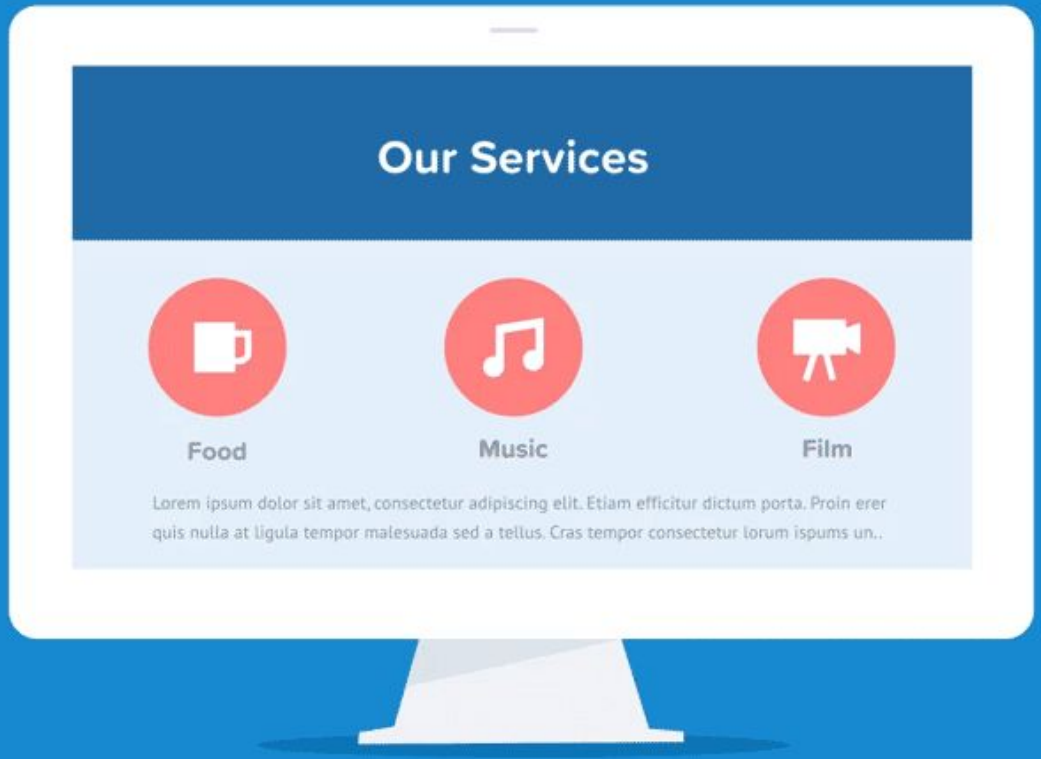
HI-FI

What is Fidelity?





Using Resolution



How do we talk about prototyping

Factors to consider

- Resolution
- Cost
- Time

Resolution

- How closely the model represents its intended goal
- Shape
- Surface finish
- Materiality
- Function

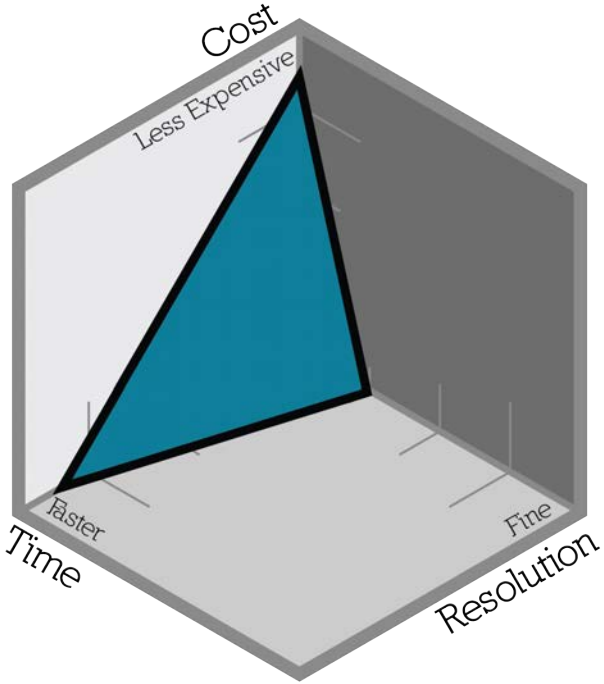
Cost

- How much money does it take (really important to companies)
- cost of material
- cost of machine
- cost to run machine

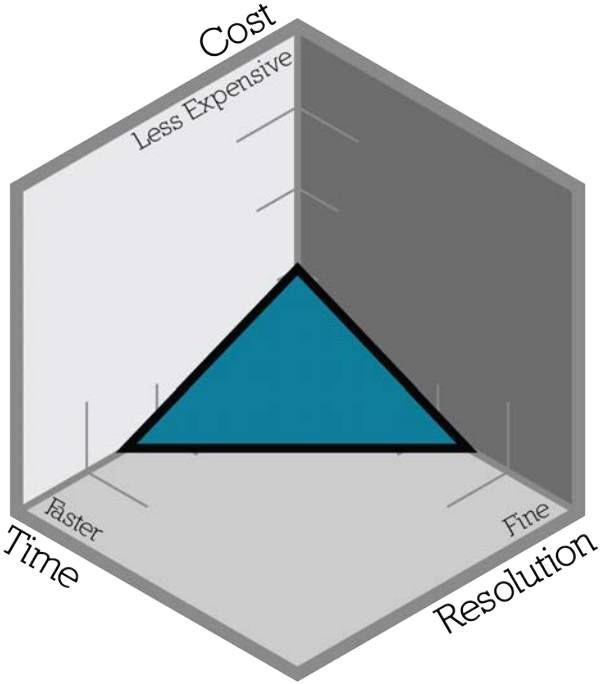
Time

- How long does it take (Important to designer)
- Time to set up file
- Time to set up machine
- Time to make the part
- Time to clean up the part

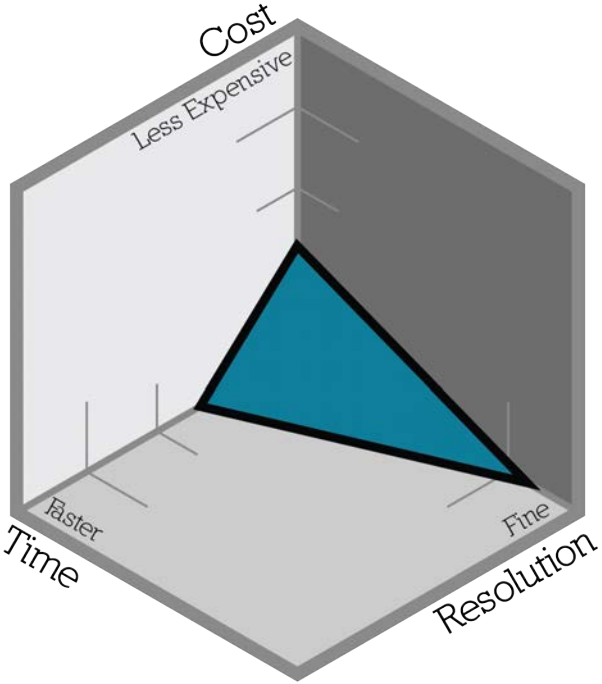
Let’s Compare (these are relative)



Sketch Model



Laser Cut



3D Print

These are a general framework, not absolute, not test question kind of material.

Approach To Prototyping

Iterative Modeling

What is Iterative Modeling?

- **Iterative Modeling** is the process of making multiple models by changing available variables to evolve the form.
- This can be used to produce a large quantity of ideas, rapidly
- In iteration there are identifiable predecessors and successors to each model

What is Iterative Modeling?

