Construction Manual

GCODe Pro

IISc Bangalore

iGEM 2017

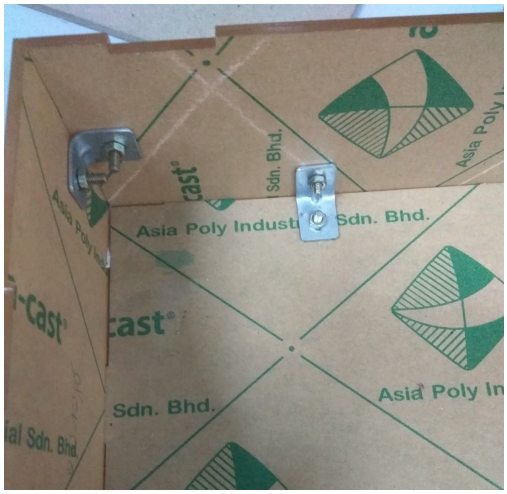
Parts list

Part Name	No	Cost Per Piece	Total Cost
Relay	1	6	
10kΩ	4	0.06	
1kΩ	3	0.06	
47Ω	1	0.06	
100kΩ	1	0.06	
220Ω	4	0.06	
220kΩ	2	0.06	
4.7kΩ	1	0.06	
15kΩ	1	0.06	
10uF	3		
1uF	2	0.04	
Male Pin Headers	56	0.08	
Screw Terminal 0.1" pitch	8	0.3	
HUDZ 5V buzzer	1	1	
KA7805 Linear Voltage Regulator	2		
Red LED (5mm)	4	0.02	
BPW34 Photodiode	1	1	
0.5Ω 5W shunt resistor	1		
PN2222A NPN transistor	1	0.04	
LM358 Dual Op-Amp	2		
L293D Motor Driver IC	2	0.8	
DIP 8 Socket	2		
DIP 16 Socket	1		
10k 3 leg staggered square variable resistor	1		
Red Wire	30cm	0.1	
Black Wire	30cm	0.1	
Electrical Box	1		
AC Wire	1m		

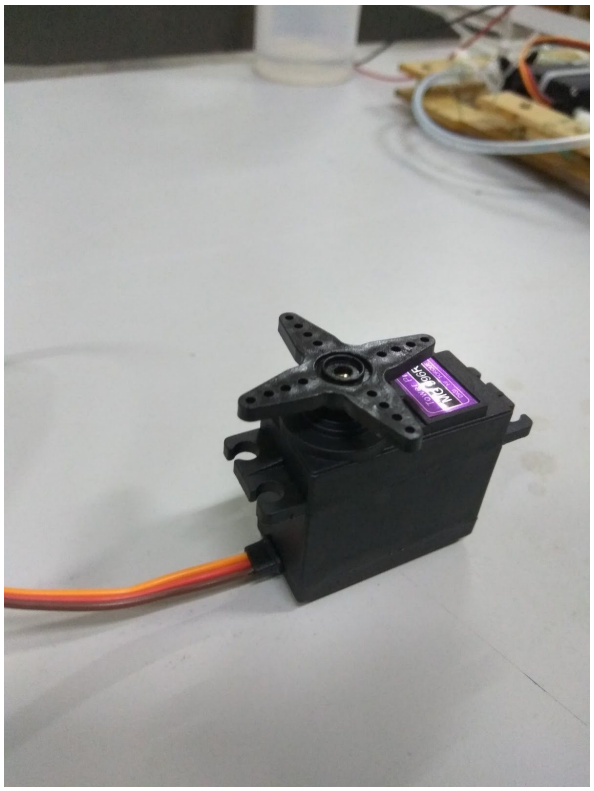
AC Socket for electrical box	1		
AC Plug	1		
DC Barrel Jack PCB Mount	1		
12V 1A AC-DC adapter with barrel jack output	1		
1N4007 diode	1		
Arduino Uno	1	8	
Large screws	14		
2cm corner bends	8	0.4	
Large nuts	47		
Small screws	13		
Small nuts	13		
4 inch zipties	24	0.05	
6 inch zipties	24	0.05	
Erasers	2	0.1	
Silicone tubing: 2.5mm inner diameter, 4mm outer diameter	2m	4	
Silicone tubing: 3.5mm inner diameter, 6.5 mm outer diameter	20cm	2	
Oxymask with 4-way connector	3		
Parafilm	-	0.1	
3-way stopcocks	8	0.62	
Adafruit Peristaltic Pump	1	25	
Glass Cuvette	1		
18 Gauge Spinal Needle	2	4	
MG996R Servo	8	6.43	
15mL Falcon Tube	1		

