Middlesex University London

Engineering Logbook

Name: Okpalaeke Chibuike

Student No.: M00543047

Module: PDE 1430

Project Title: Mechatronics

Dates: Inf

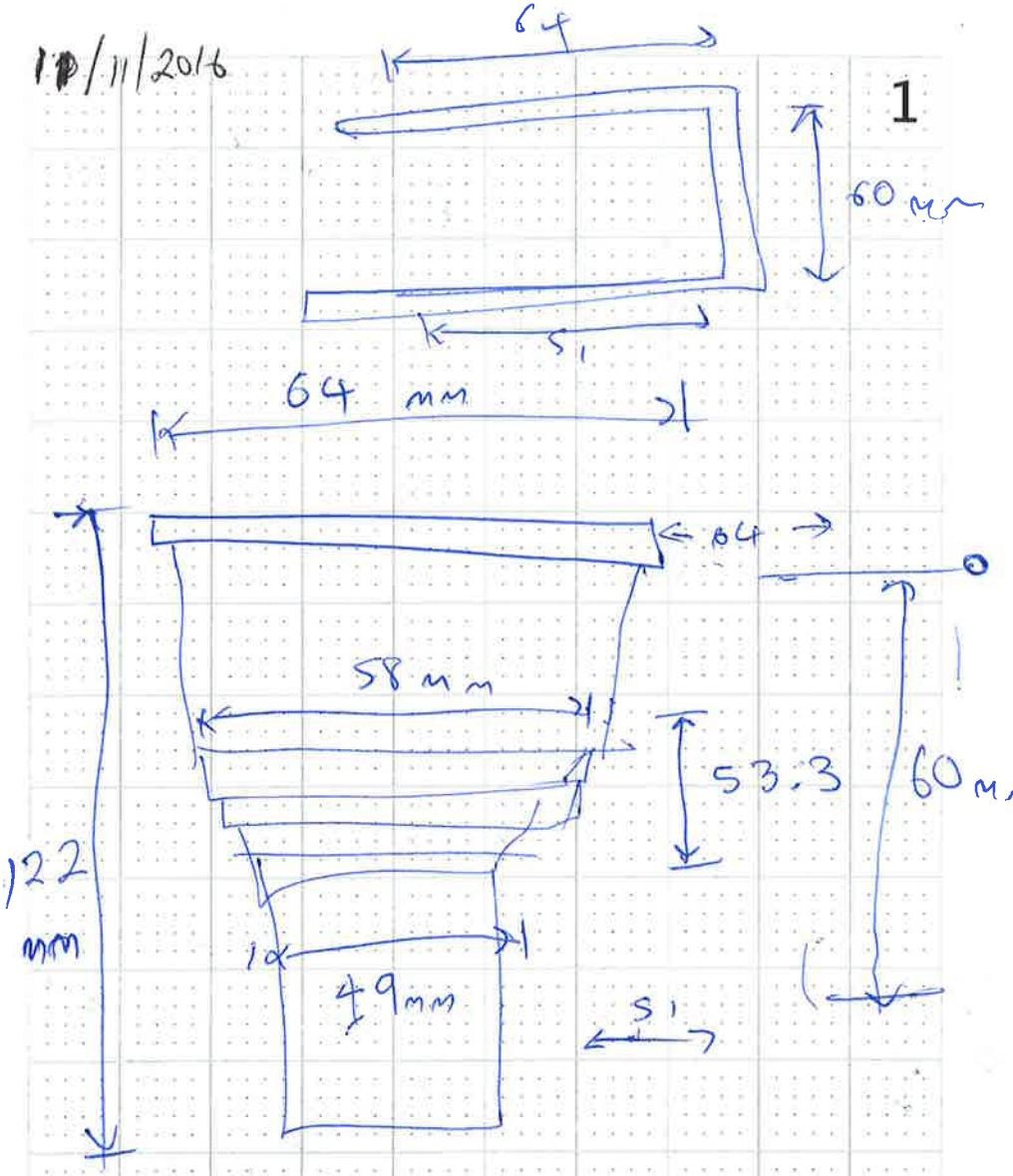
Quantity	Usual Symbol	Unit	Unit symbol
Voltage	V	Volt	V
Current	I	Amp	A
Charge	Q	Coulomb	C
Resistance	R	Ohm	Ω
Capacitance	C	Farad	F
Inductance	L	Henry	H
Reactance	X	Ohm	Ω
Impedance	Z	Ohm	Ω
Power	P	Watt	W
Energy	E	Joule	J
Time	t	Second	s
frequency	f	hertz	Hz

Milli (m)	Micro(μ)	Nano (n)	Pico (p)
0.000 000 001	0.000 001	0.001	1
0.000 000 01	0.000 01	0.01	10
0.000 000 1	0.000 1	0.1	100
0.000 001	0.001	1	1000
0.000 01	0.01	10	10 000
0.000 1	0.1	100	100 000
0.001	1	1000	1000 000
0.01	10	10 000	10 000 000
0.1	100	100 000	100 000 000
1	1 000	1 000 000	1 000 000 000

Prefix	Prefix Symbol	Value
Pico	p	0.000 000 000 001
Nano	n	0.000 000 001
Micro	μ	0.000 001
Milli	m	0.001
Centi	c	0.01
Deci	d	0.1
(none)	-	1
Deca	D	10
Hector	h	100
Kilo	k	1 000
Mega	M	1 000 000
Giga	G	1 000 000 000
Tera	T	1 000 000 000 000