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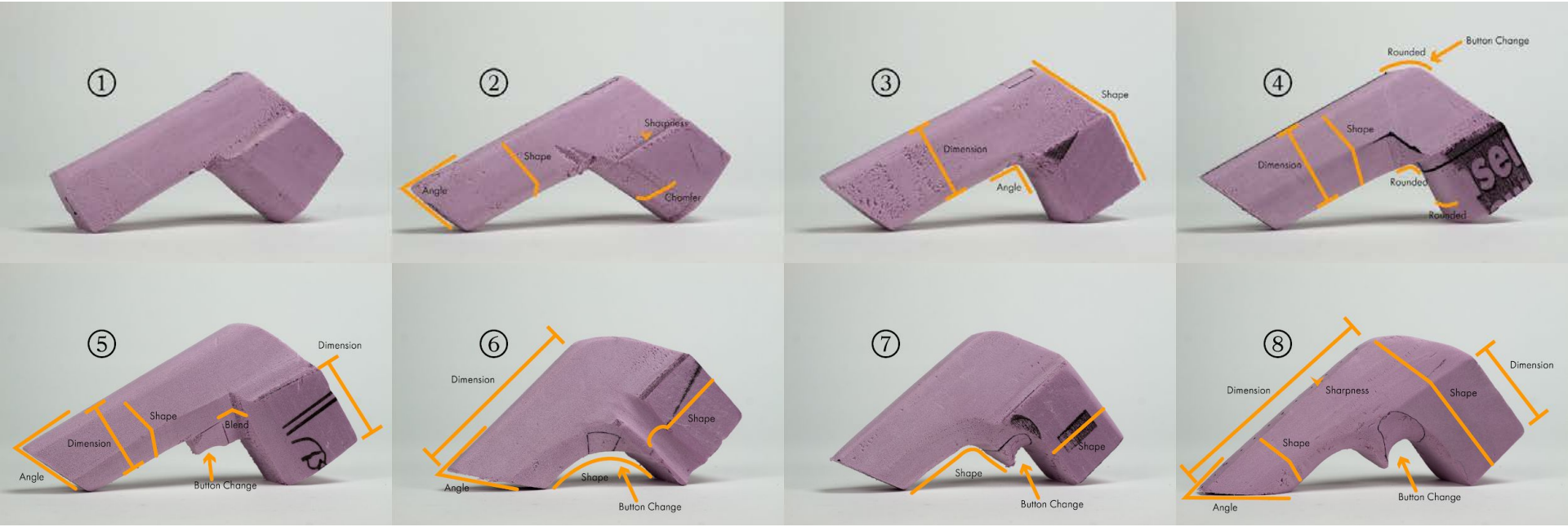
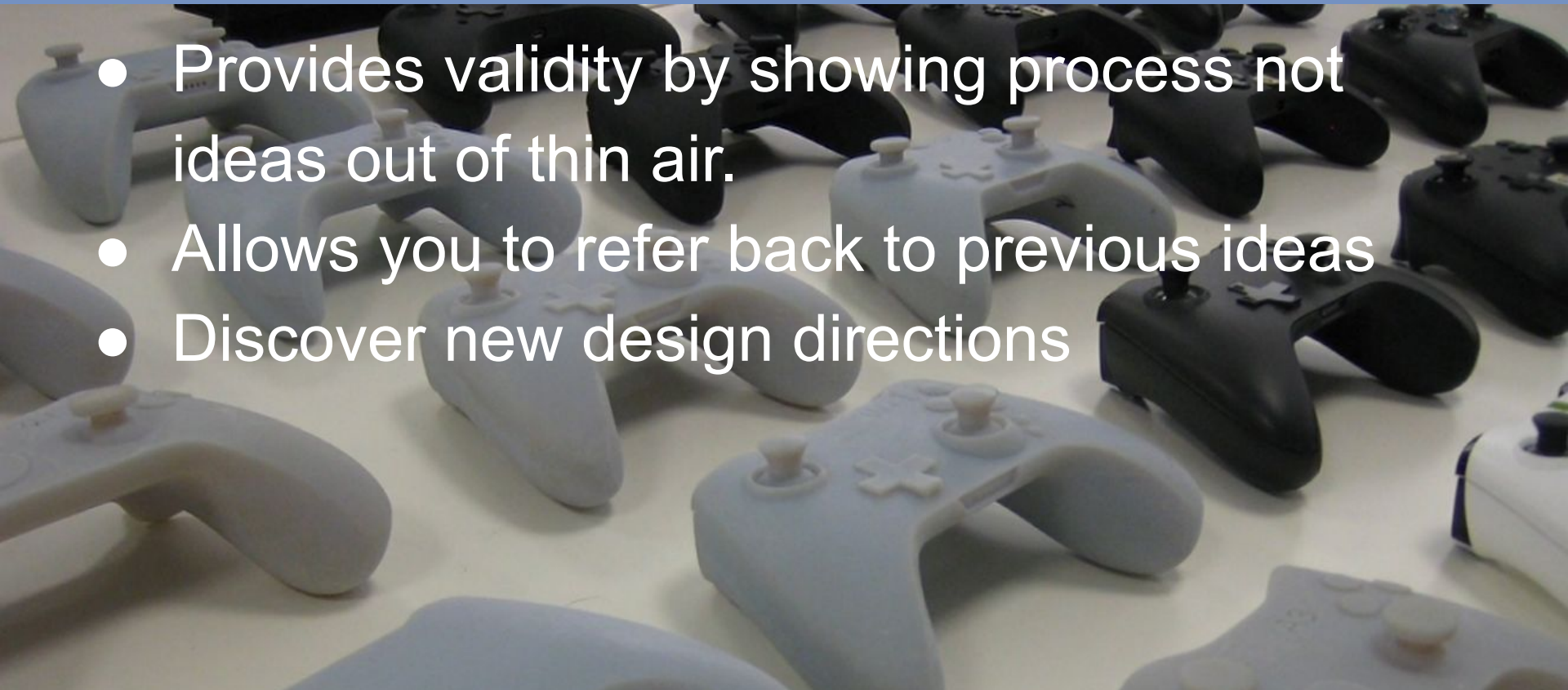


