Joy Institute of Technology

Science for the poor



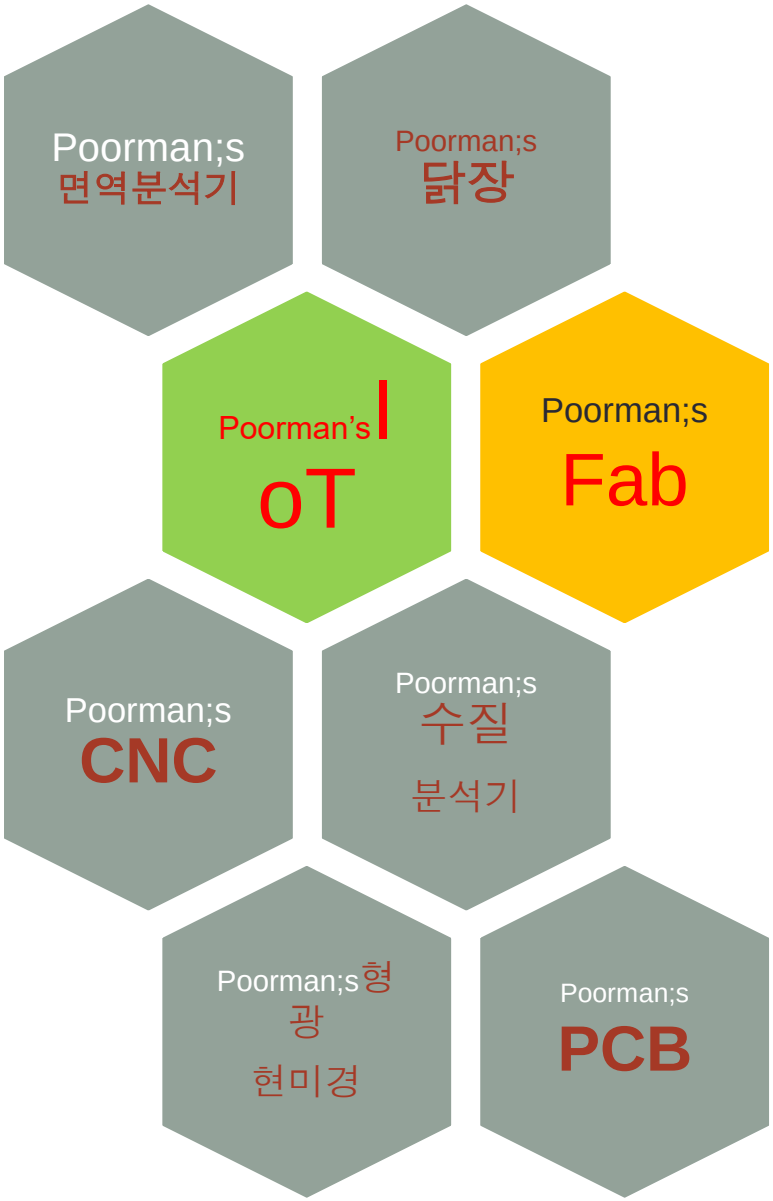


Vision - Science to the poor

Use open source projects – JoyCNC, JoyIoT, JoyFarm

Invent low-cost professional tools – Joyfab

Challenge science competitions – Google science fair


Poorman;s
면역분석기
Poorman;s
닭장
Poorman's
oT
Poorman;s
Fab
Poorman;s
CNC
Poorman;s
수질
분석기
Poorman;s형
광
현미경
Poorman;s
PCB