18/11/2016

1



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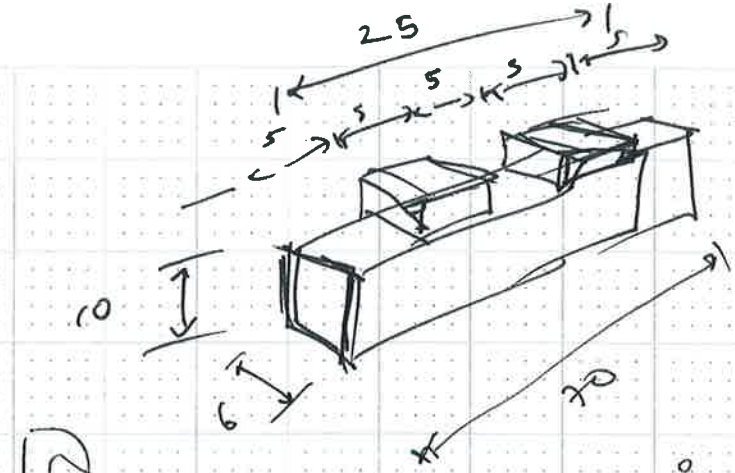
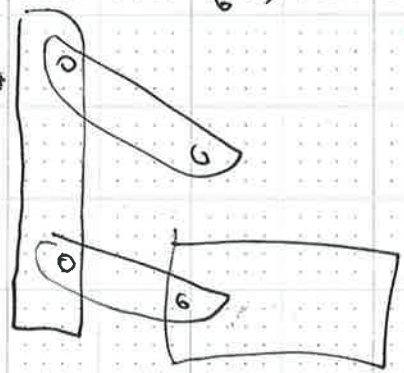
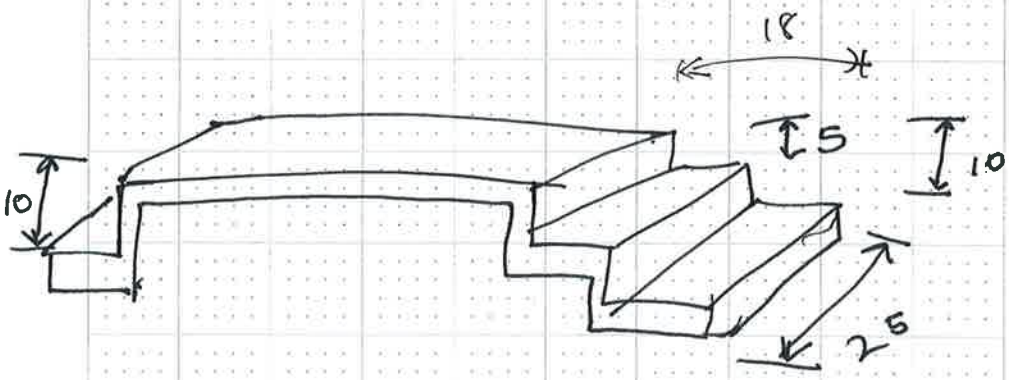
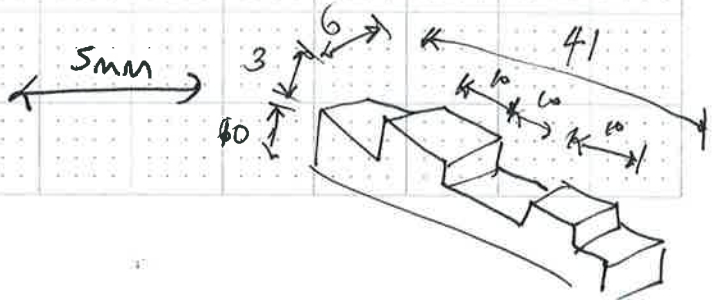
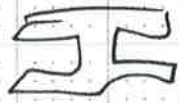
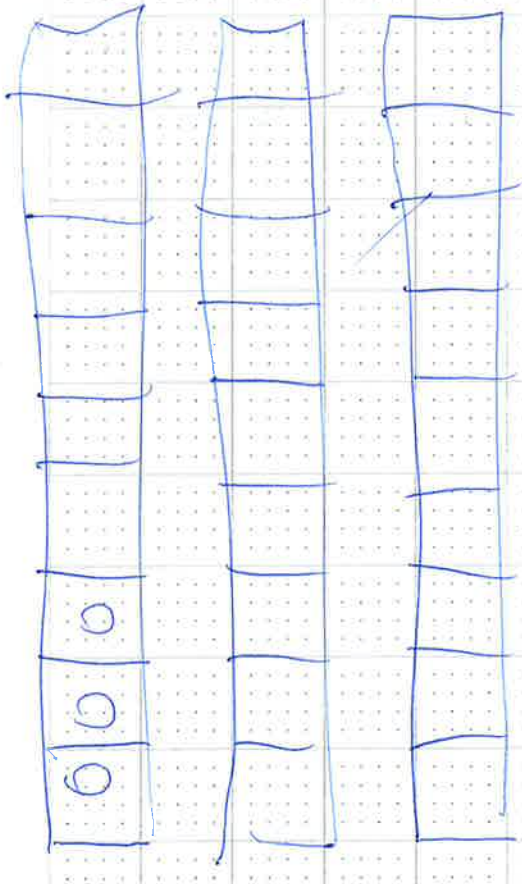