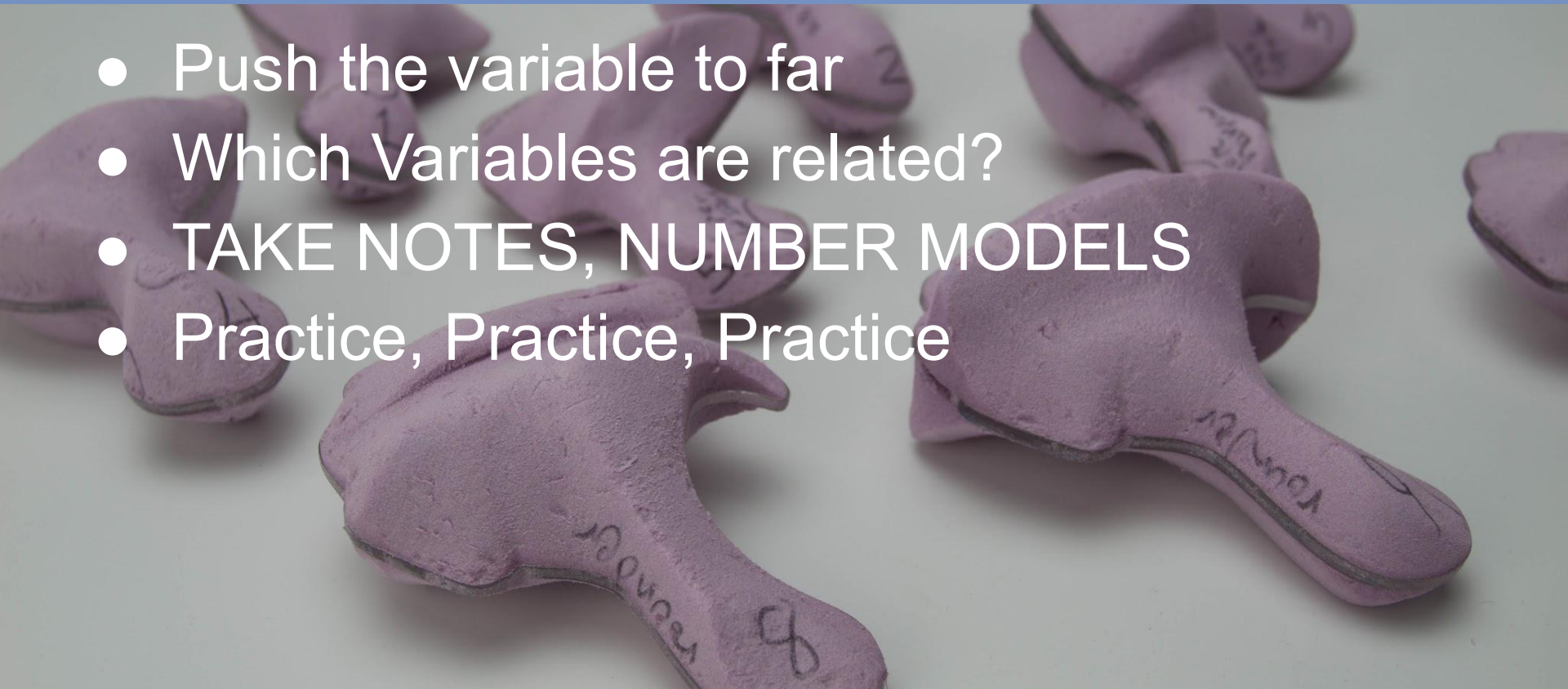
What is Iterative Modeling?

Why Iterate?



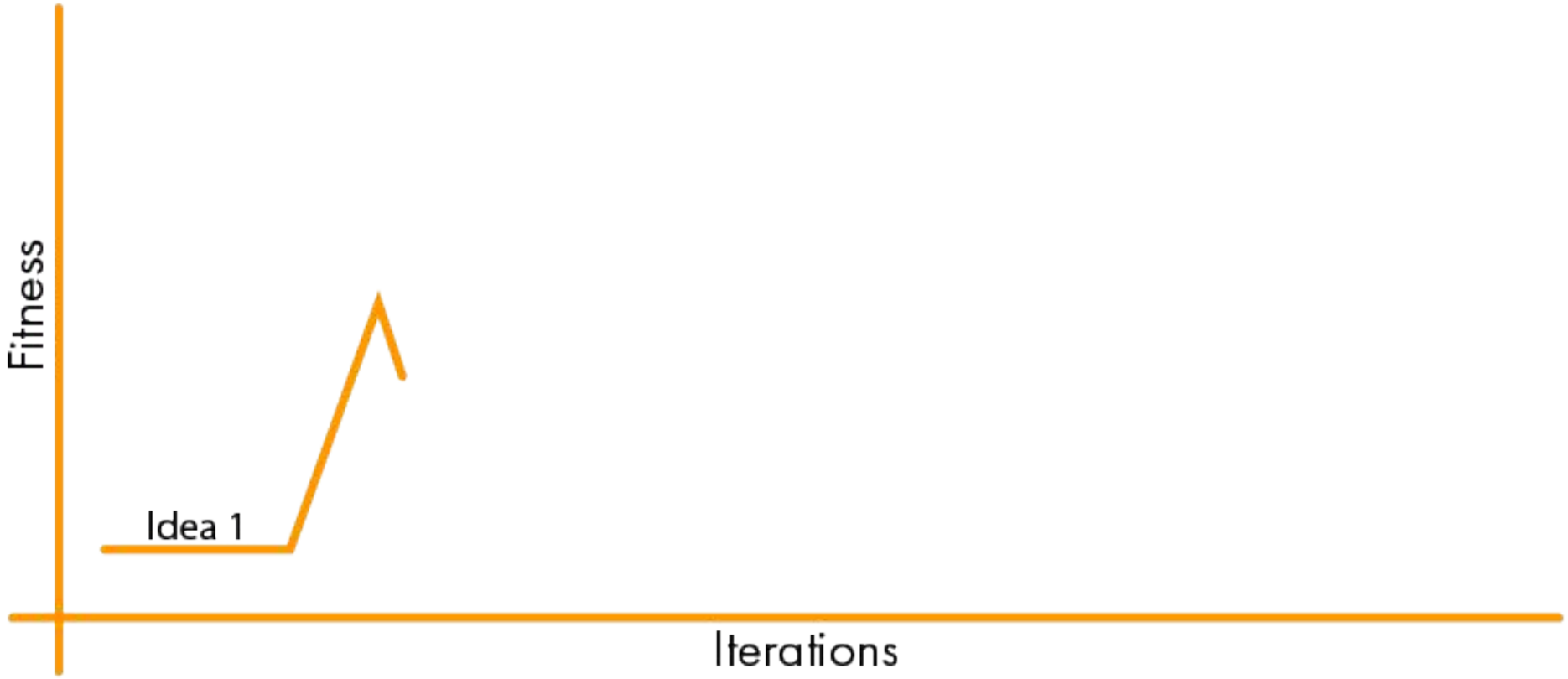
- Provides validity by showing process not ideas out of thin air.
- Allows you to refer back to previous ideas
- Discover new design directions