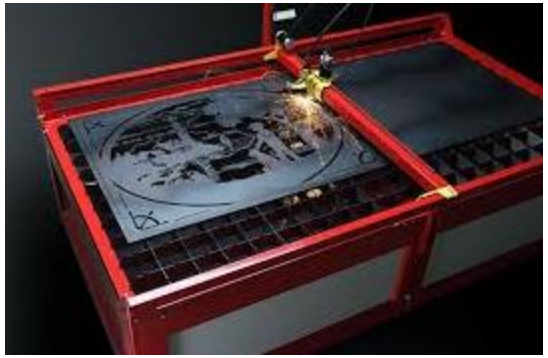
Poorman's Lab













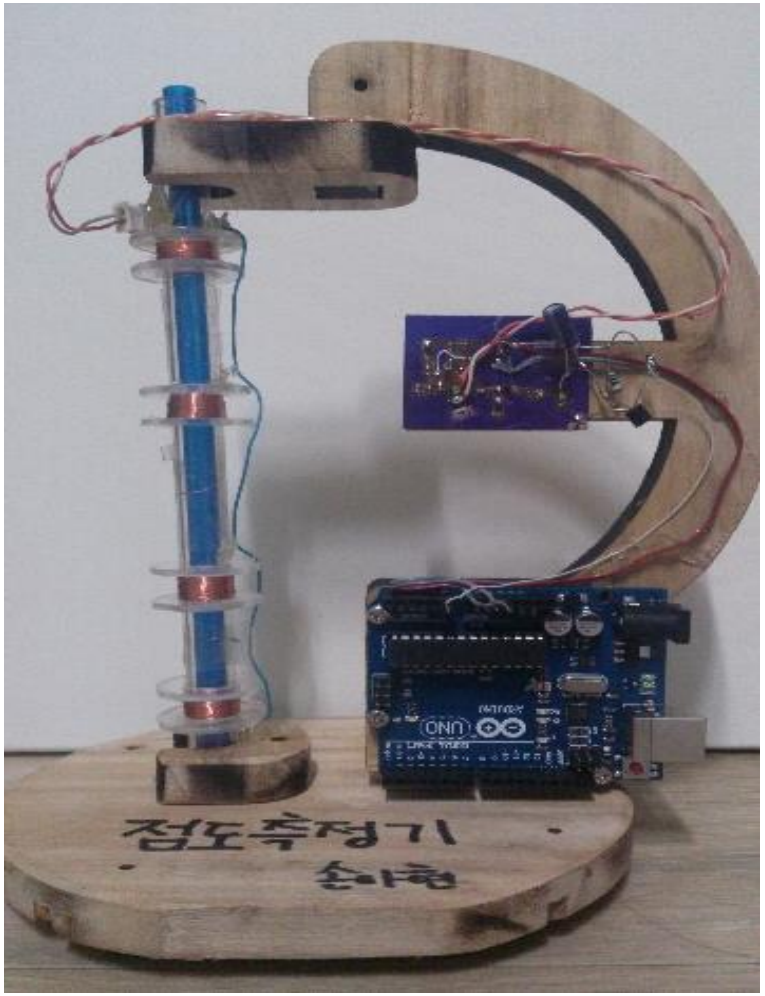
Poorman's Lab

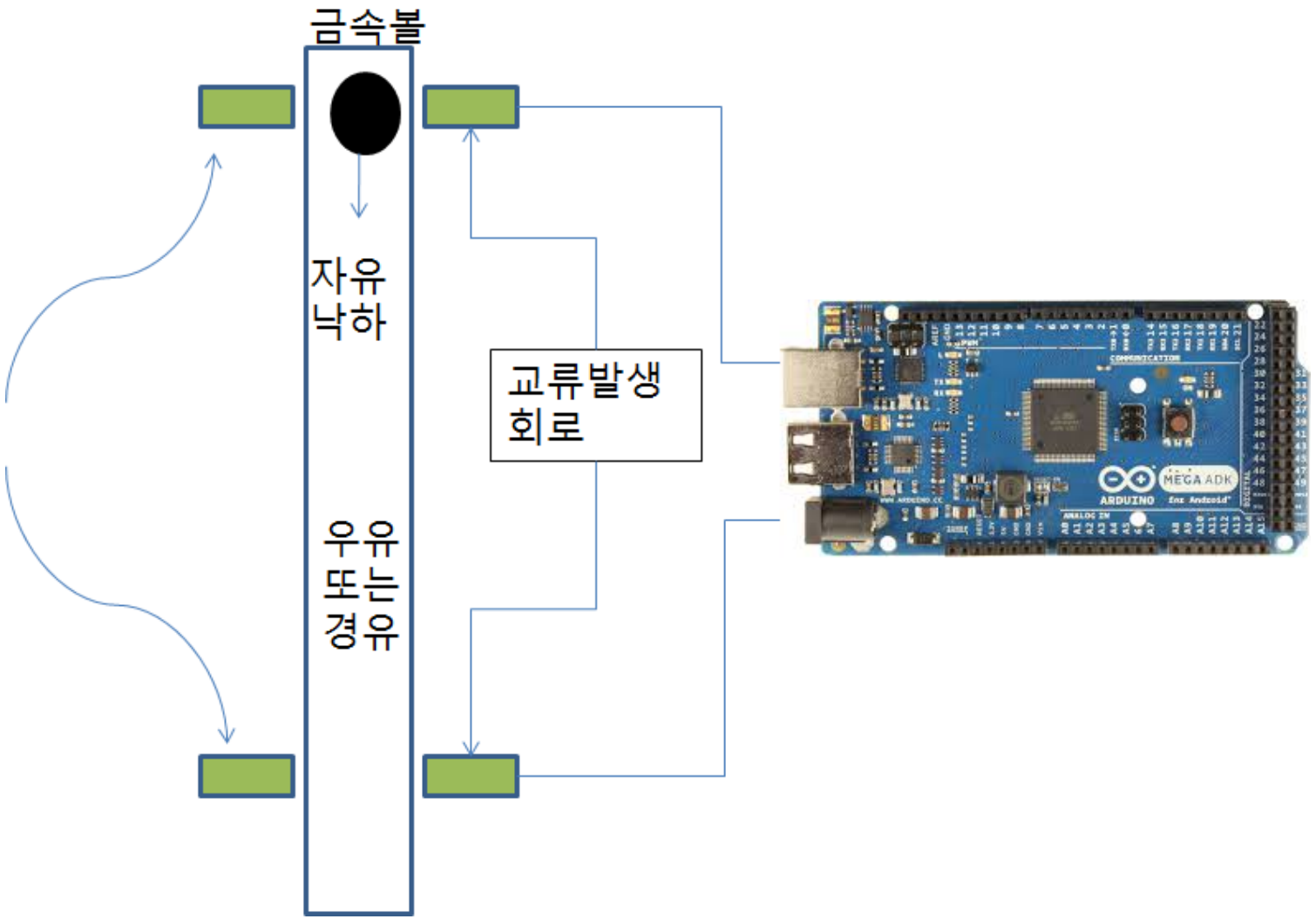






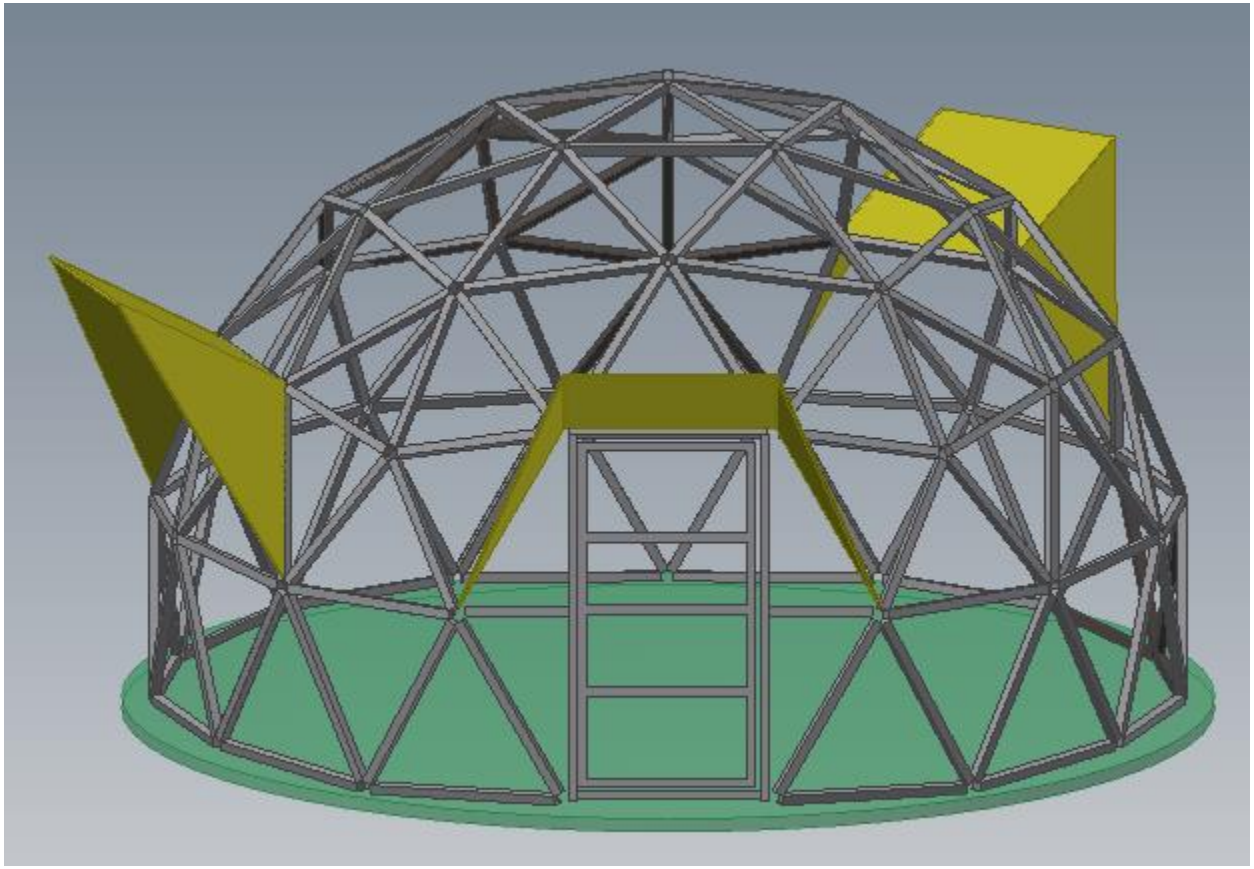
Joy Viscometer - 어린이용 점도계




금속볼
자유
낙하
우유
또는
경유
교류발생
회로
MEGA ADK
ARDUINO

JoyFarm -어린이용 온실





JoyHut -도토리집