Physical Assembly:

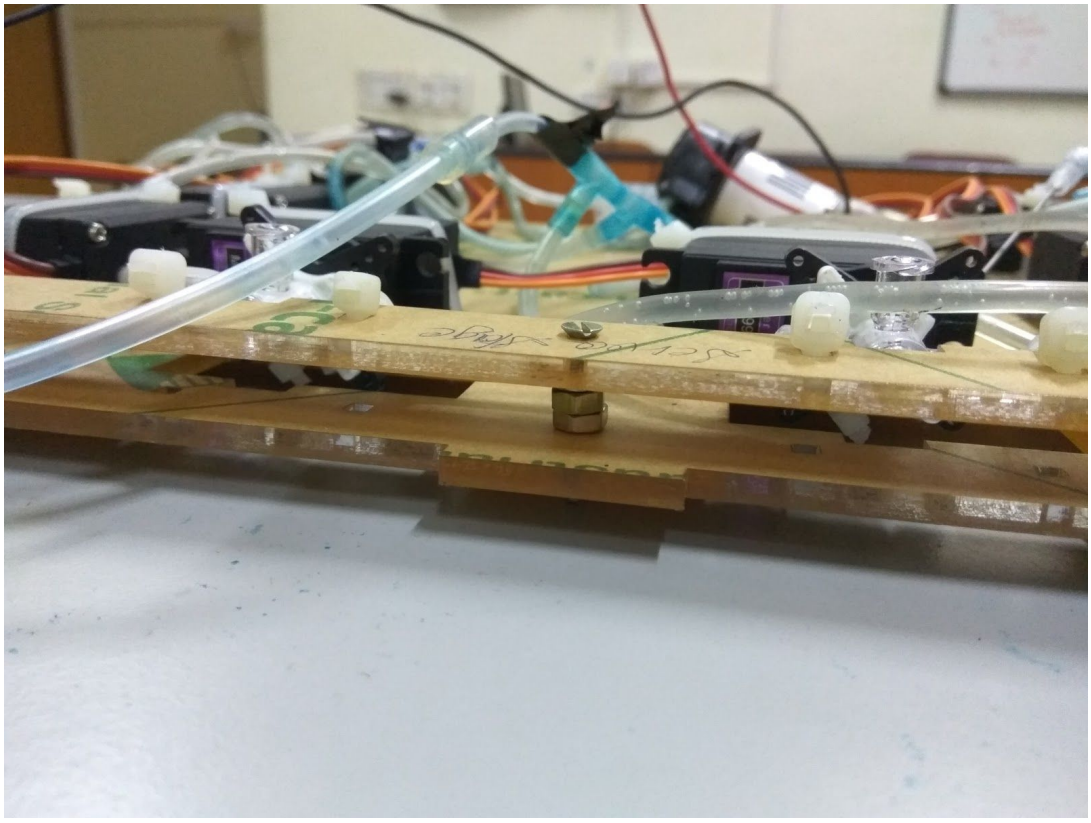
The construction of the lower part of the box is fairly straightforward. Put the laser-cut parts together with L-bends, nuts and bolts.



Attach servos to the star-shaped connector that comes with them.