Keep in Mind

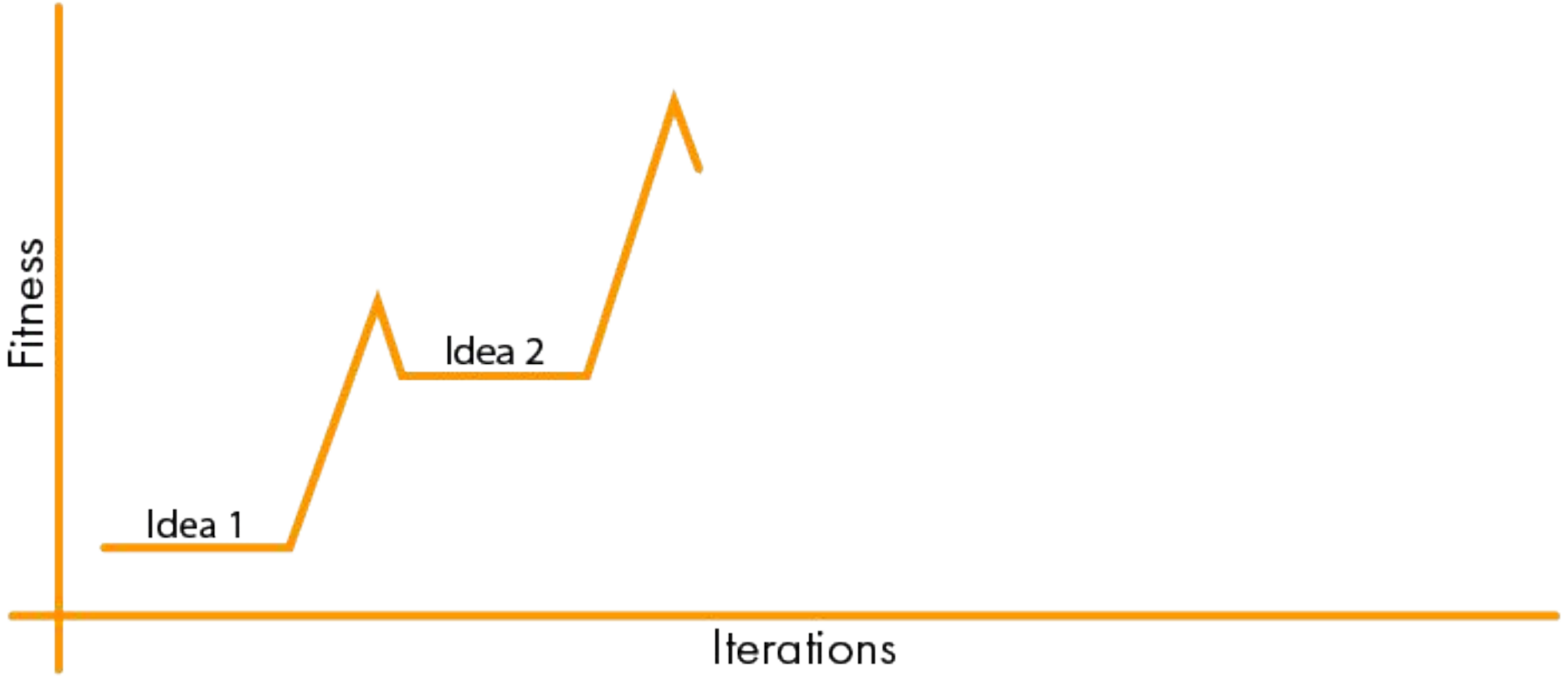


- Push the variable to far
- Which Variables are related?
- TAKE NOTES, NUMBER MODELS
- Practice, Practice, Practice

Keep in Mind: Push The Variable



Keep in Mind: Push The Variable



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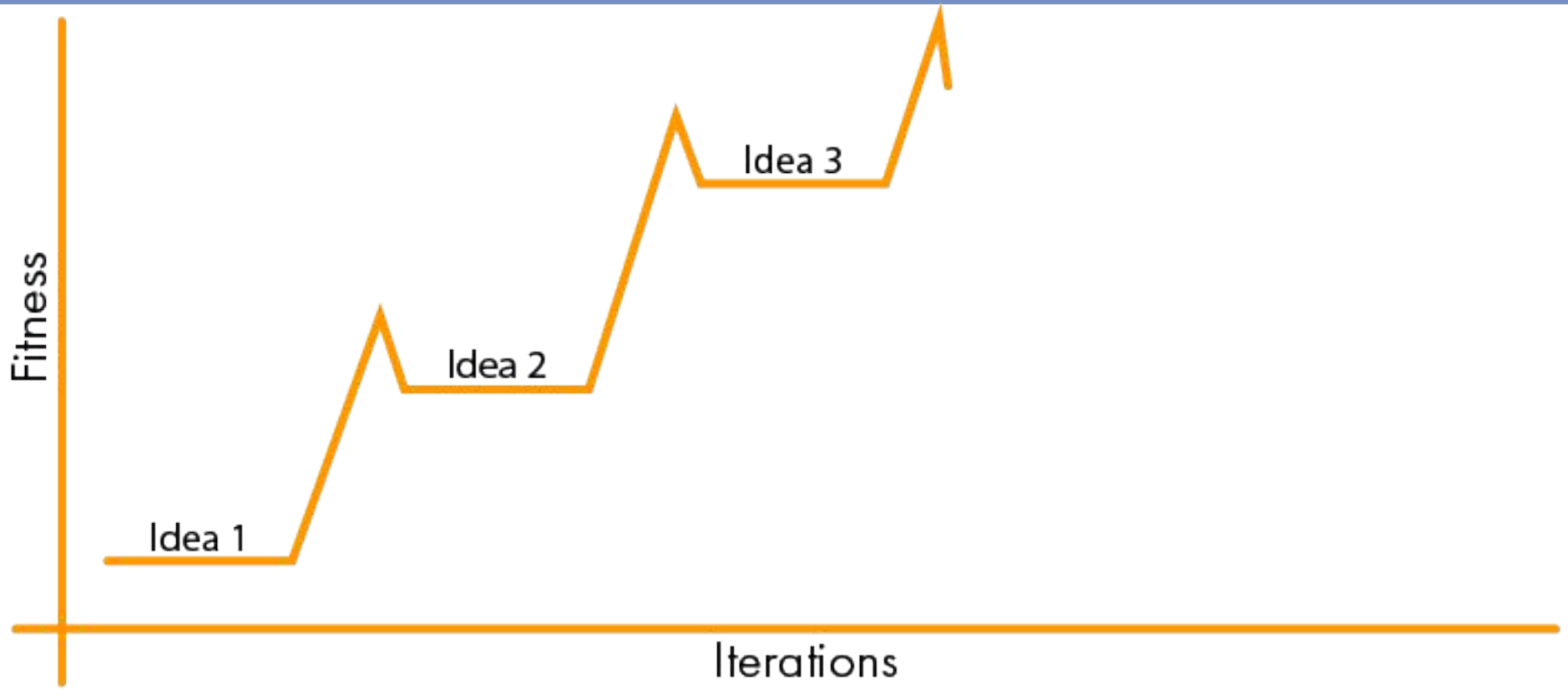

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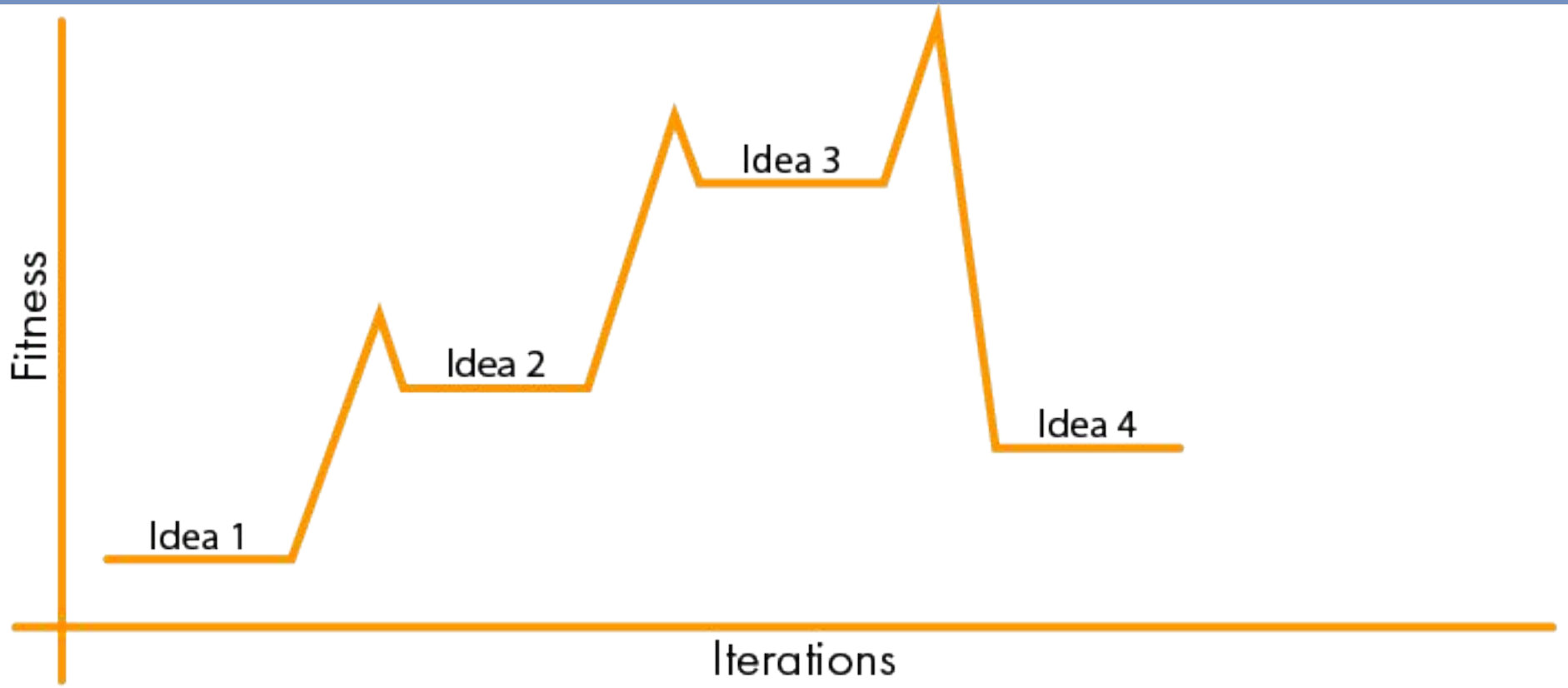