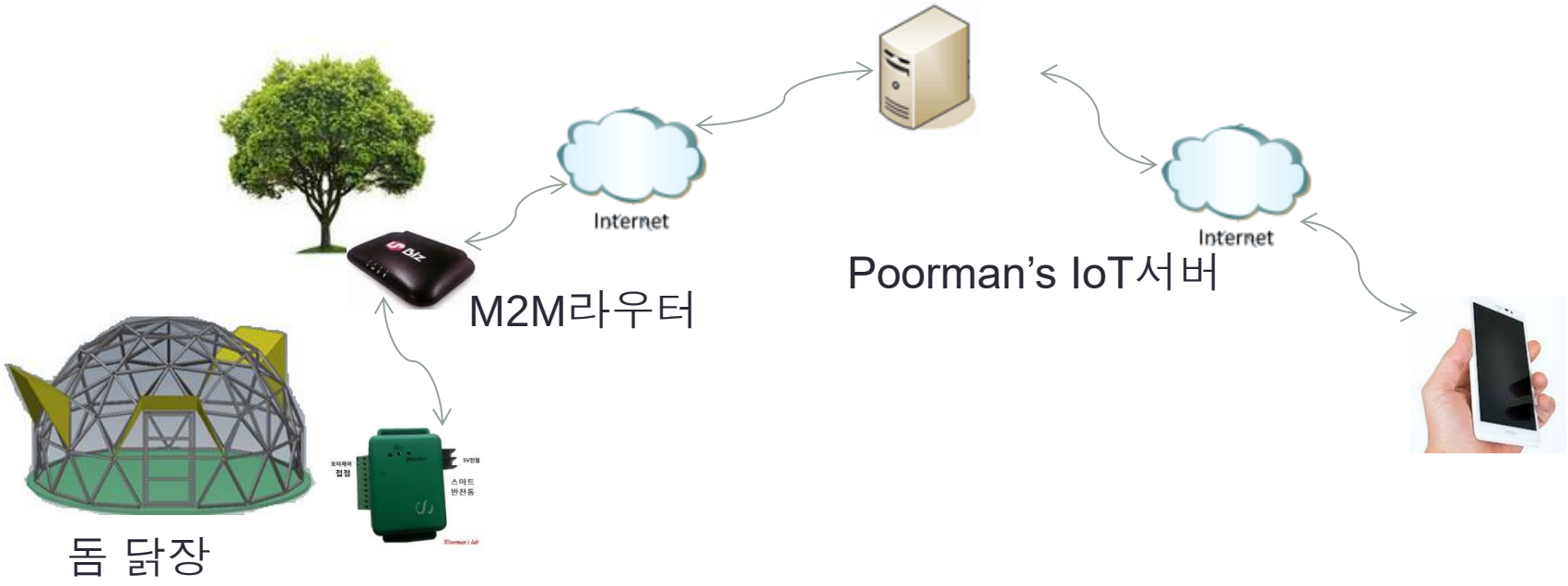


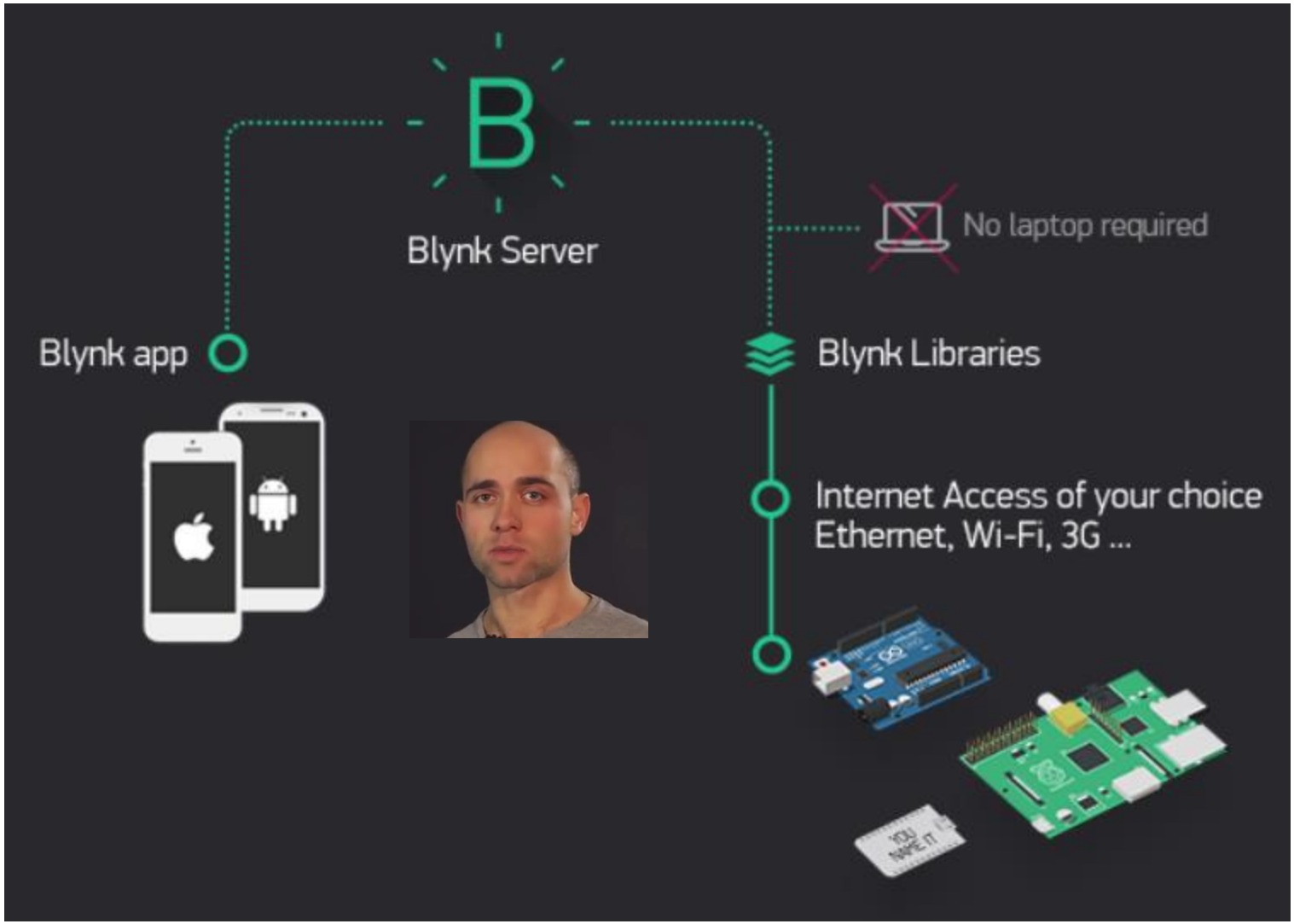


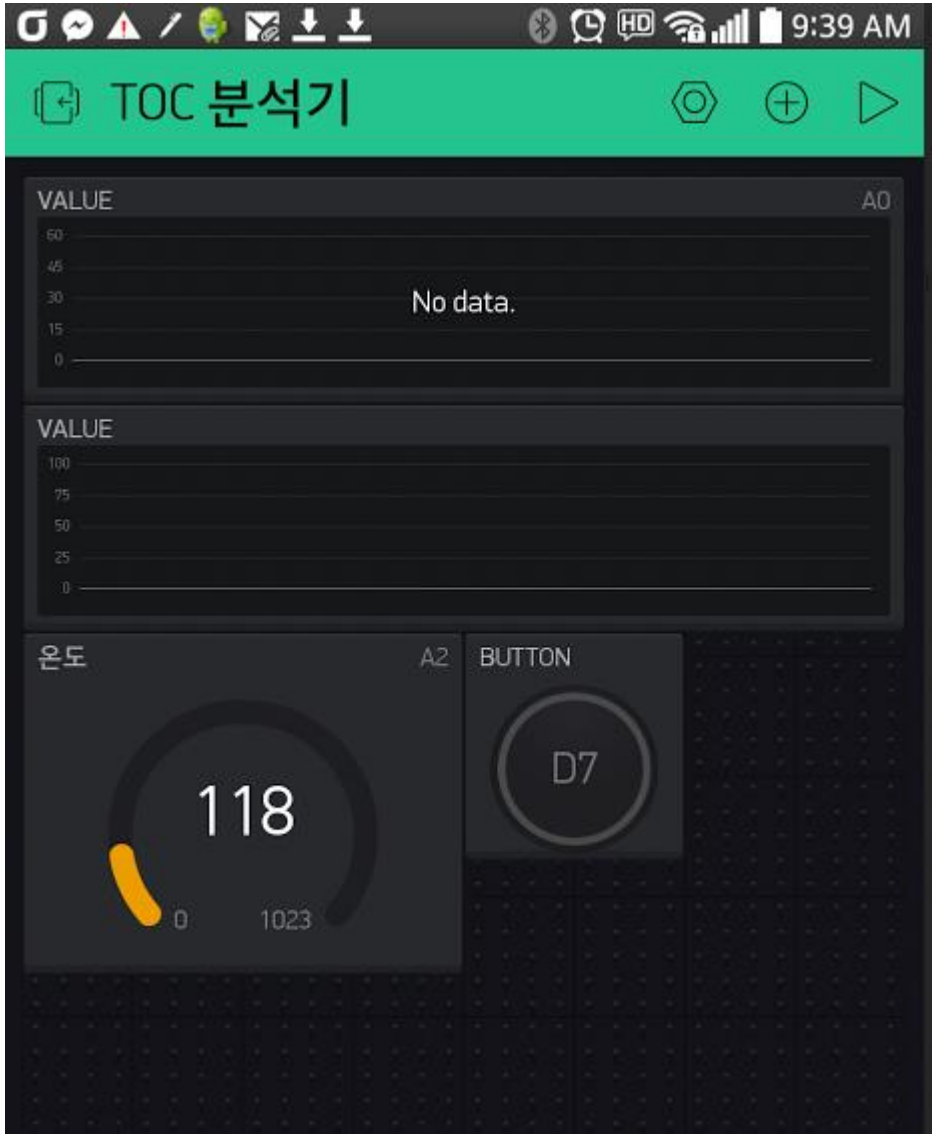
JoyIoT - 궁극의닭장






Internet
Internet
M2M라우터
Poorman's IoT서버
돔 닭장


Blynk Server
No laptop required
Blynk app
Blynk Libraries
Internet Access of your choice
Ethernet, Wi-Fi, 3G ...