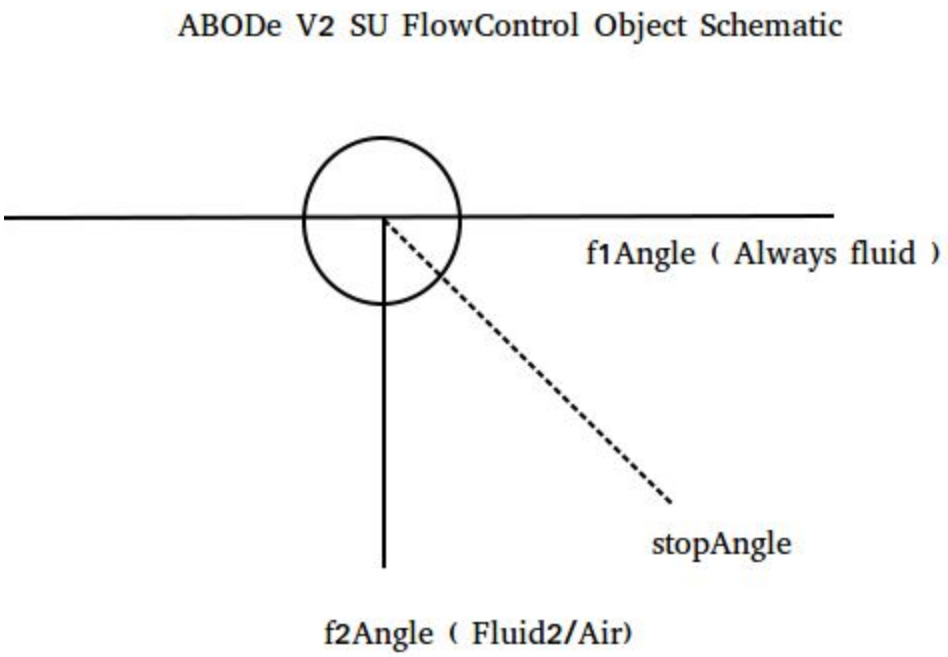


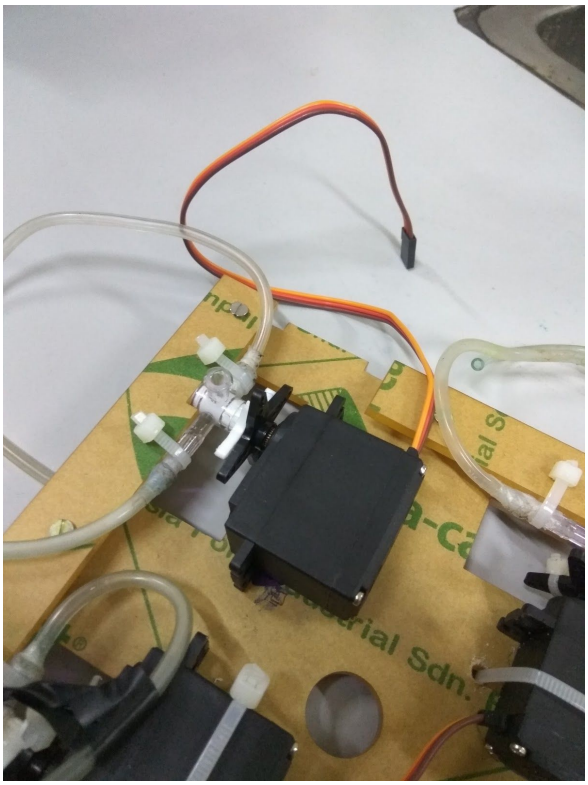
In the top panel, install the long thin panels. We need this to attach servos. The height needs to be adjusted for the servos. For the servos we used, we used two bolts.

