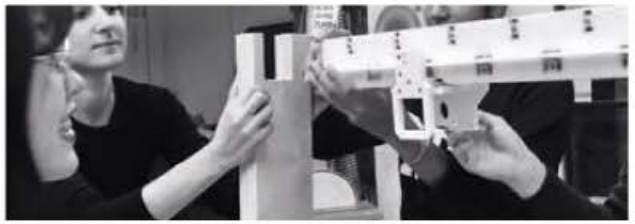
TO KILL A BALLON

Project Type: Machine Design | Group
Role: Electronics , Design
Duration: One week
Instructor: Neil Gershenfeld



A Fab Lab, or digital fabrication laboratory, is a place to play, to create, to mentor and to invent: a place for learning and innovation.It provides access to the environment, the skills, the materials and the advanced technology to allow anyone anywhere to make (almost) anything.

> **Research Attempt on the fabrication workflow and methodologies with least time and financial cost.**

> **An methodological system built for "how to make (almost) any machine"**

Time limitation
One-week

Delivery
Machine design
experimental system

People
Architecture teammates

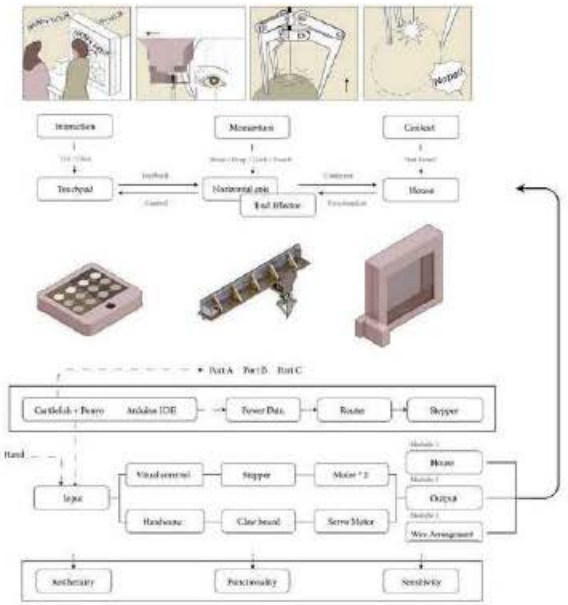
Tools
CNC/SRM-70/Ultimaker..

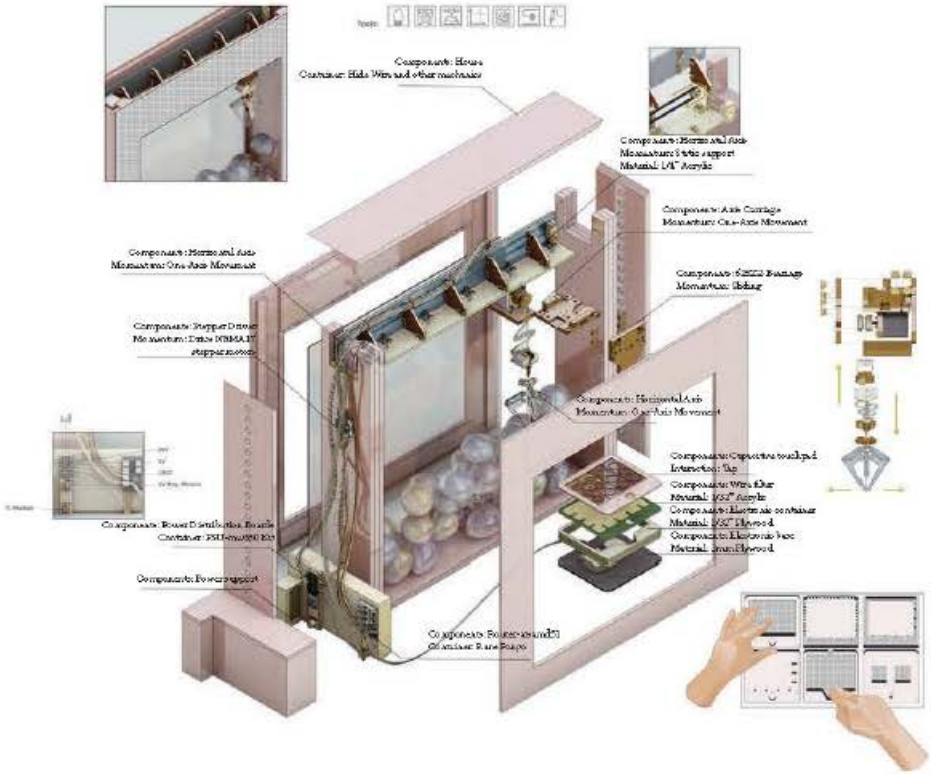
Electronics
Components
Multi-meter

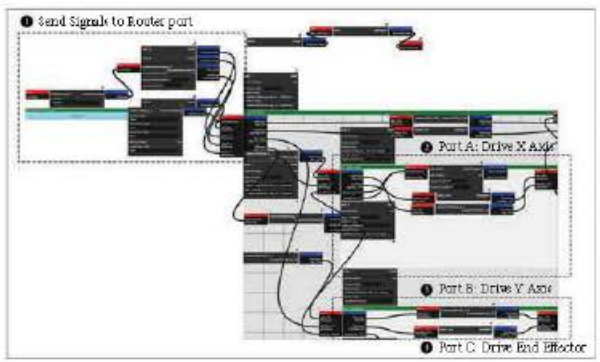
Softwares
Squidworks(Cuttlefish)

Materials
1/2" Plywood
1/4" Plexiglass
1/4" Acrylic white
1/4" MDF
PCB boards
Copper paper
Rainbow Wires
Motors