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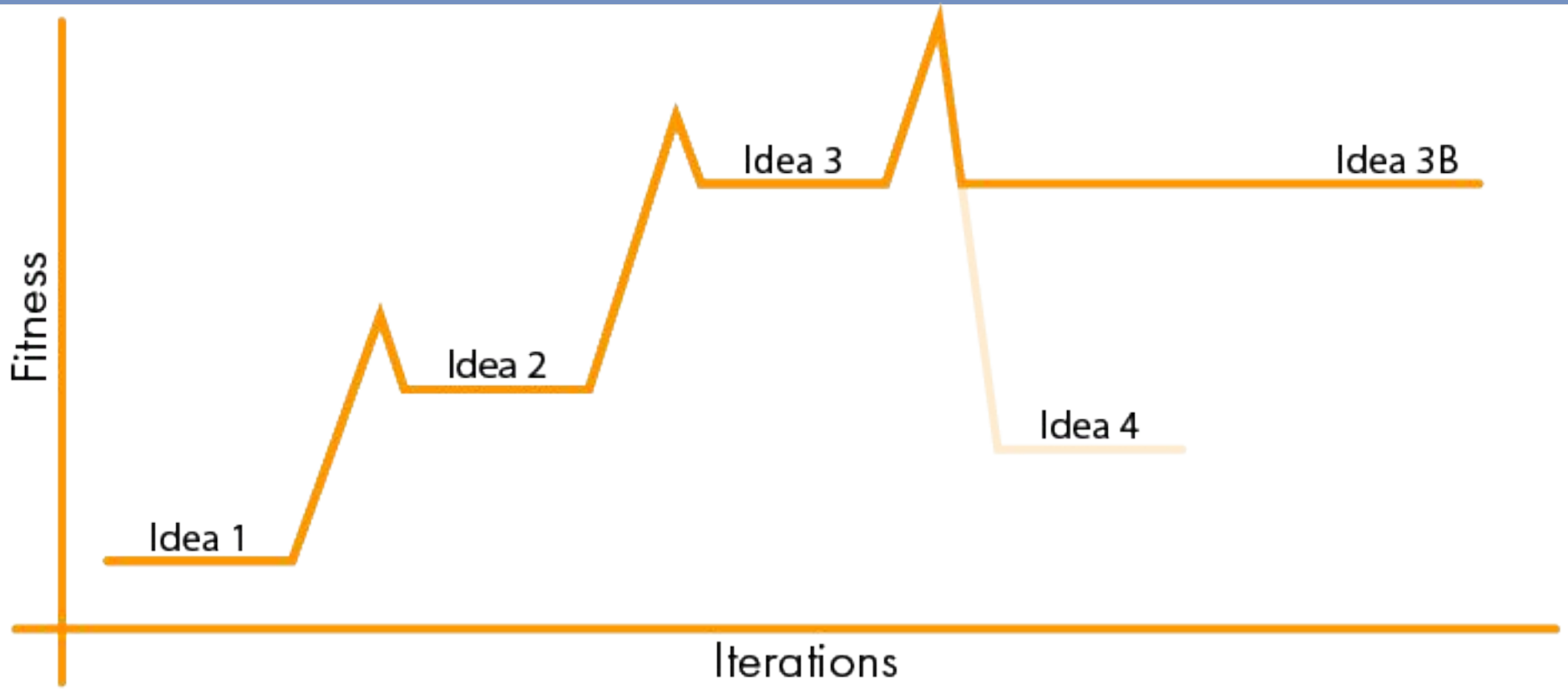