9:39 AM
TOC 분석기
VALUE
A0
60
45
30
15
0
No data.
VALUE
100
75
50
25
0
온도
A2
118
0
1023
BUTTON
D7







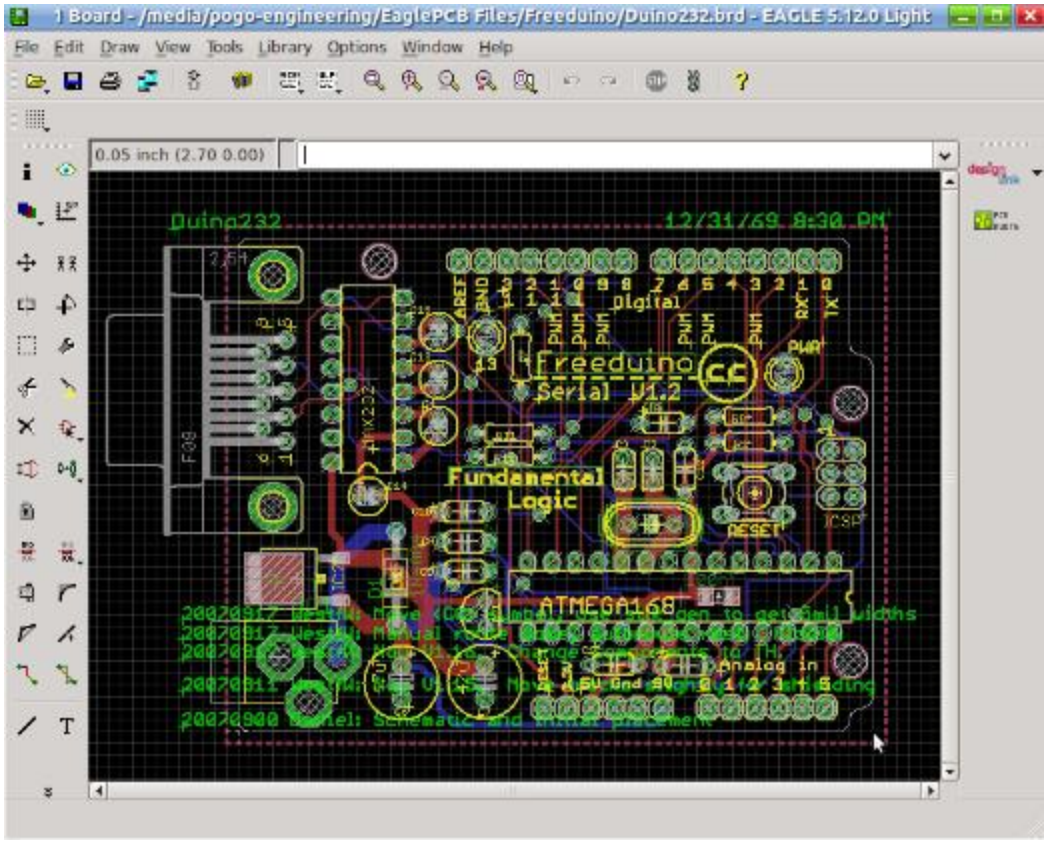


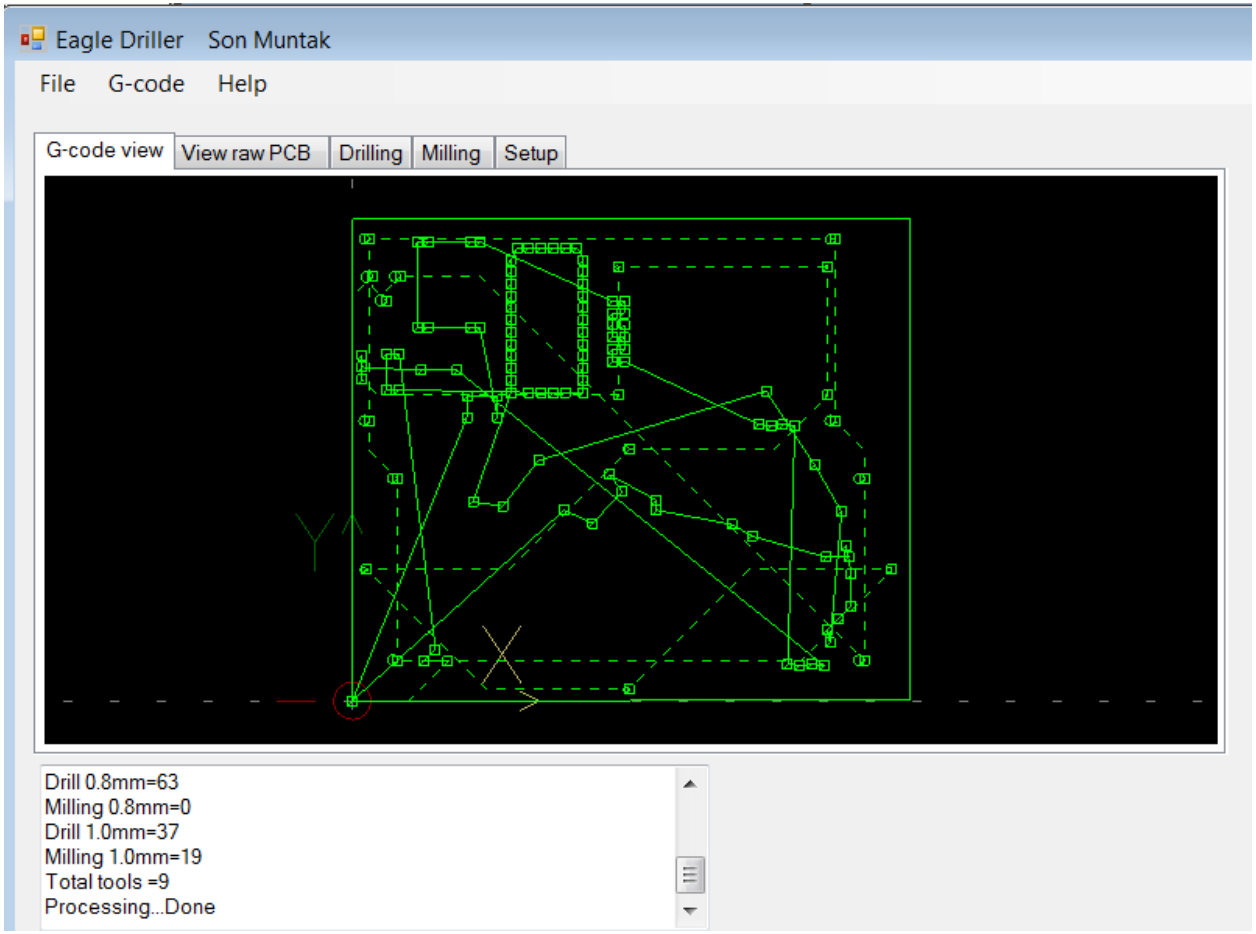




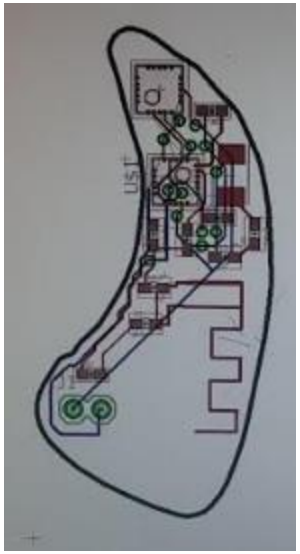


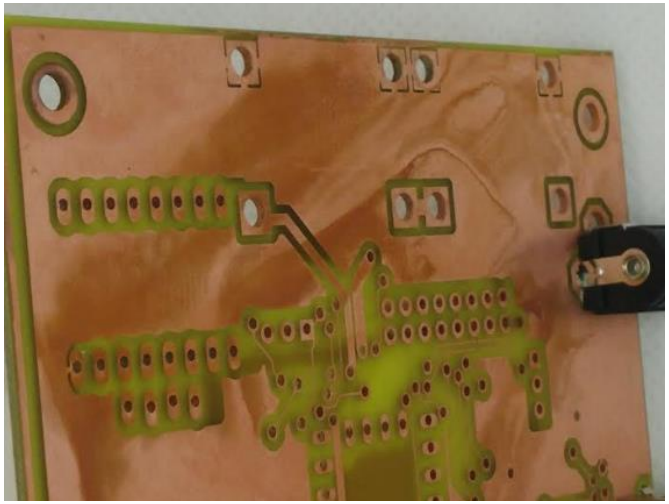
JoyPCB –가난한자의 회로기판



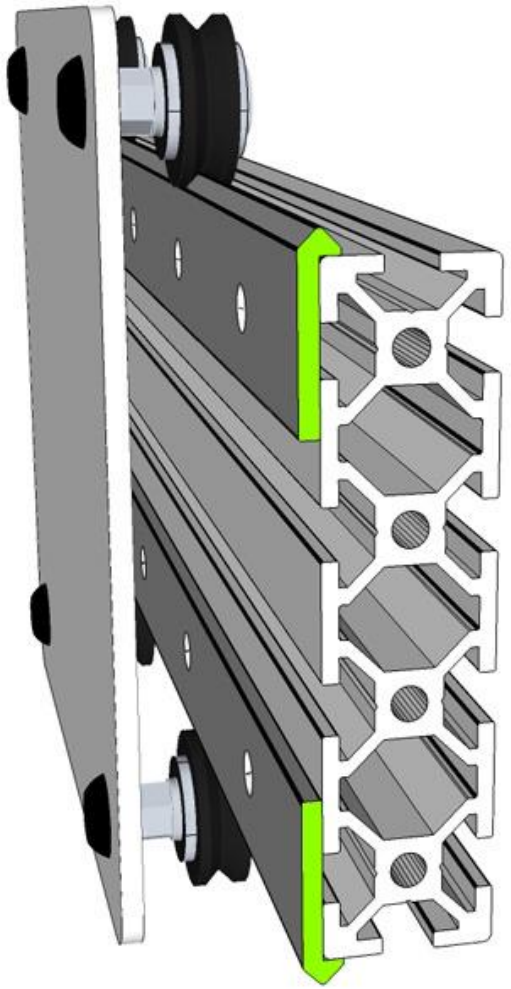

Eagle Driller Son Muntak
File G-code Help
G-code view
View raw PCB
Drilling
Milling
Setup
Drill 0.8mm=63
Milling 0.8mm=0
Drill 1.0mm=37
Milling 1.0mm=19
Total tools =9
Processing...Done