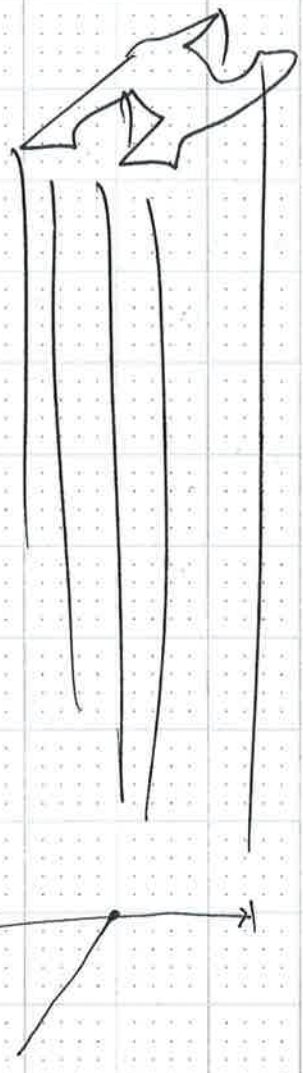




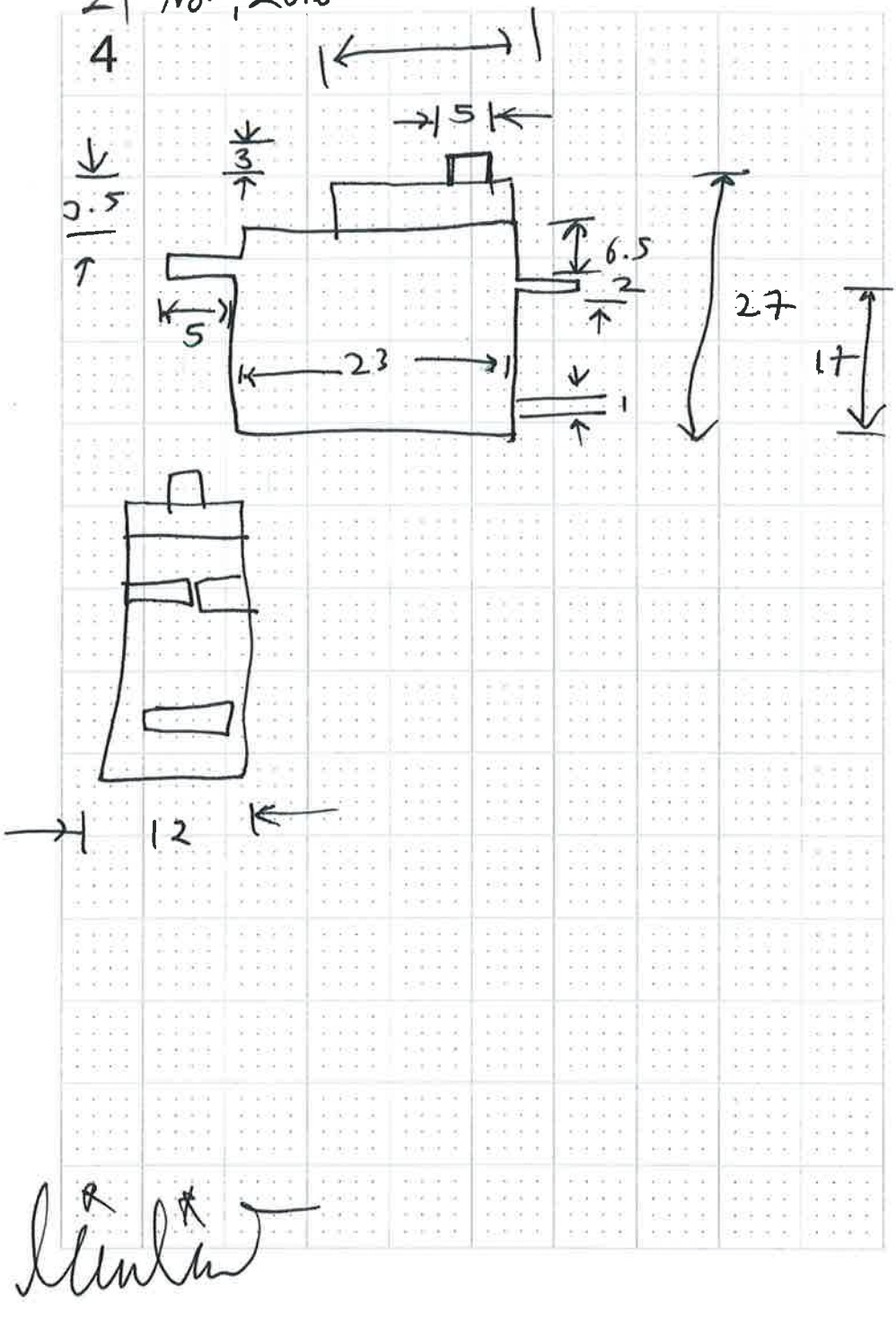


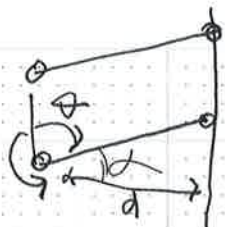






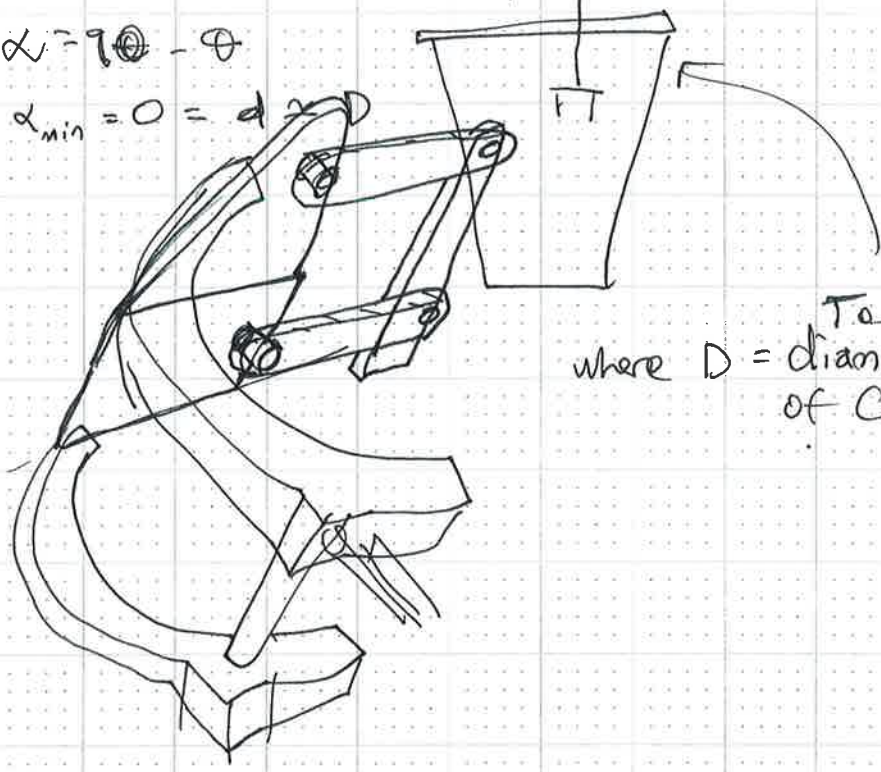
21 Nov, 2016



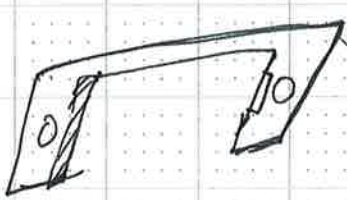


$\alpha = 90 - \theta$

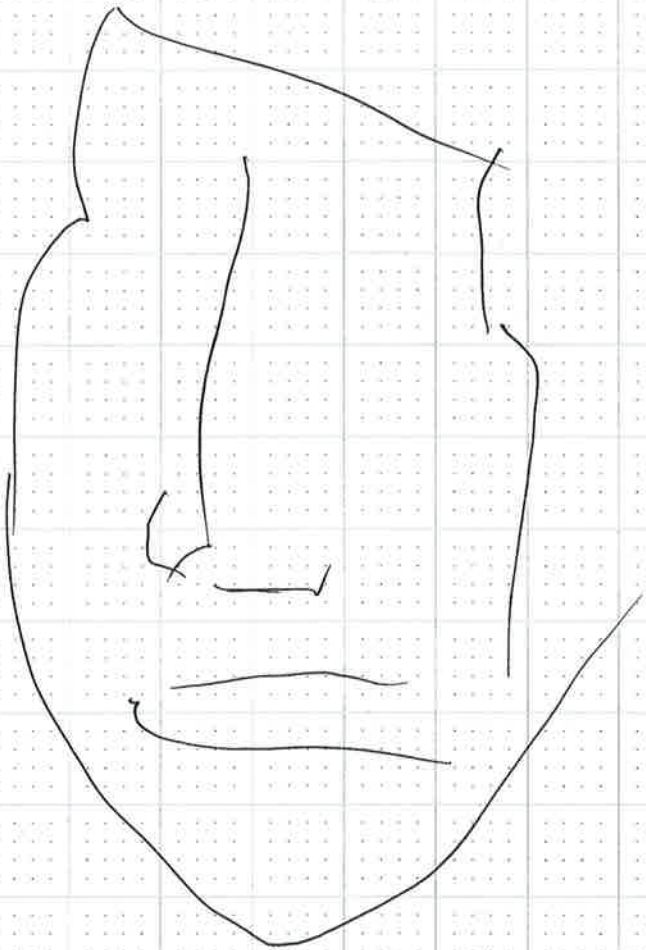
$\alpha_{min} = 0 = d \rightarrow D$

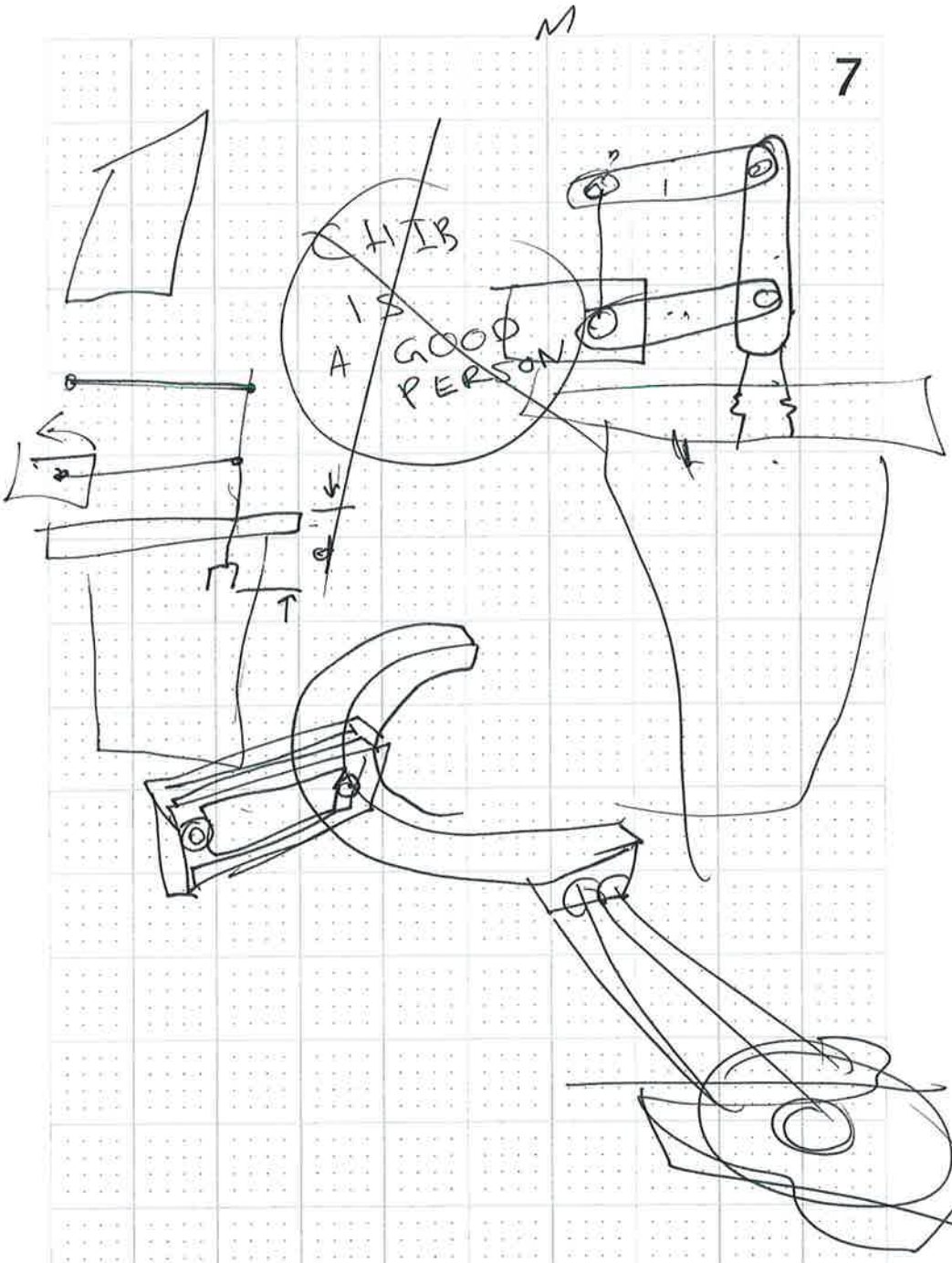


where D = Top diameter of Cup



6