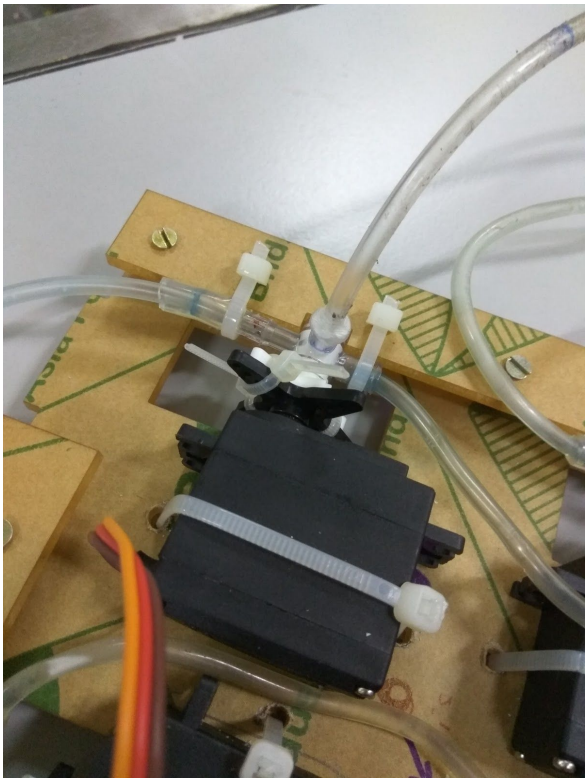


Attach the three-way stopcocks to the corresponding grooves on the top panel of the Case using zip ties. We will be using zip ties to attach more things soon.

Place the servos co-axially with the stopcock in such a way that the 90 degrees position of the servo corresponds to the closed position of your stopcock. According to our convention, the longer section pipe of the stopcock was f1, the top was f2 and the position in-between was close. The schematic below will make it clearer.



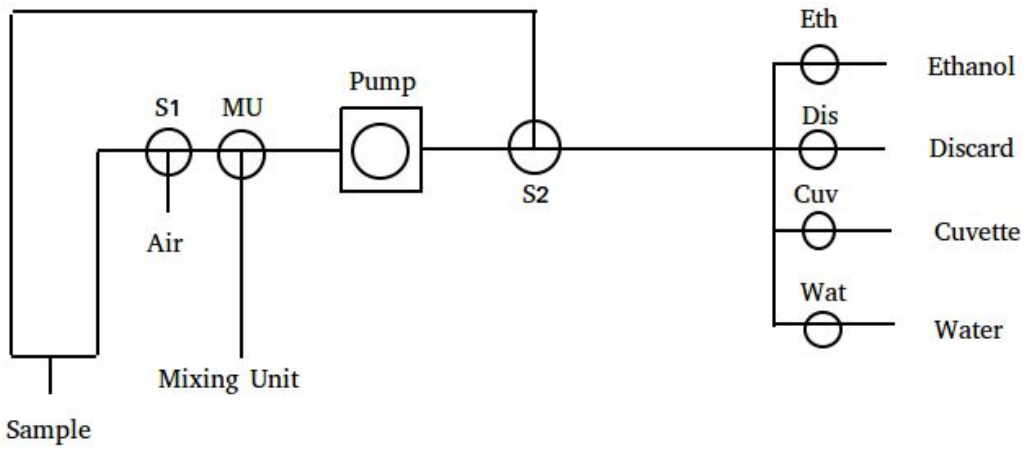




Attach all other servos in a similar way.