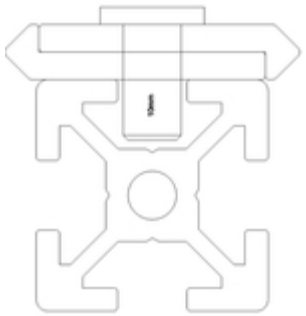


JoyCNC - 가난한자의 초대형CNC

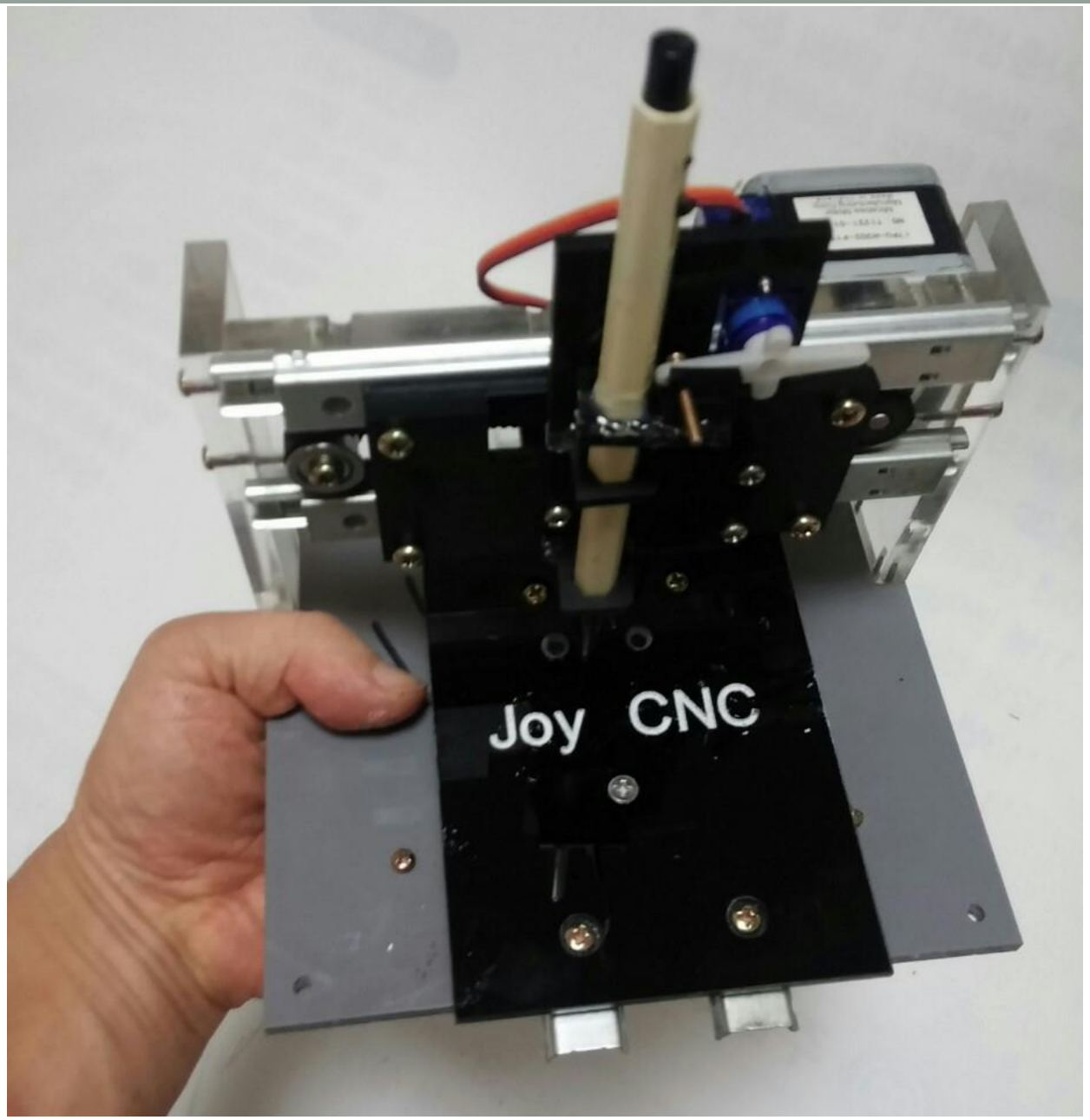


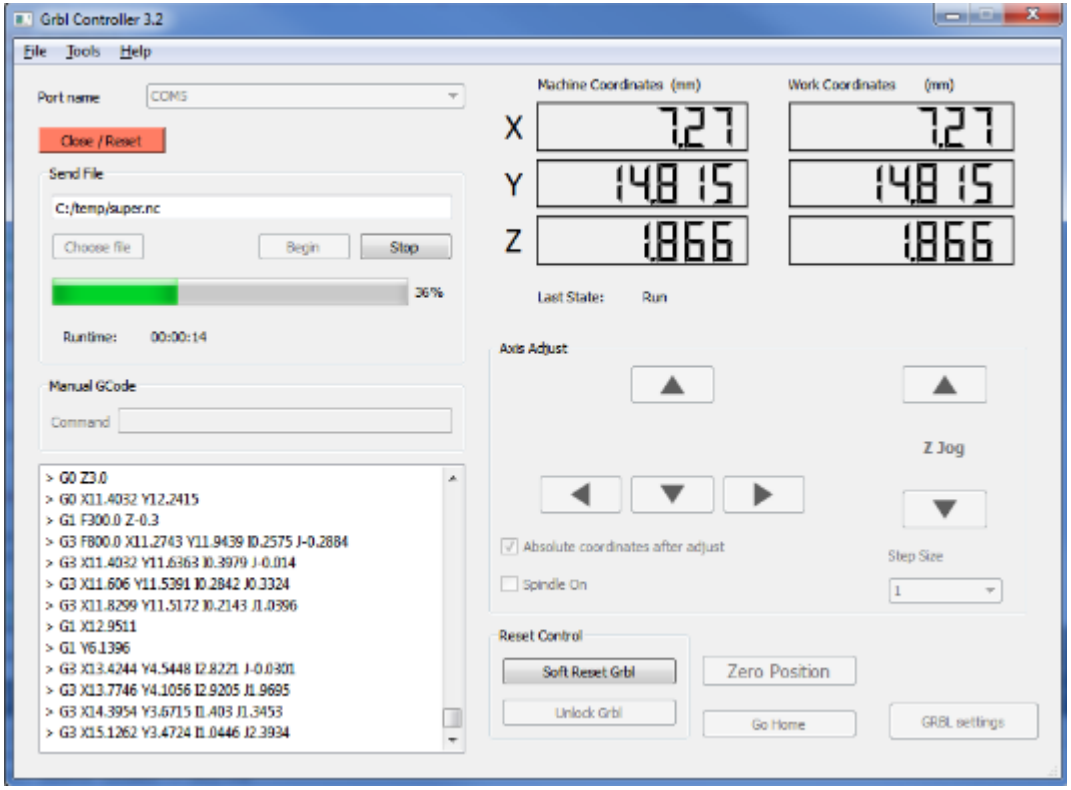
OPENBUILDS PARTSTORE

OpenRail



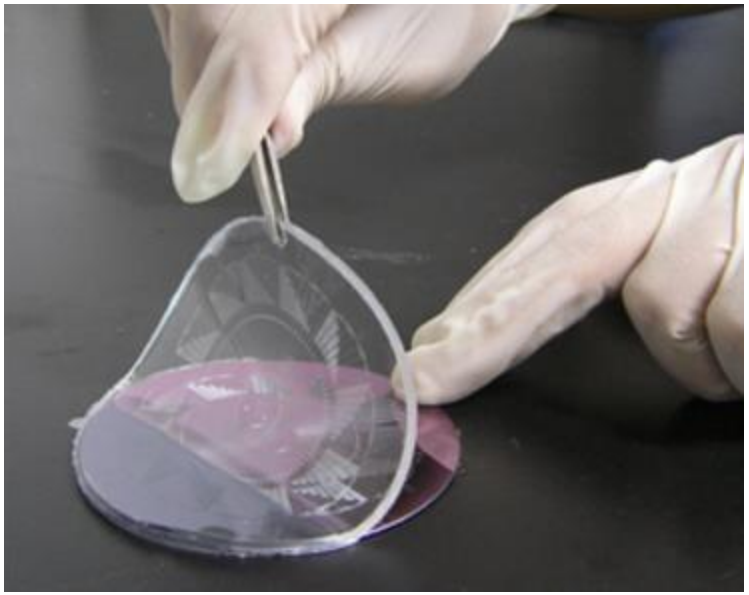



Joy CNC

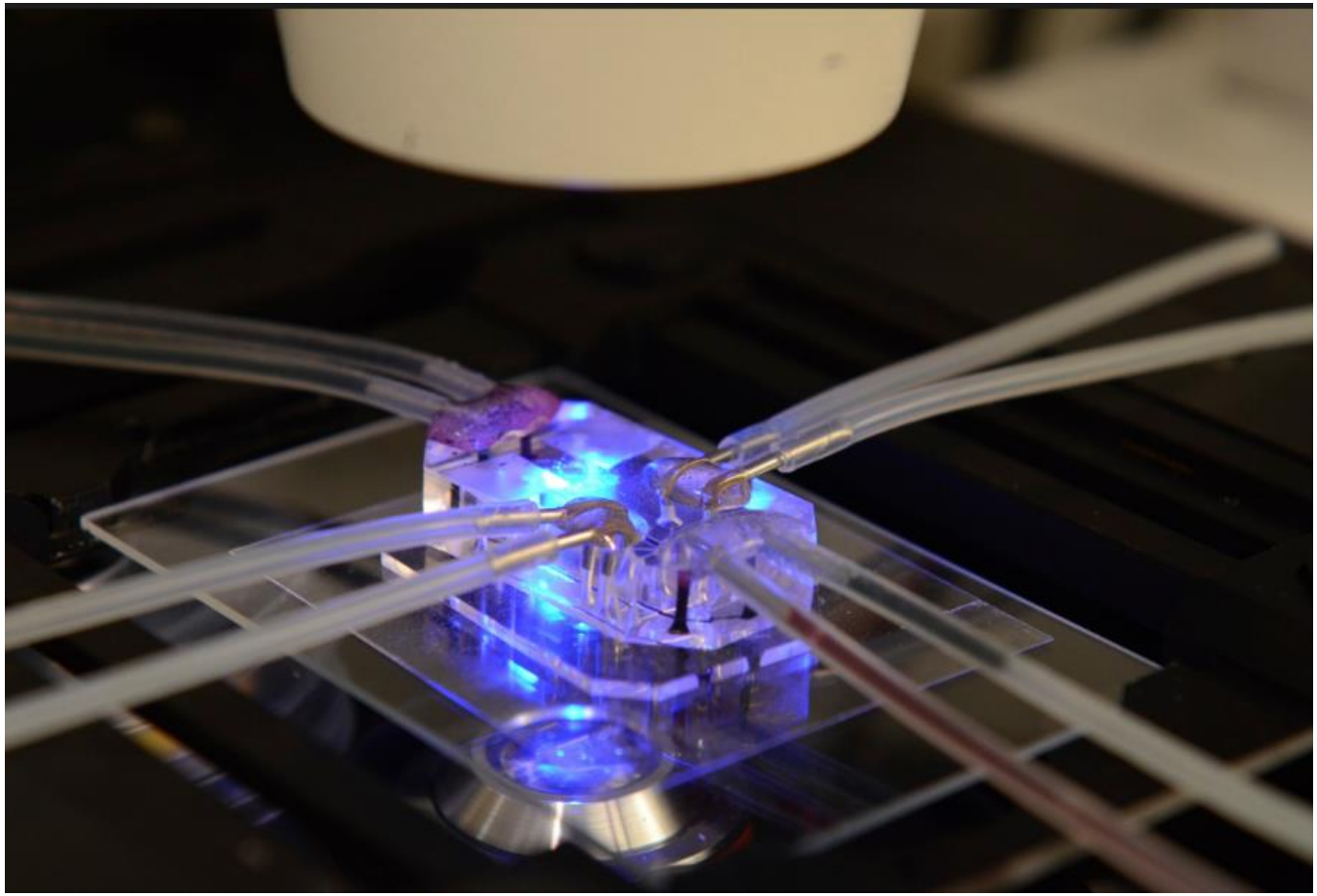

Grbl Controller 3.2
File Tools Help
Port name
COM5
Close / Reset
Send File
C:/temp/super.nc
Choose file
Begin
Stop
36%
Runtime: 00:00:14
Manual GCode
Command
> G0 Z3.0
> G0 X11.4032 Y12.2415
> G1 F300.0 Z-0.3
> G3 F800.0 X11.2743 Y11.9439 I0.2575 J-0.2884
> G3 X11.4032 Y11.6363 I0.3979 J-0.014
> G3 X11.606 Y11.5391 I0.2842 J0.3324
> G3 X11.8299 Y11.5172 I0.2143 J1.0396
> G1 X12.9511
> G1 Y6.1396
> G3 X13.4244 Y4.5448 I2.8221 J-0.0301
> G3 X13.7746 Y4.1056 I2.9205 J1.9695