HIB
IS
A
GOOD
PERSON
T

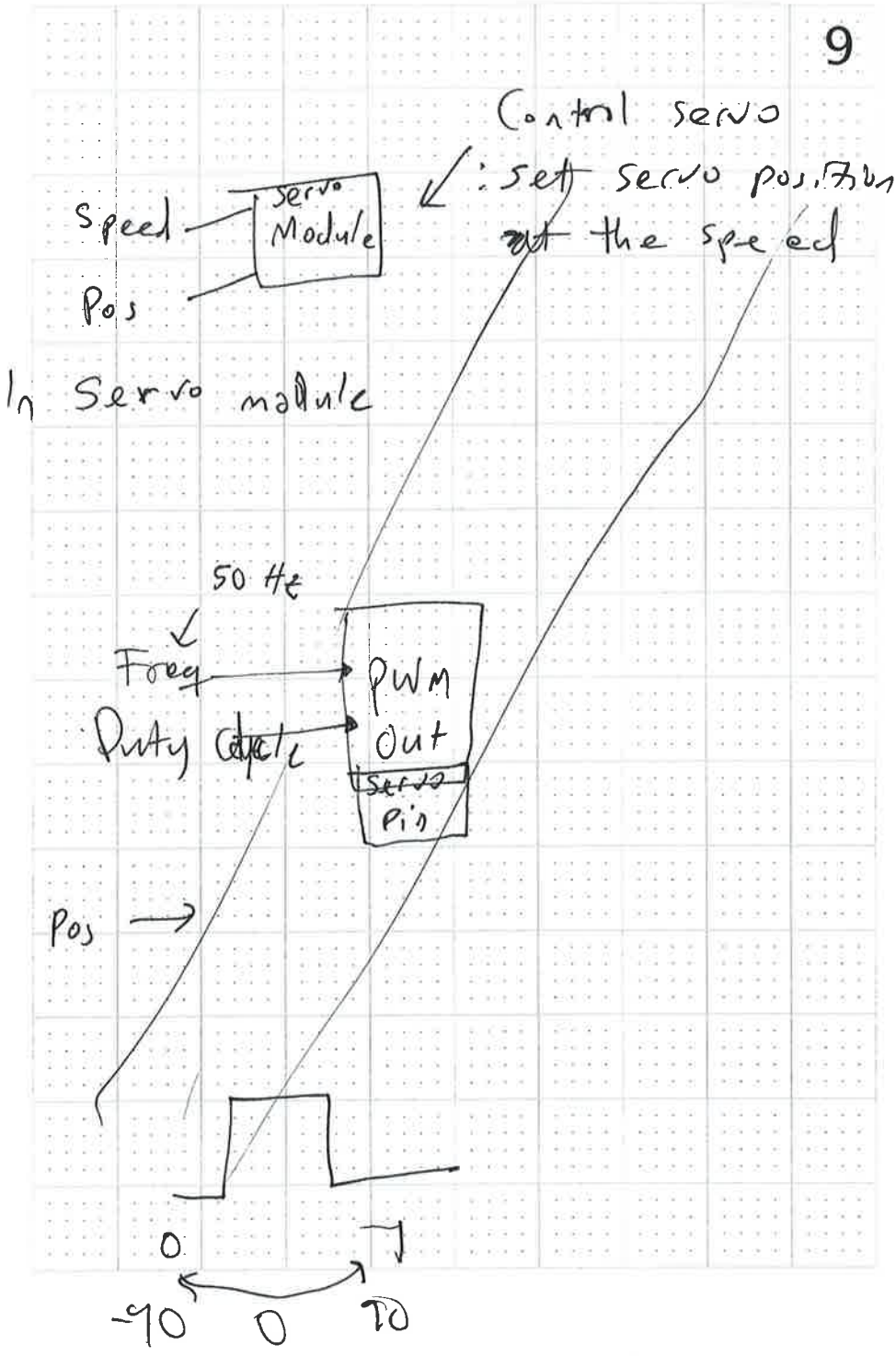
8 Code

Sequence
turn on Red led
BTN 1 :

Close grippers
Checks for water
IF water Green ~~Red~~
turn on Led
else
Turn on Red Led

BTN 2 :

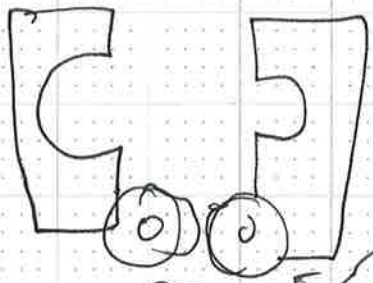
Twist : <1deg per ½ sec>
Reverse Twist
wait 3 sec
Open grippers
Turn on Red led


Control servo
: set servo position
at the speed
Speed
Servo Module
Pos
In Servo module
50 Hz