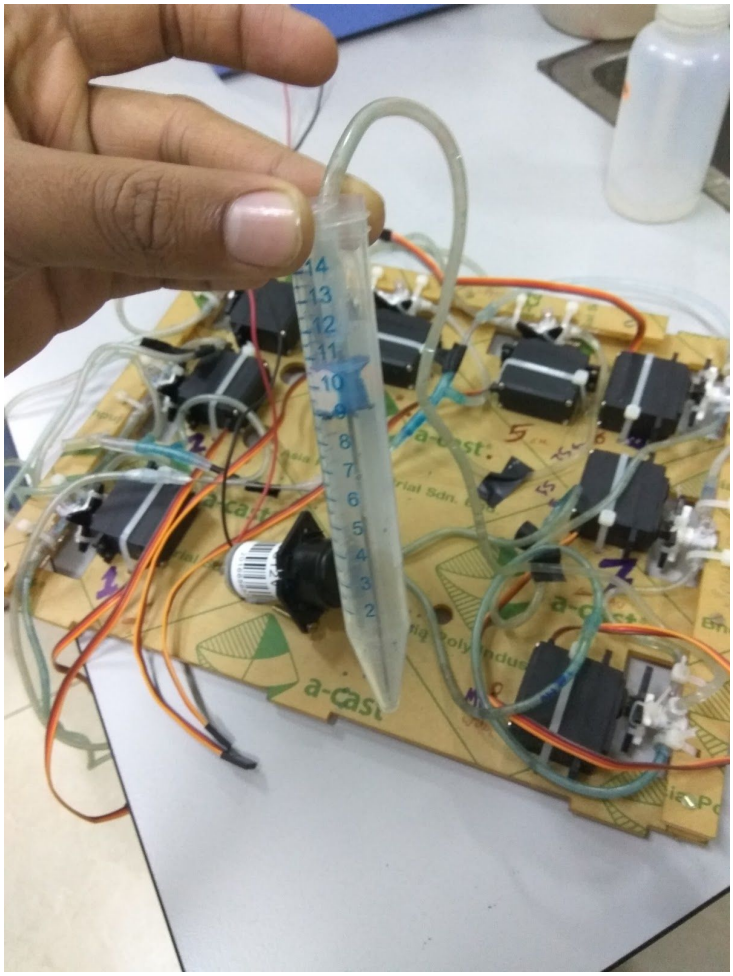
Attach the tubing according to the following schematic.

ABODe V2 Sampling Unit Schematic

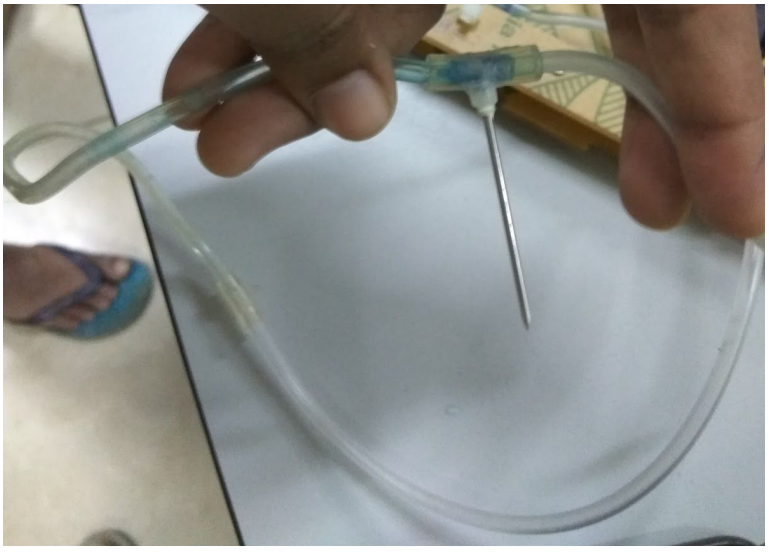


The sample part, the mixing unit part Cuvette will be explained further. The discard, Ethanol and Water are just beakers corresponding to their respective contents.