> G3 X14.3954 Y3.6715 I1.403 J1.3453
> G3 X15.1262 Y3.4724 I1.0446 J2.3934
Machine Coordinates (mm)
Work Coordinates (mm)
X
Y
Z
7.27
14.815
1.866
7.27
14.815
1.866
Last State: Run
Axis Adjust
Z Jog
Absolute coordinates after adjust
Spindle On
Step Size
1
Reset Control
Soft Reset Grbl
Unlock Grbl
Zero Position
Go Home
GRBL settings



JoyFab – 가난한자의 랩온칩 제작

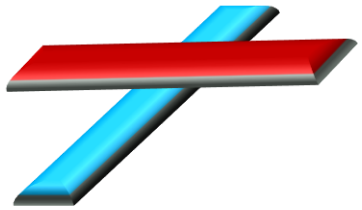


Francesca Burgoyne.

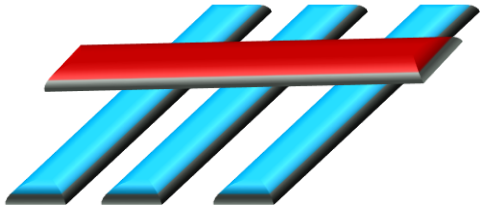


pbmc.seas.upenn.edu

What's 3-layer PDMS labchip ?



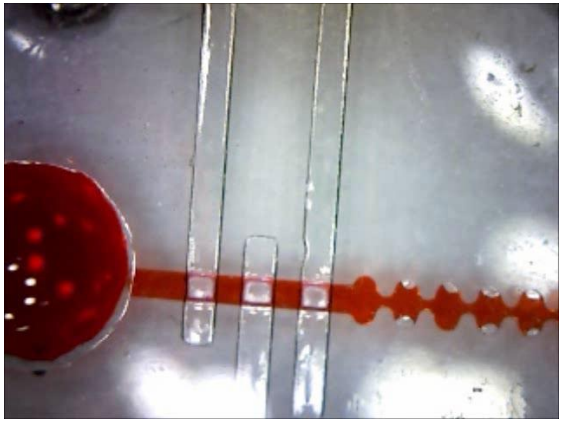
microvalve



micropump



micromixer

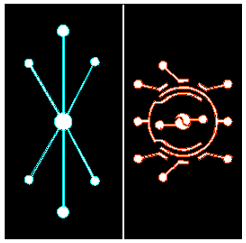


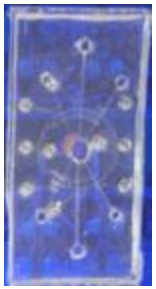


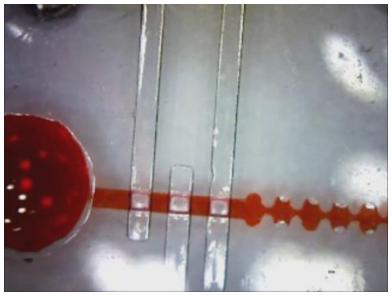
Is this dream possible?