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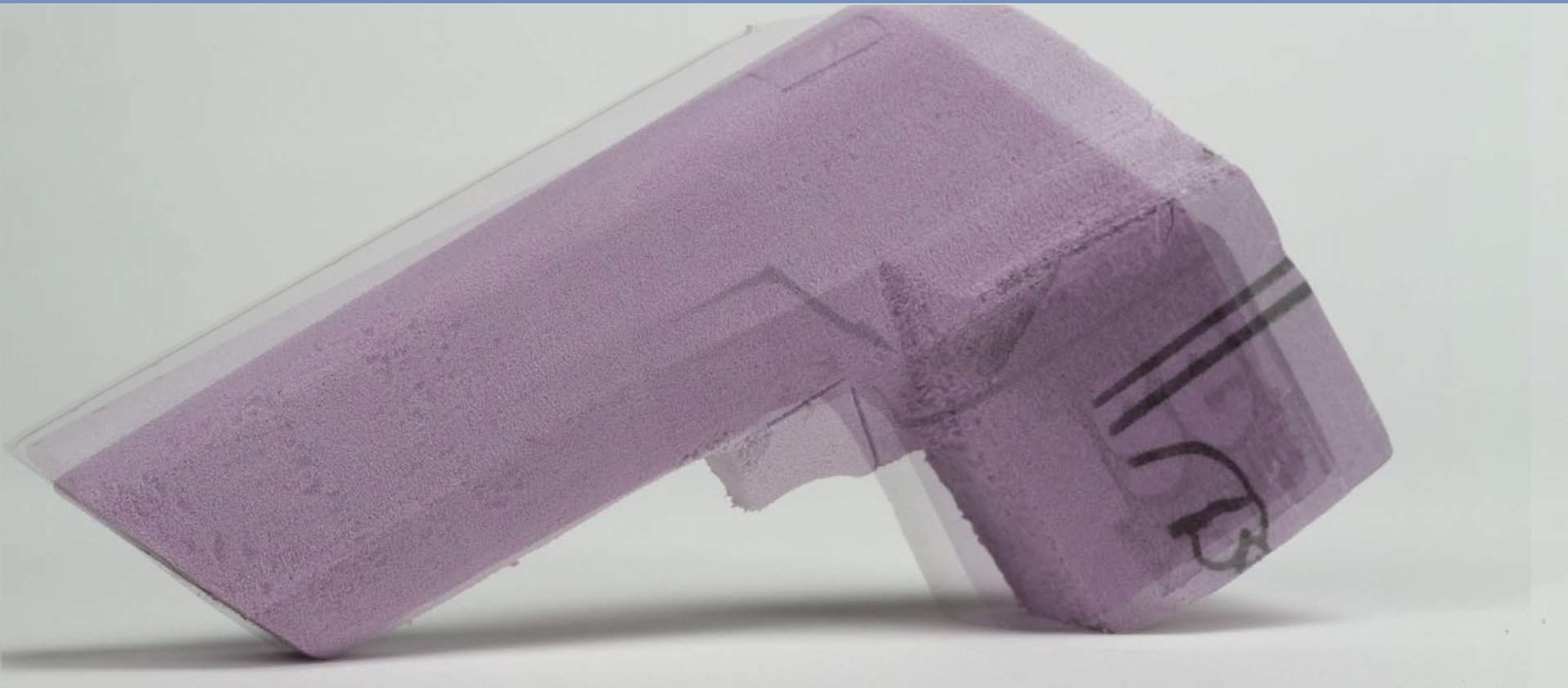
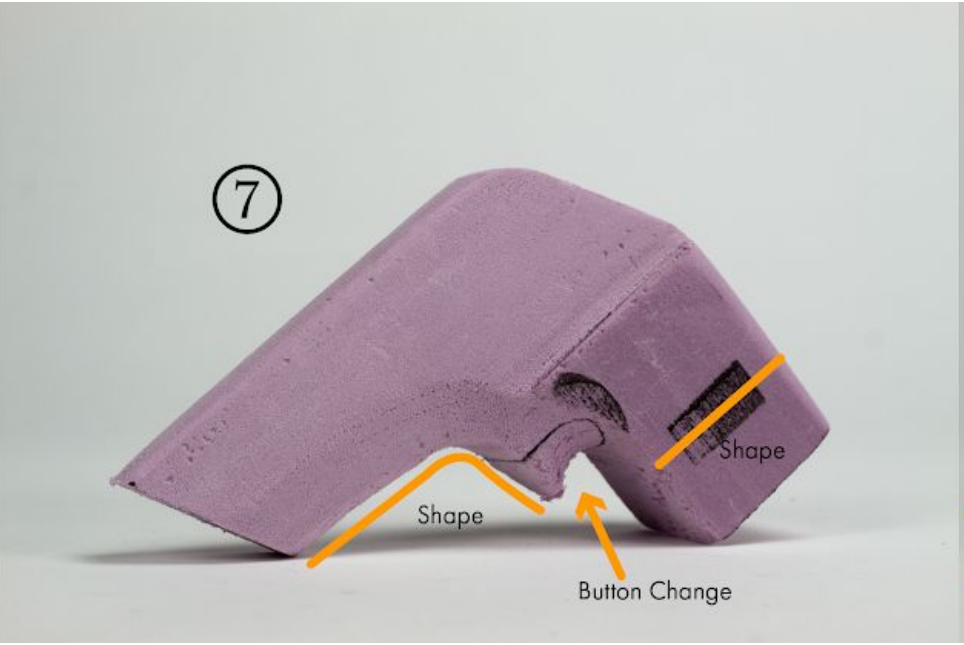
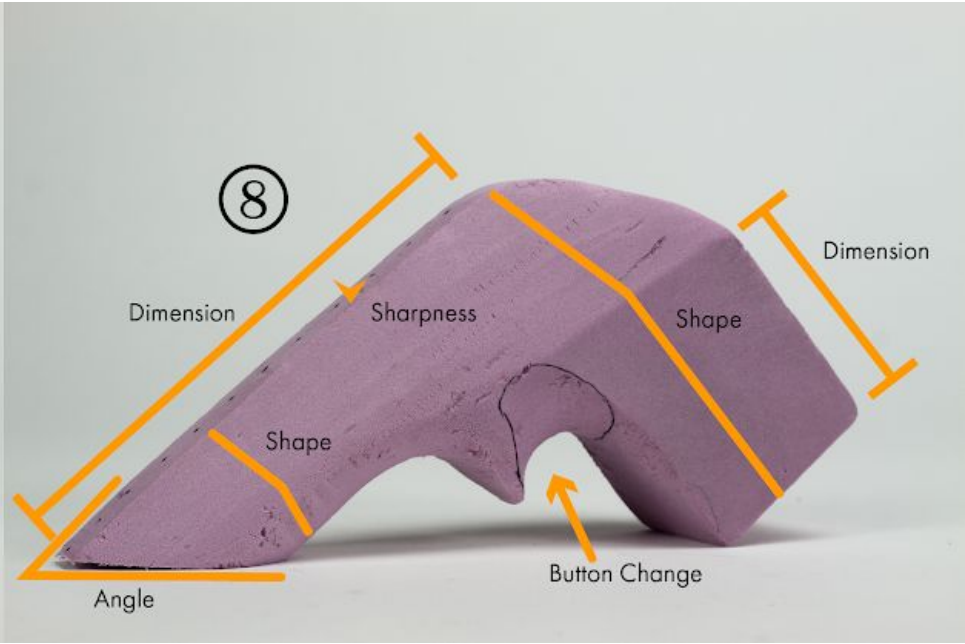
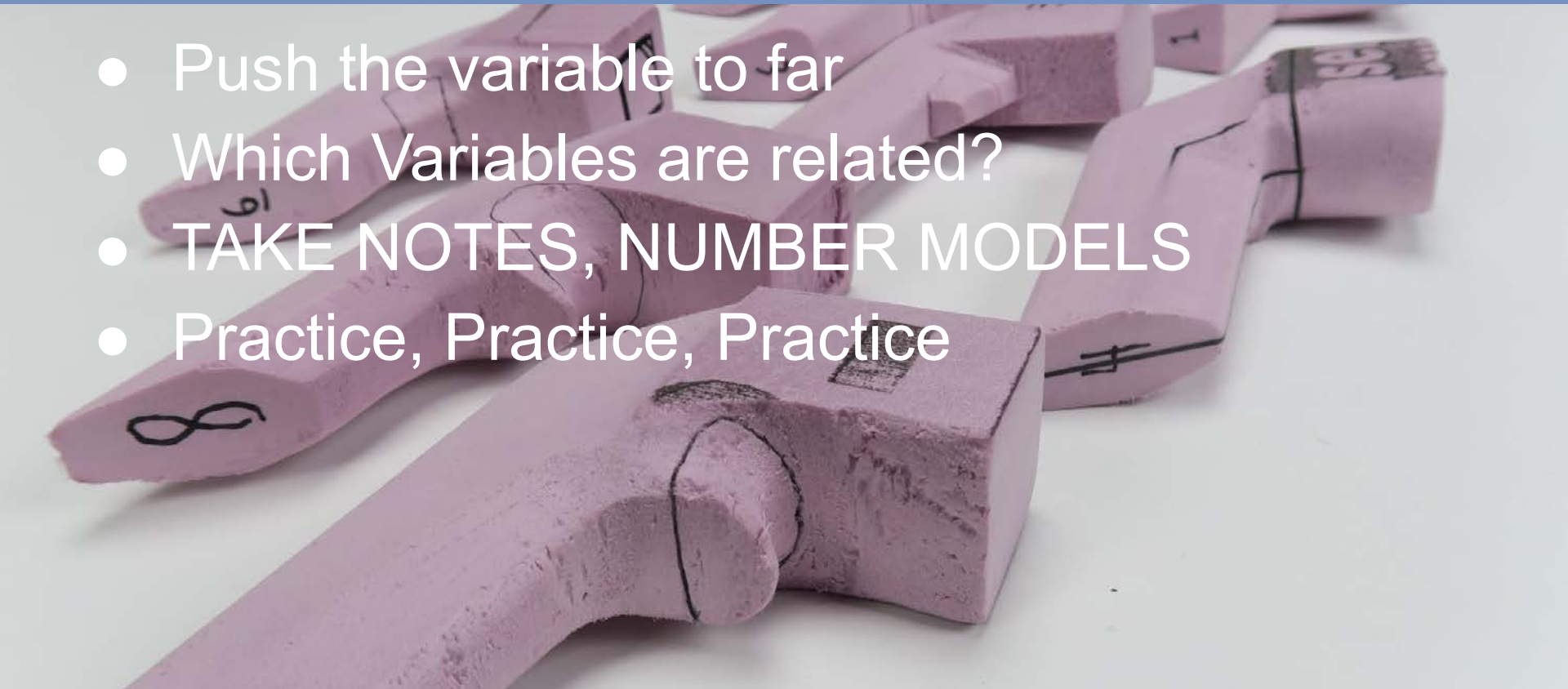