Freq
Duty cycle
PWM Out
Servo Pin
Pos
0
-90
0
90

10

We would need 3 servo modules

1) Jaws

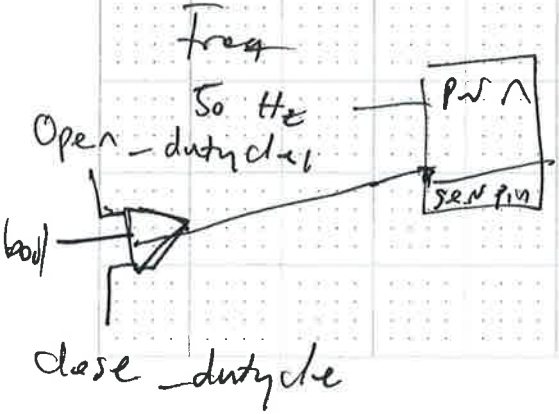


Positons → (2) Closed
Opened

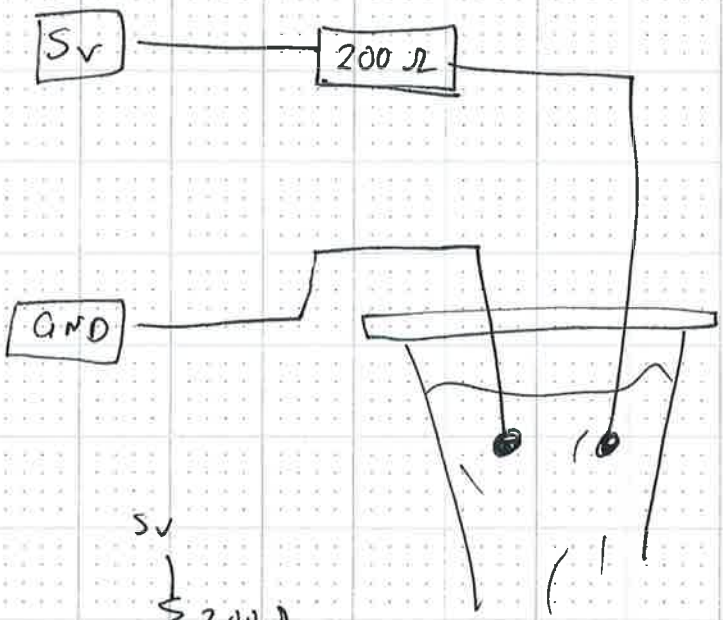
we would find out angle

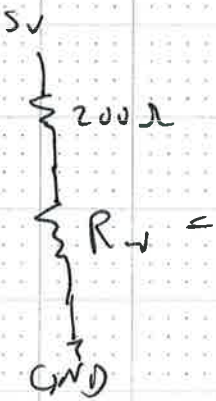
dutycycle_Close — 0
dutycycle_Open — 1

Using Jaws would deduced the number of actuators needed, because both jaws can be driven with one actuator