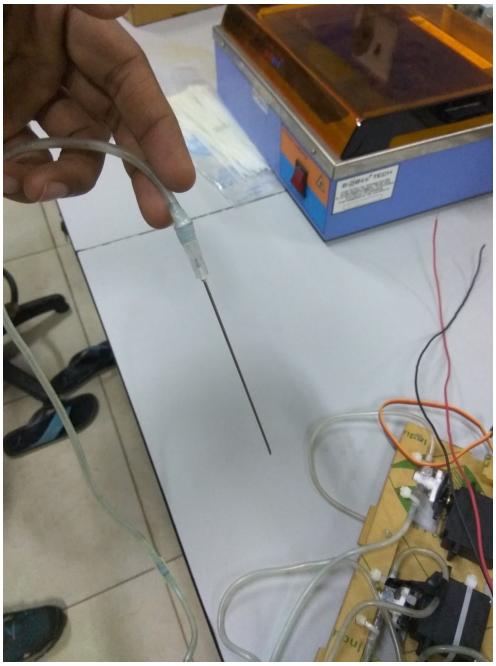
The Mixing Unit is a Falcon tube with a cut eraser to make it watertight with a syringe through it.

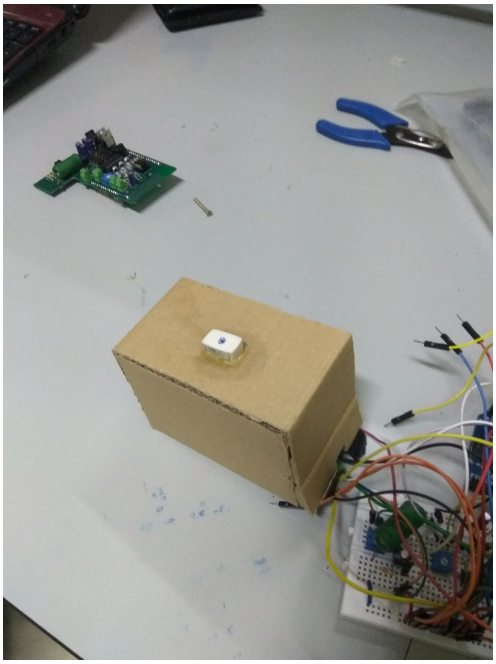


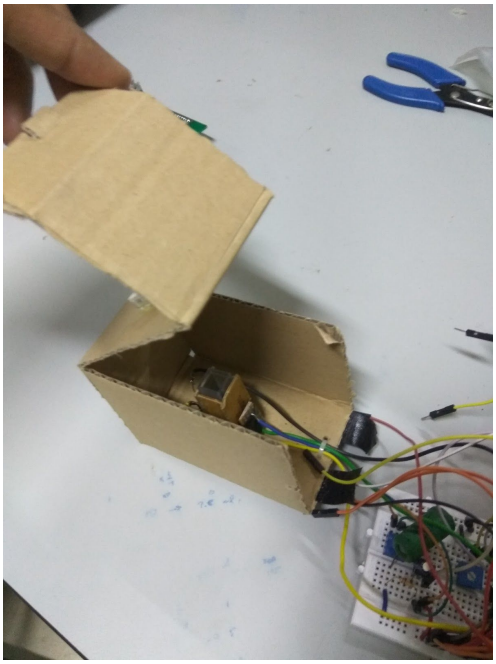
The sampling tube is made from a tube perpendicular pierced by a syringe needle. This is the part that will go inside the shaker.



The analysis unit has to be assembled from the tiny Laser-cut parts. This is where the cuvette will go. A similar Eraser-syringe assembly is made. We had a temporary cardboard Assembly unit for our test version.