1. Brain Storm
   - Define scenario
   - Design game mechanics and rule system that creates psychological happiness and surprise for players
2. Machine Design
   - Define Game Context
   - Decide on Interaction methods
   - Design Machine mechanics (momentum) and modules
   - Make budget plan, tool and material list
3. Fabrication
   - Fabricate PCB boards: Input device, Output device, and microcontrollers
   - 3D-Printing: Test design rules on printers
   - CNC and Lasercamm: Onion skin test
   - Vinyl cutting
4. Programming
   - New programming tool: Cuttlefish
   - Arduino IDE
5. Module Evaluation
   - Horizontal Axis
   - End Effector
   - House
   - Balloon
   - Capacitive touch board and Motor driver
6. Assembly and Test
   - Wire arrangement





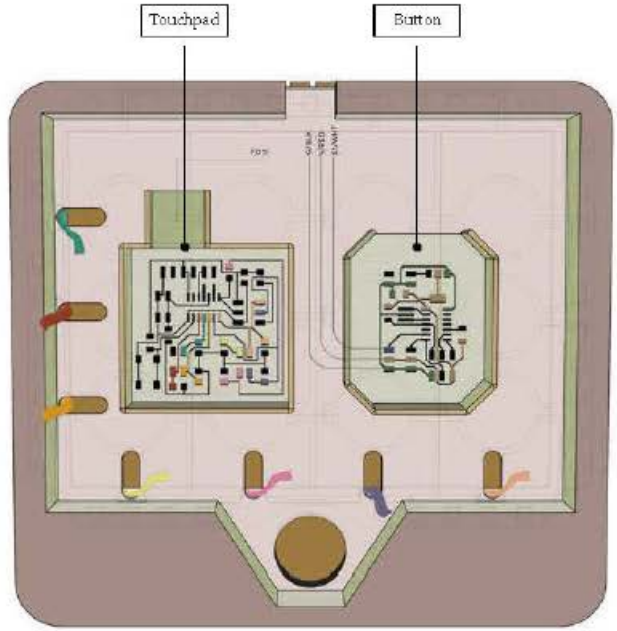


Distributed Dataflow Control

Cuttlefish is a modular browser computing system and a member of the squidworks project developed by Jake Read, an effort to develop a distributed dataflow computing protocol.

Virtual Dataflow Enviornment

Cuttlefish is one such VDE, for the browser. It also serves visual representations of its own dataflow graphs, as well as dataflow across a network. This is the tool that allows us to see, interact with, build and edit distributed programs. Ponyo, the smallest fish (and queen of the sea), runs dataflow graphs on embedded microcontrollers. At the moment this is specific to the ATSAMD51J19, a 120MHz Arm M4F.

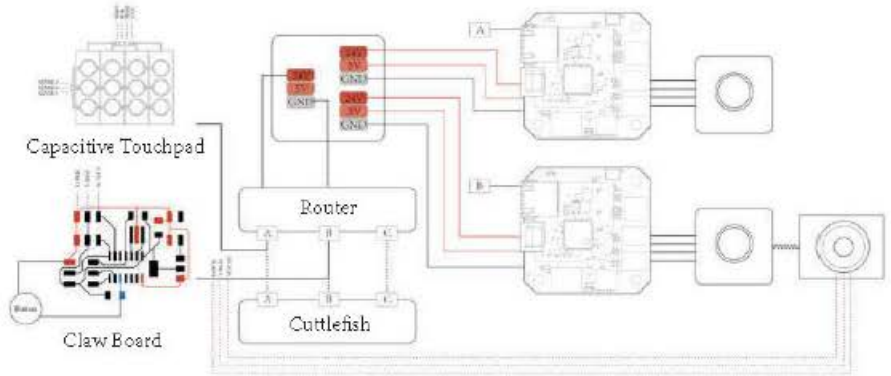


Input Device

Two self-fabricated input boards are designed to control two motors, one stepper motor for horizontal movement and the other servo motor for dropping and grabbing.

Ground
MOSI
SCK
MISO
SENSE5
SENSE6
SENSE7

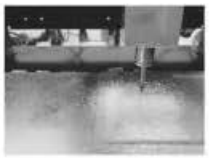
Schematic Diagram

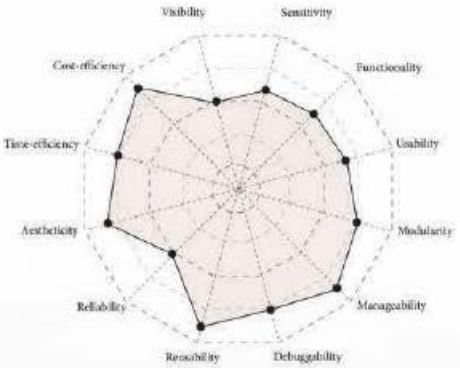


Evaluation

User evaluation was made on MIT SA+P weekly Happy Hour. A total of about 30 students playing with the machine and give feedback on its functionality, aesthetic, sensitivity, and visibility. System evaluation was discussed in the group about the experimental self-fabrication and virtual workflow. Critiria includes usability, modularity, reusability, reliability, time efficiency, cost efficiency, and manageability.

As we fabricated almost all hardwares on our own and reuse some discarded materials in the studio(e.g. wires, ethernet, chipboard etc), the total cost of this machine is about $30 for buying the 1/2"plywood and 1/4" plexiglass.





The next improvement is to do comparison test on the choice of needle thickness and sharpness. Some users reported that the current needle is not thick enough to pop the ballon even when it pierced in and suggests the gaming experiences will be enhanced if the needle can give immediate feedback.