2) Water sensor





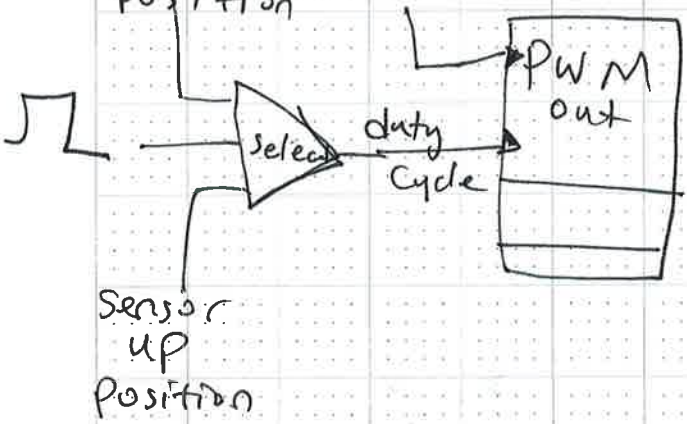
R_w = Resistance of Water

$$I = \frac{5v}{R_w + 200} =$$

I must $< 20_{mA}$

12 Labview bit of the water sensor

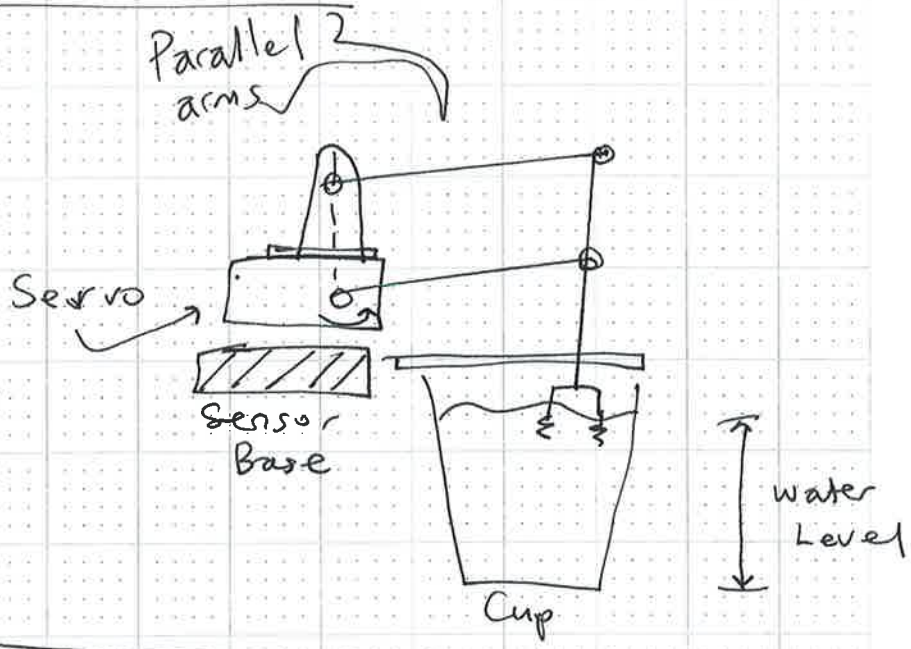
Freq
50 Hz



13 Nov 2018

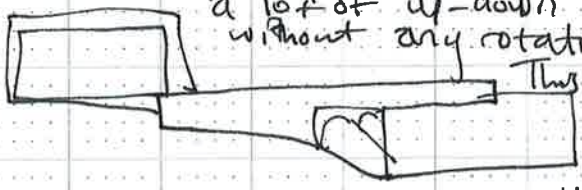
Water Level Sensor Lever Plan

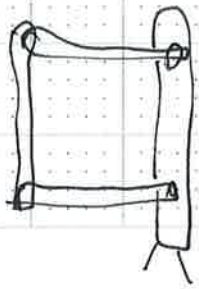
Stick Model

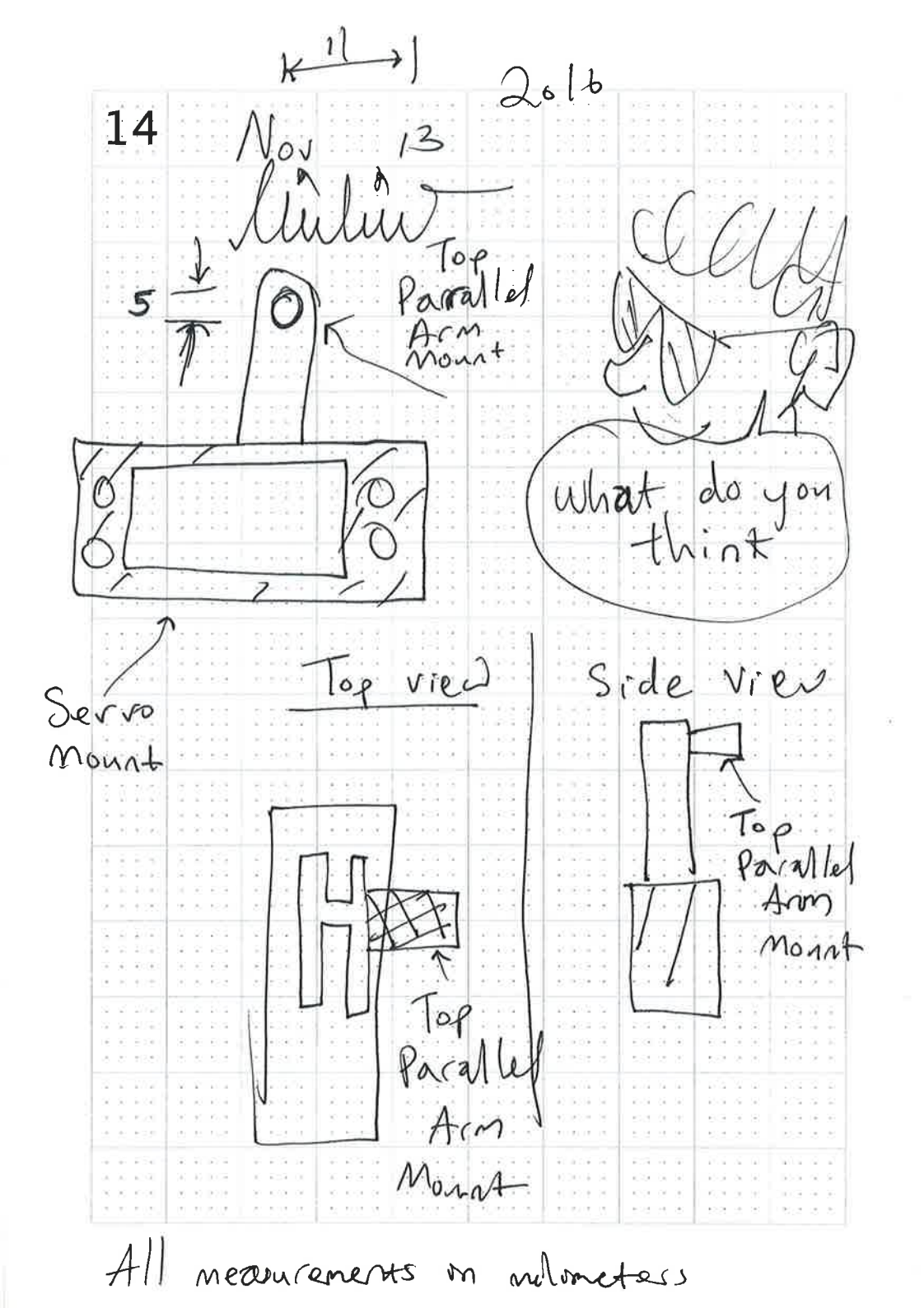


Reason

Parallel arms used to ensure sensor tip doesn't collide with the walls of the cup. Since paralled arms can achieve a lot of up-down deviation without any rotation. This deviation is crucial to avoid any collision with the cup walls.