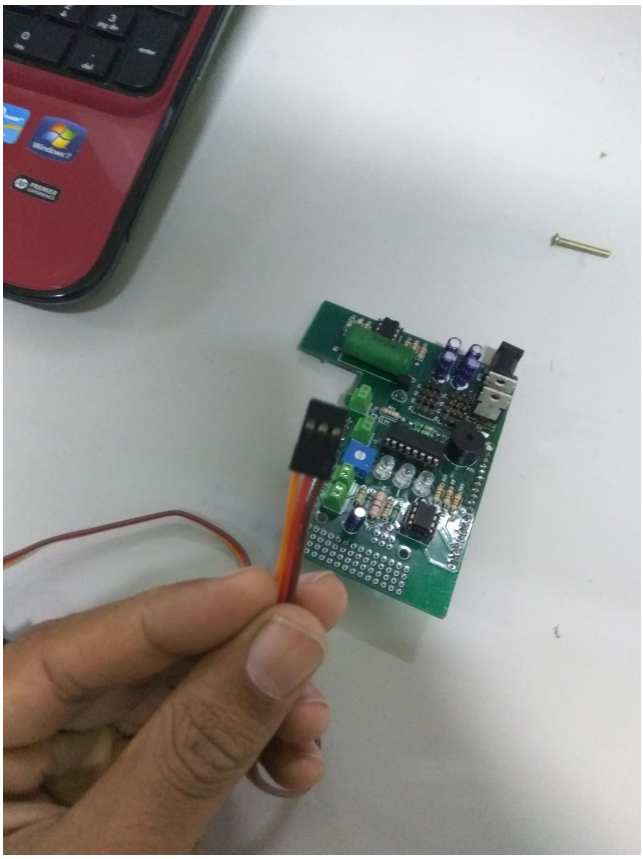


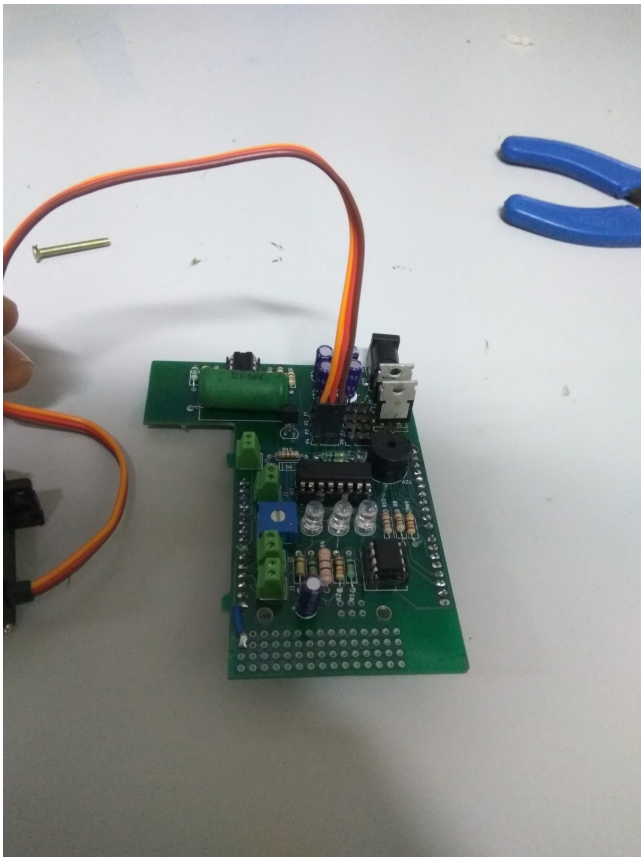
Our assembly was really hacky - when we had to join tubes of the same width, we used a wider piece of tube to link them.

Now, download the source code from the IISc-iGEM wiki page. Extract the folder, and upload the code iGEM_V2_Stage3_SU_Serial.ino

Next, break off the PCB, solder the components (given in the schematic in the Fabrication source files.)

Connect the servos to their respective pins as shown.





Attach the PCB to the Arduino, and complete the circuitry according to the schematics.

After completing the circuitry, you have to calibrate the specified variables in the code. If you have used the same components as we did, most of the variables other than the flushing variables must be similar to what is there in the code. After calibration, you will be able to draw specified volumes of liquids through desired channels!

The Analysis Unit is similar to the one on the Mini, and can be implemented in a similar way. Refer to the Mini's manual for the nitty-gritty details such as the Gain adjustment.