Mask In → MICO → Chip out

Chip in → CIMO → Movie out







From photomask to a movie clip in an hour.

JoyFab MICO



UV box

Corona treater

Hole punch

Spray etcher

Spin coater

Vacuum chamber

JoyFab CIMO




X-Y stage handle
7” Android pad
Microscope
compressed air inlet
Labchip
Manifold
ANDROID
Clearbridge BioLoc

Mold making

CAD **drawing** → printing **photomask** → Photoresist **lamination** → **UV** exposure → Spray **etching**

Chip casting

PDMS **weighing** → Vacuum **Degassing** → **Cast** into the mold → **Cure** → **Demold** → **Punch** holes

Membrane making

Spin-coat thin membrane → **Cure**

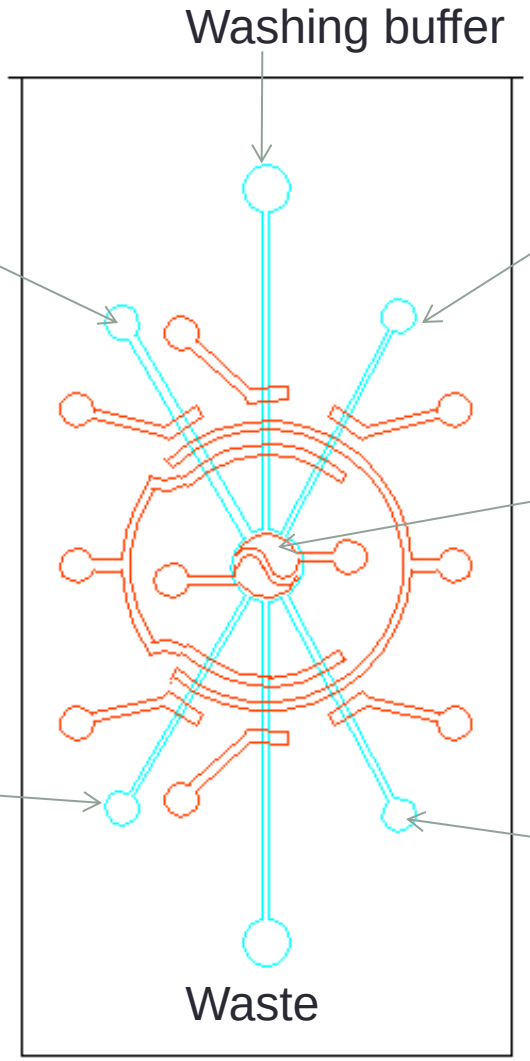
Bonding

Corona treat → **Bond** liquid layer → **Bond** air layer

Evaluation

Prepare **manifold** → **Run** the software valve, pump & mixer → **Image** processing