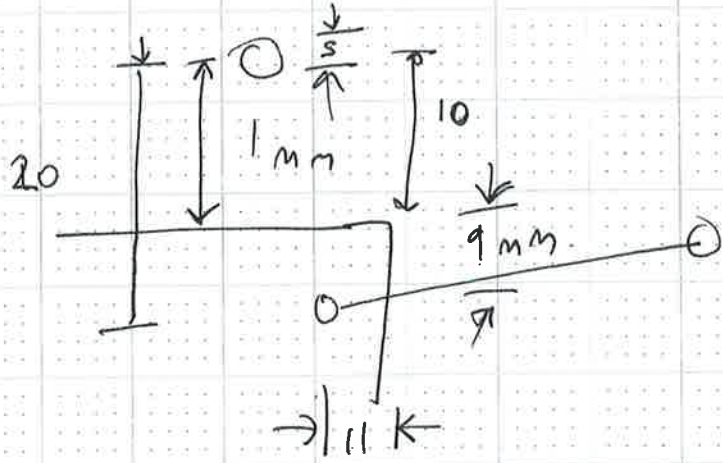






All measurements in milimeters

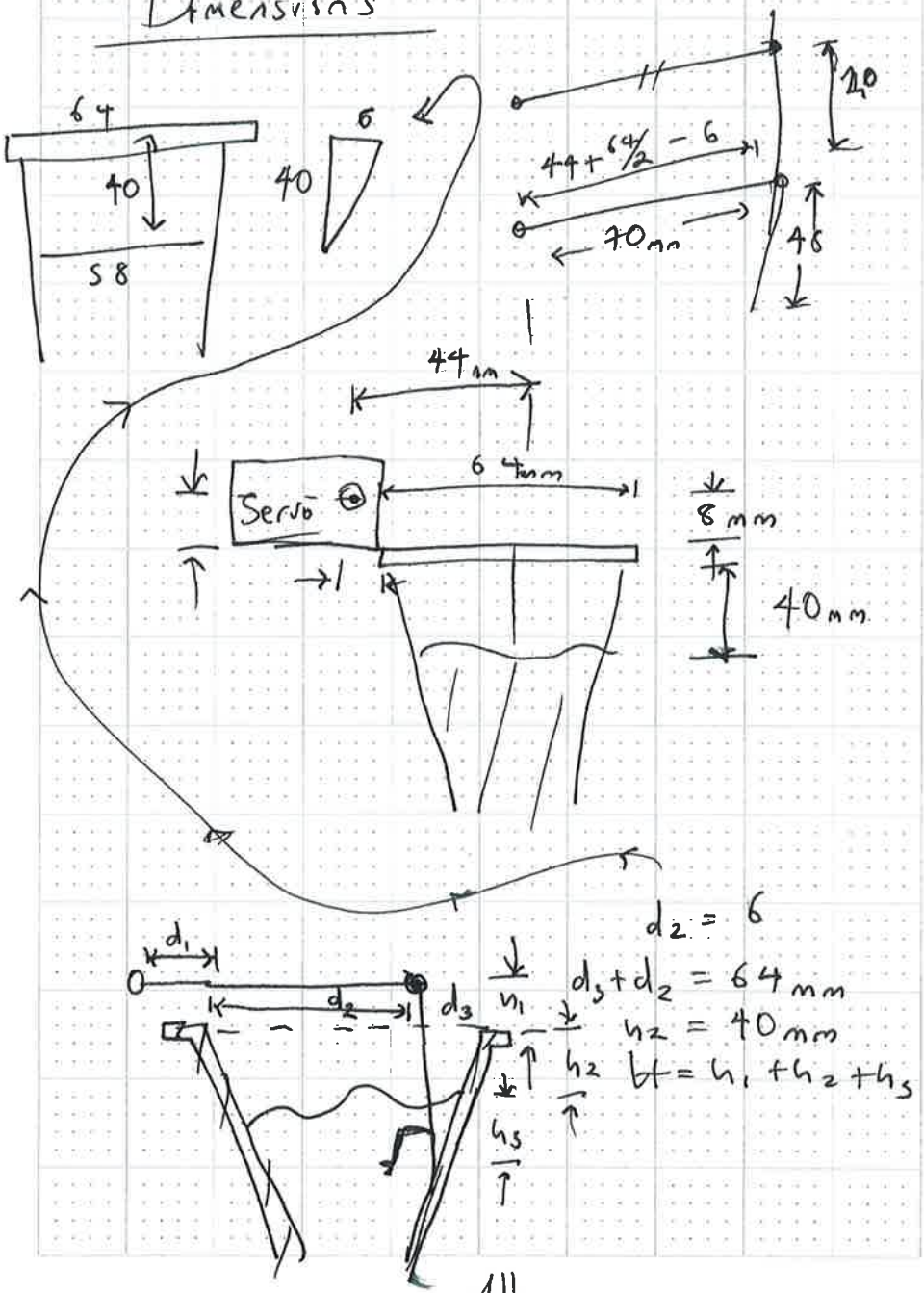
Nov 13 2016



All measurements in mm

13 Nov 2016

16 Dimensions



$d_2 = 6$

$d_3 + d_2 = 64\ mm$

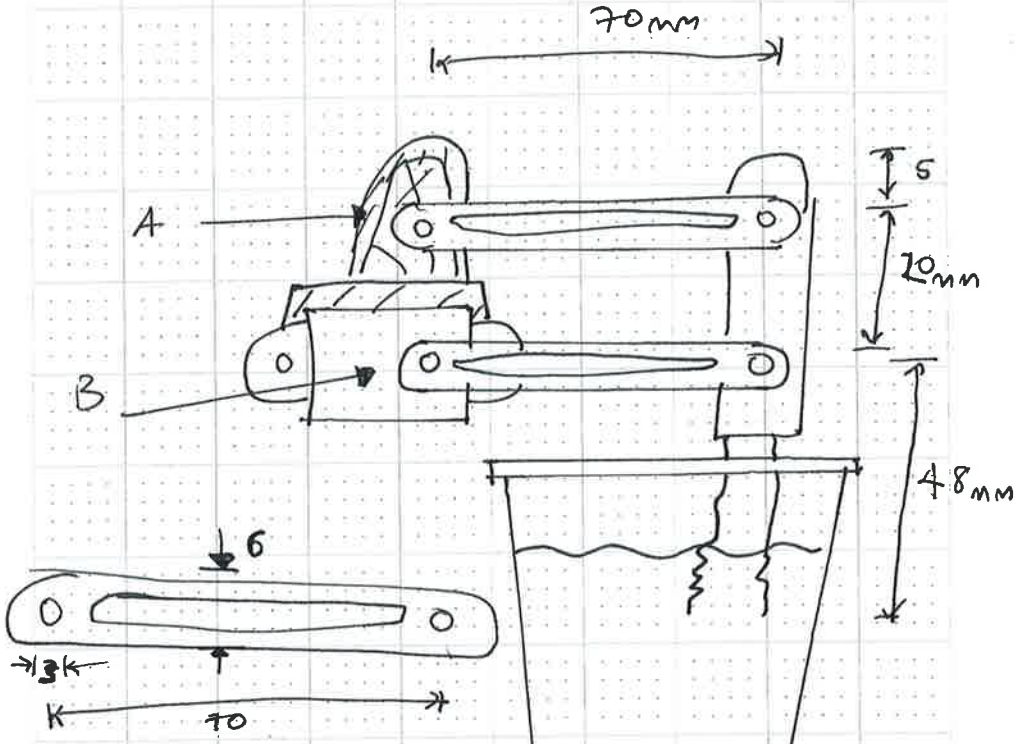
$h_2 = 40\ mm$

$bt = h_1 + h_2 + h_3$

All measurements in mm

13 Nov 2016

17



Using a parallel arm which ensure that the sensor is lifted up vertically.

This would prevent the senser from crashing into the cup, while providing enough clearance

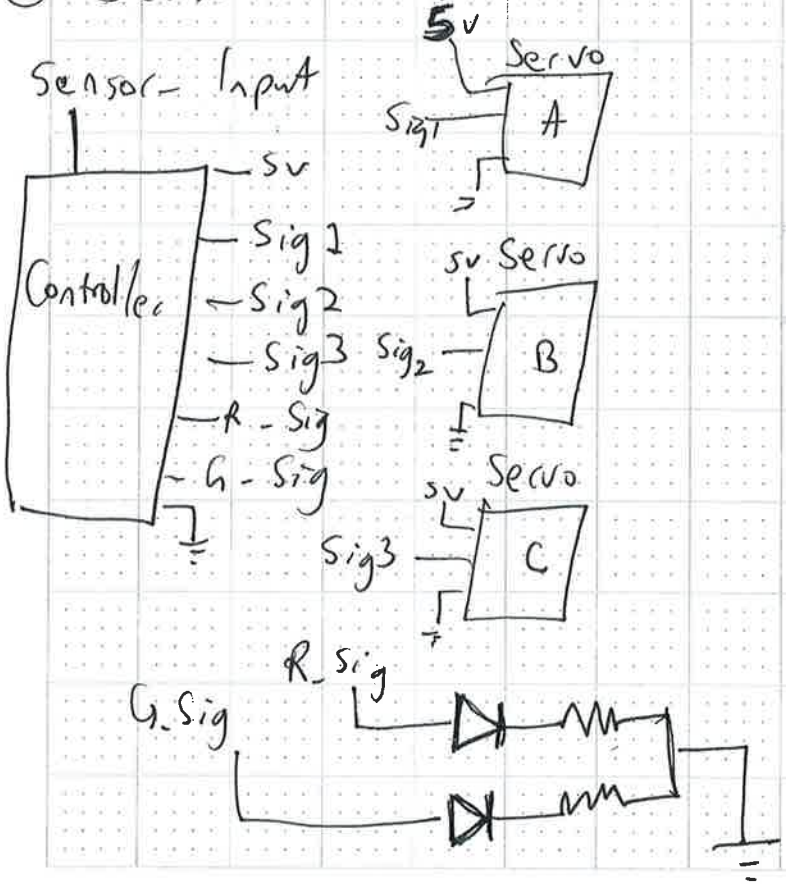
All measurements in millimeter

14 Nov

18 Electrical Circuit