Keep in Mind: Related Variable





Keep in Mind: Number Models



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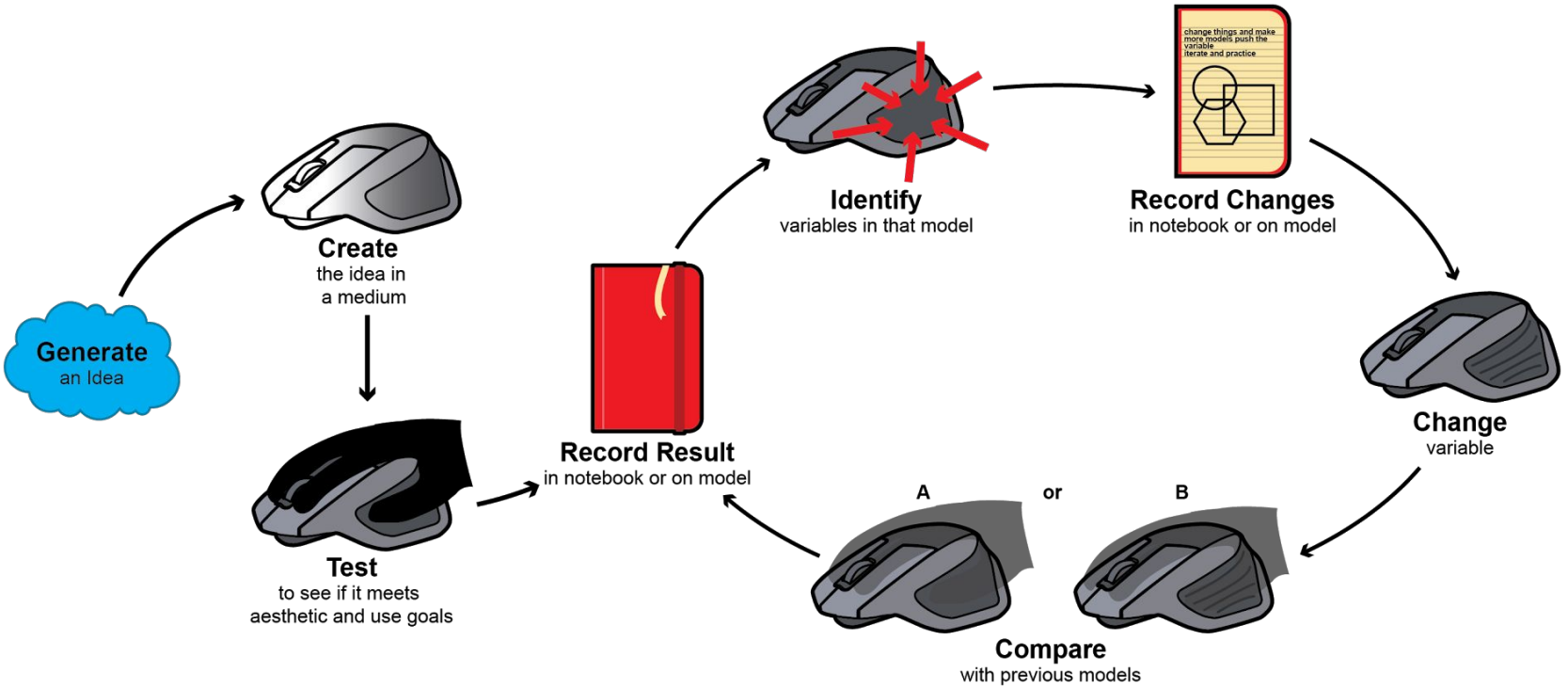
How to Iterate



How to Iterate

- Make a model
- Identify variables (write them down)
- denote relationships
- Test the model against goals (fit, looks good)
- Note changes
- Document the model
- Make the next one
- Repeat Repeat Repeat Repeat Repeat Repeat Repeat Repeat

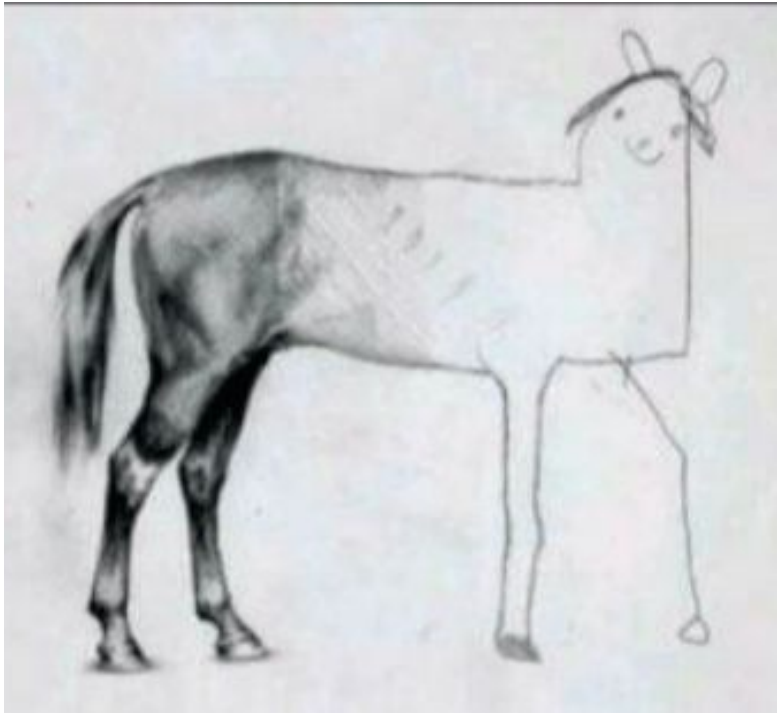
How to Iterate (Changes)

- Record
  - What is being changed (radius)
  - How you are changing it (make larger)
  - Why you are changing it (better hand fit)
- Support changes with
  - notes
  - pictures
  - video
  - test notes
- This defines intent

Intent

- Reason for a design
- What the designer imagines something to be
- “I did this because”
- “The design is what it is because I wanted it to be this way”

Intent: Without Craft

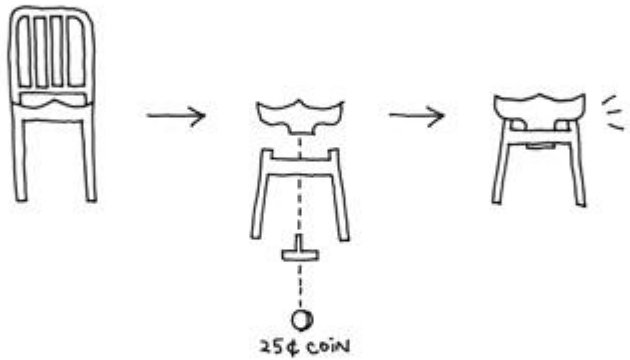


Intent

Execution

Intent

When all details are synchronous with intent the designer has accomplished his or her goal.



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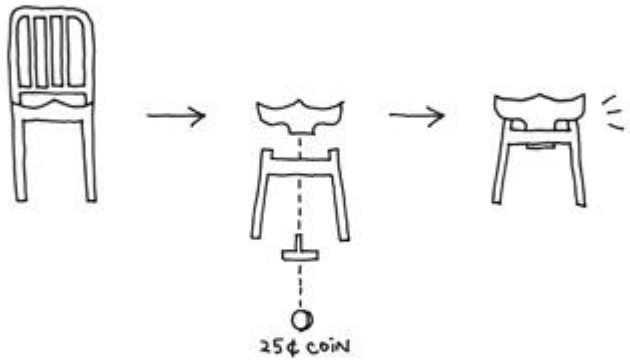


Intent

When all details are synchronous with intent the designer has accomplished his or her goal.