Labchip design - Immunoassay chip



Magnetic bead - Antibody conjugate

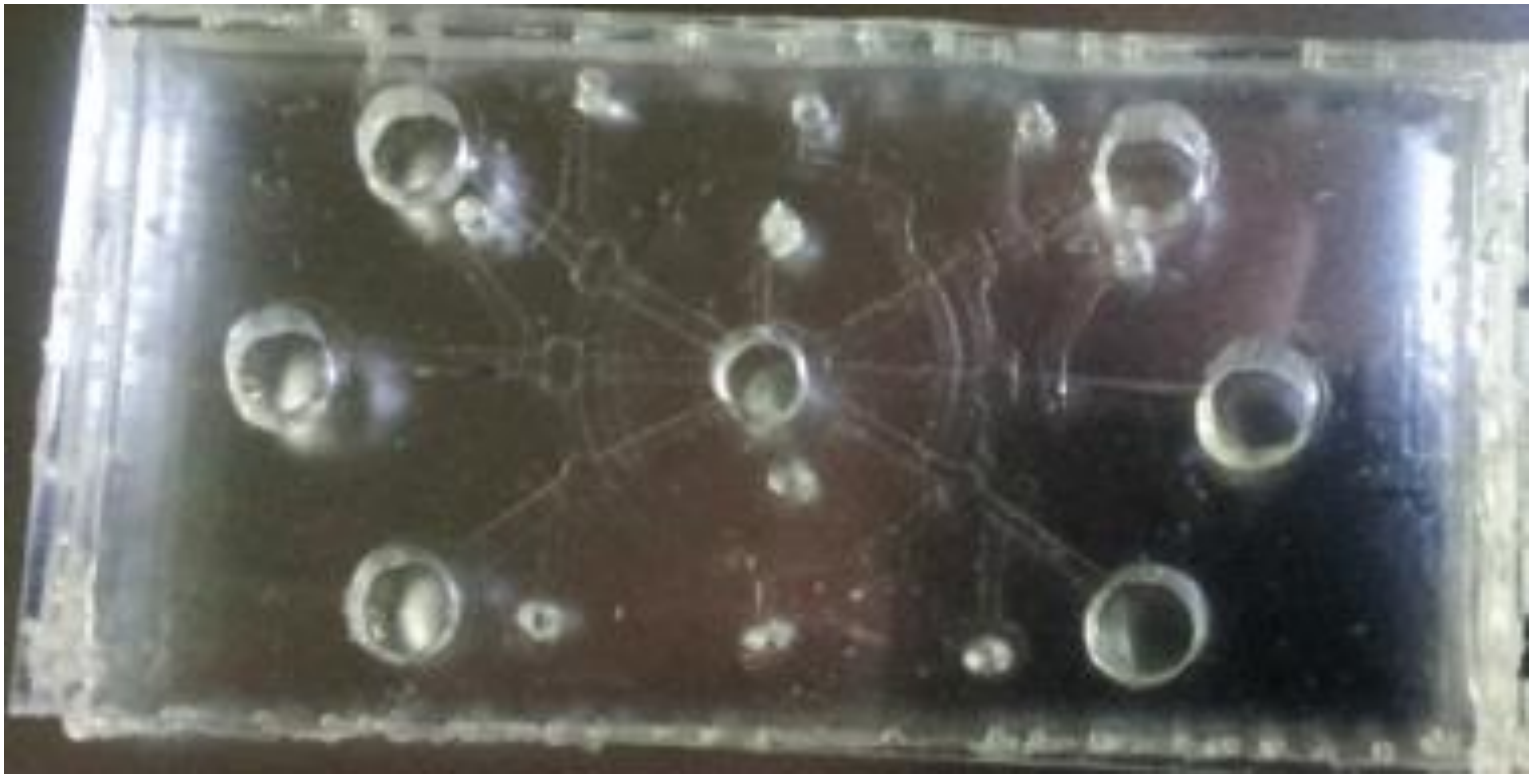
Fluorescence bead - Antibody conjugate

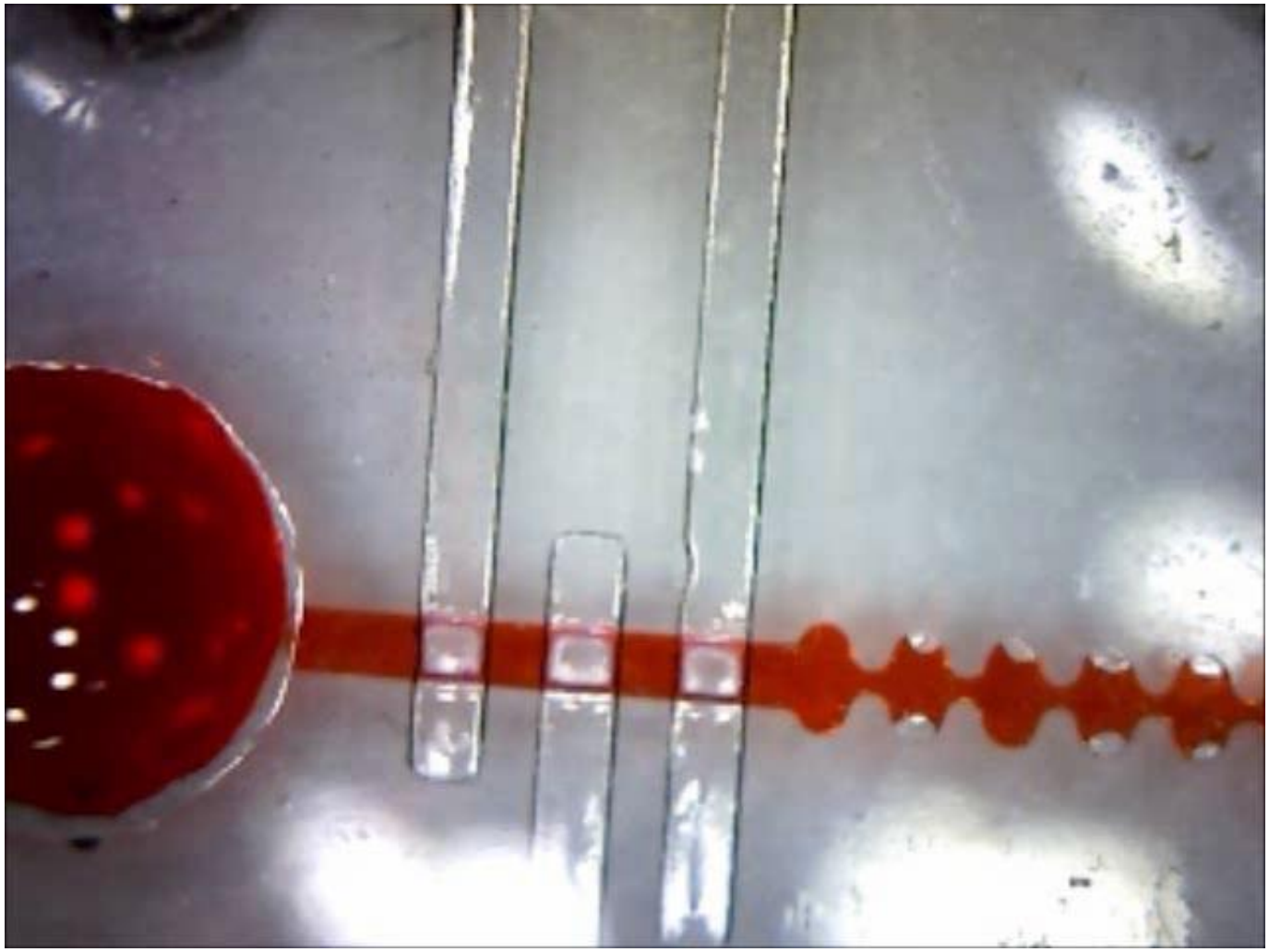
6 reagent wells
4 micropumps
15 microvalves
1 mixer

Open reactor with a vortex mix

Fluorescence standard solution

Reserved







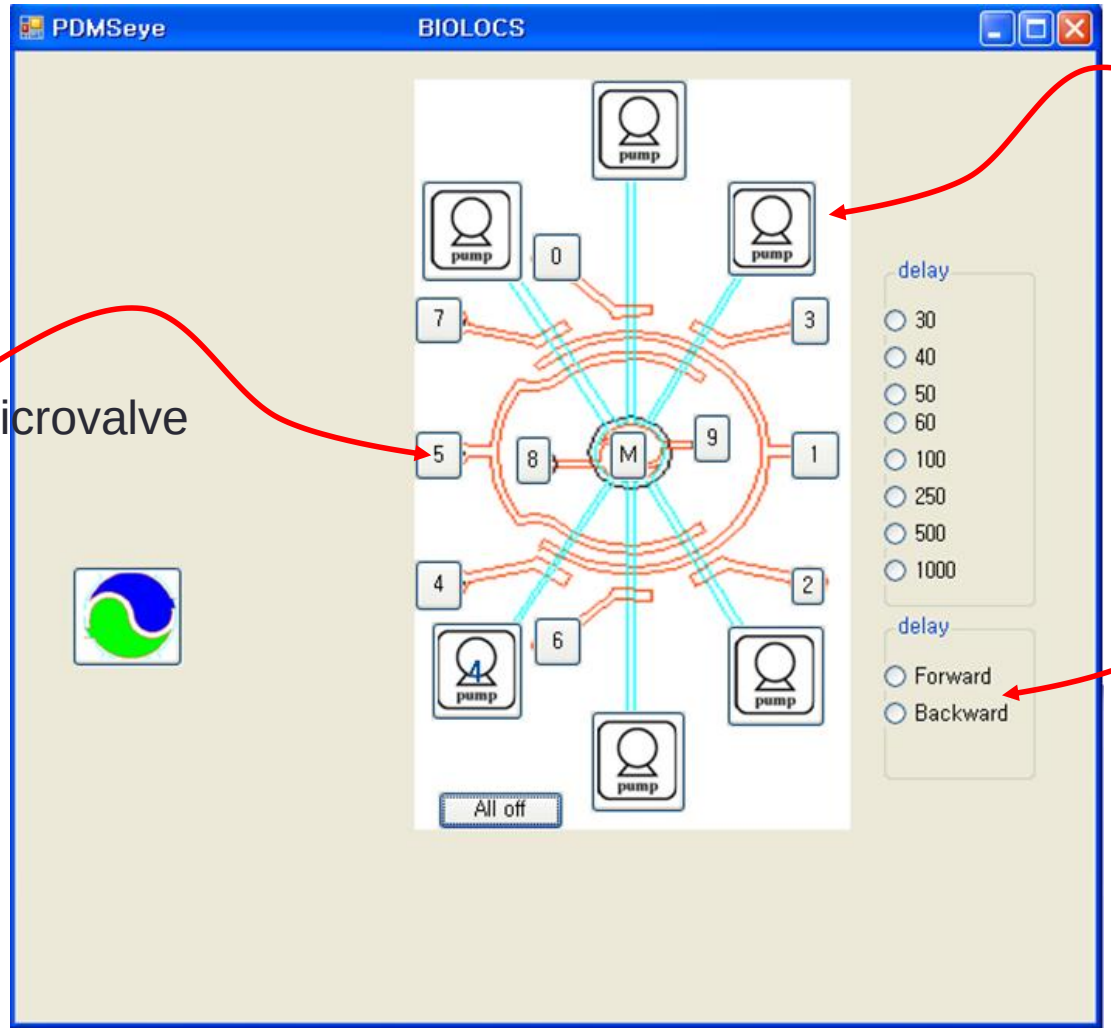
CIMO 3 - software





Laboratory setup using
MS Windows PC

Portable labchip
workstation

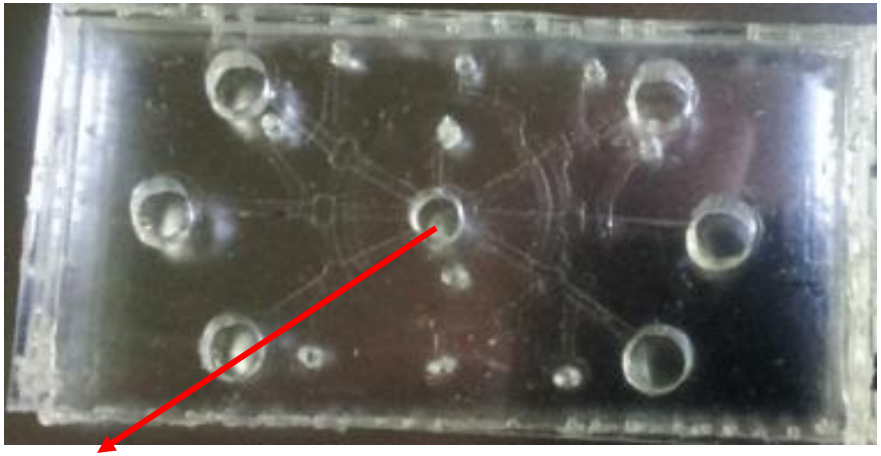


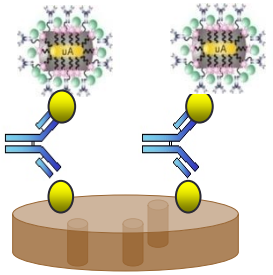
Run micropump

Run microvalve

Pump rev/fwd

Professional use
– multiplexed immunoassay







Joy Institute of Technology

Bring science to the poor

Use open source project – JoyCNC, JoyIoT, JoyFarm, …

Invent low cost version of professional tools – Joyfab

Challenge open science competition – Google science fair