Intent = Execution

Things to Remember

- Push the variable

Things to Remember

- Push the variable
- Build more

Things to Remember

- Push the variable
- Build more
- Work fast

Things to Remember

- Push the variable
- Build more
- Work fast
- Move on

Where to find tools

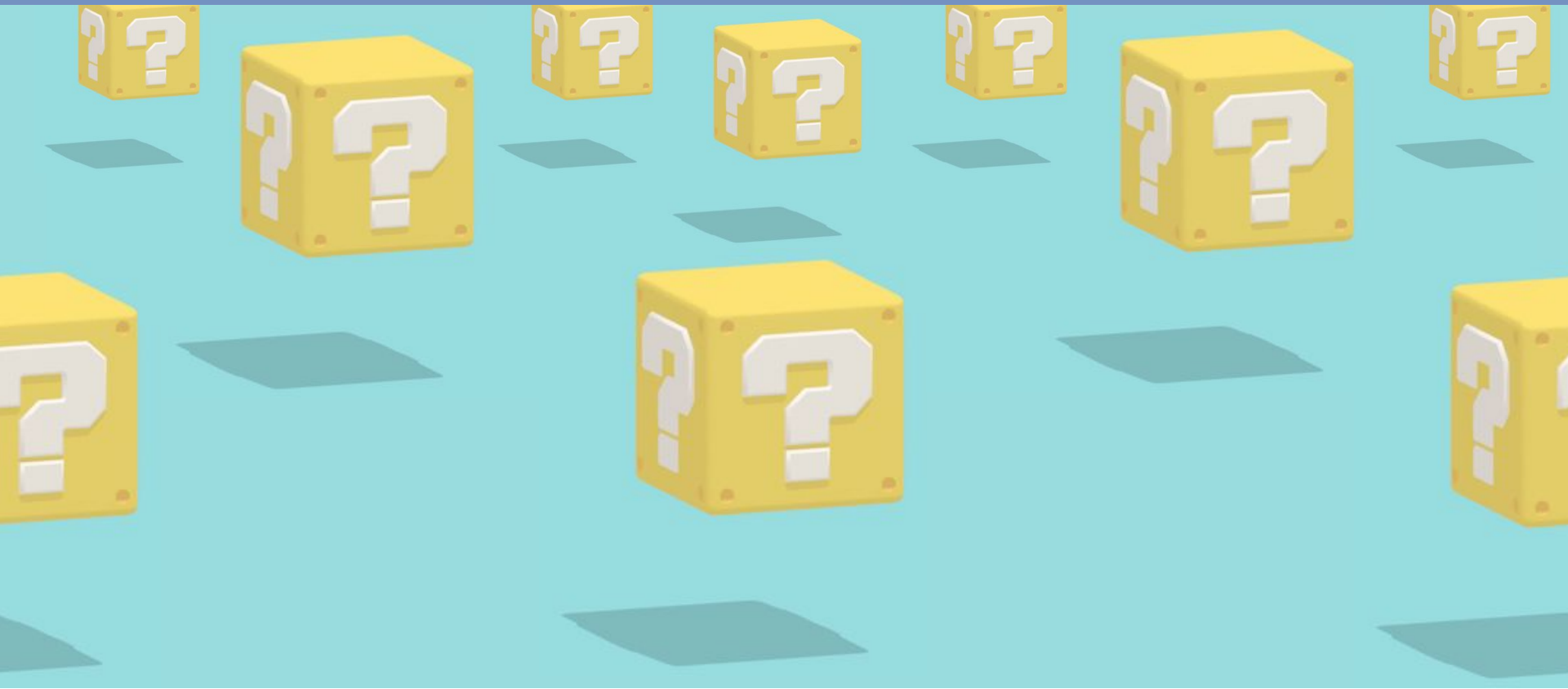
- COA shop (limited)
  - Basement of ARCH East
- DFL (limited)
  - Marietta street
- GVU prototyping (semi-limited)
  - Tech Square Research Building
- Invention studio (Open)
  - MRDC

Feel Free to Reach Out

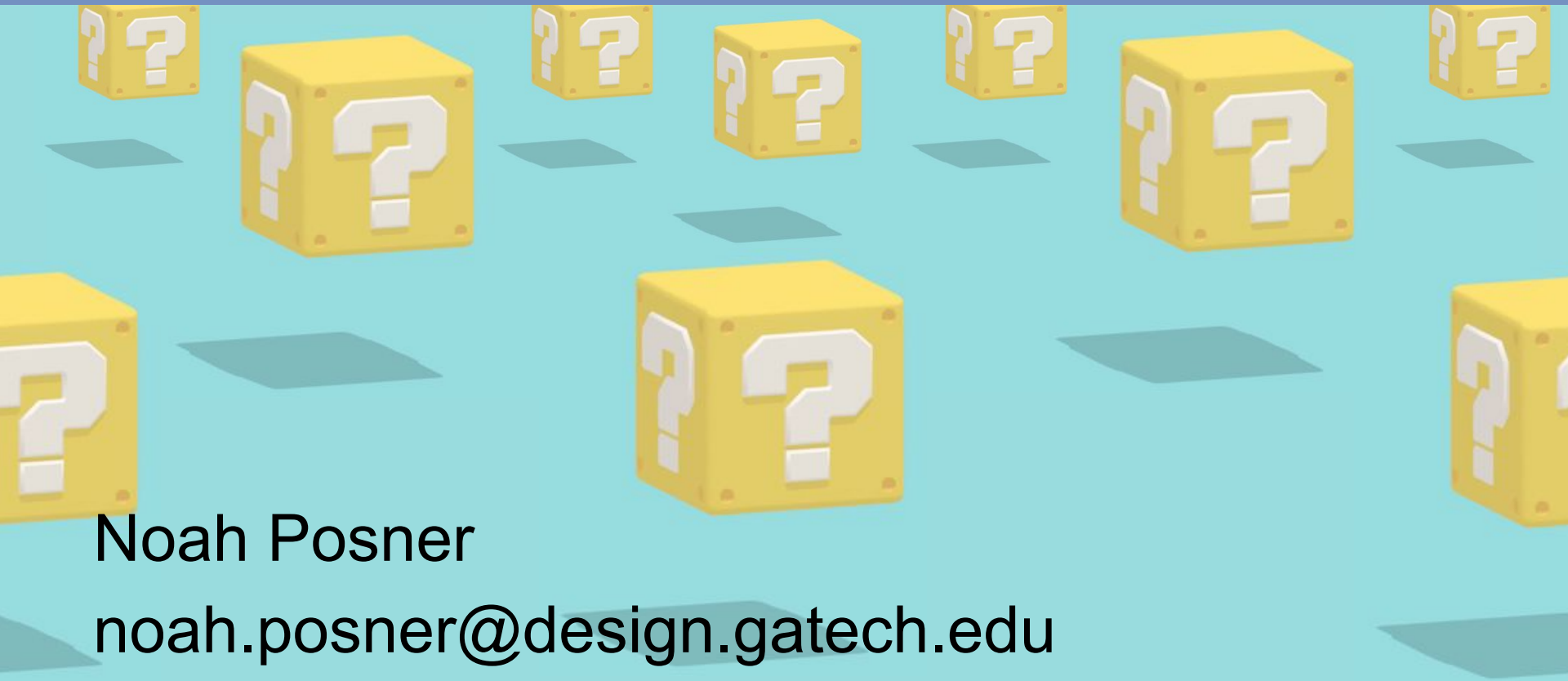
Noah Posner

noah.posner@design.gatech.edu

Thank you



Thank you



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