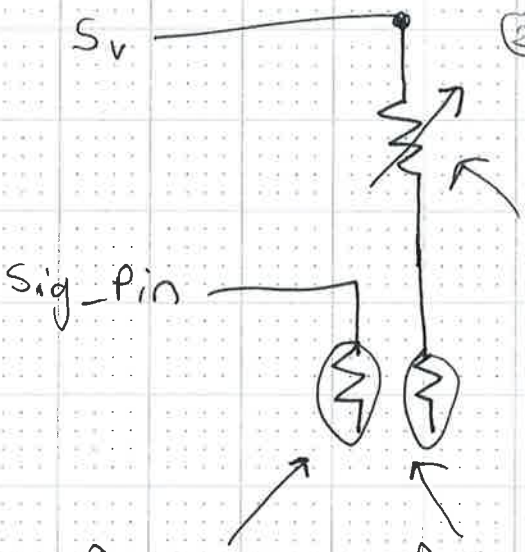
Peripherals

1. Wire
2. Led <Bi-Colour> x 1
3. Servo x 3



Sensing the water

Using a
① resistor limits the current on the sig-pin.
② The resistor stabilizes the sig-pin



$R_w \cong 2k\Omega$

$3v \leq V_{out} \leq 5v = V_{out}$

$\therefore$

$$3.3 = \frac{5v\,R_w}{R_1 + R_w} \rightarrow R_{min}$$

$$5v = \frac{5v\,R_w}{R_1 + R_w} \rightarrow R_{max}$$

No 14

20

Making R_1 The subject of the formula

$V_{out}(R_1 + R_w) = 5_v R_w$

~~$V_{out} R_1 + V_{out} R_w$~~

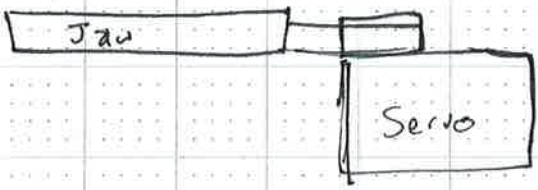
$V_{out} R_1 + V_{out} R_w = 5_v R_w$

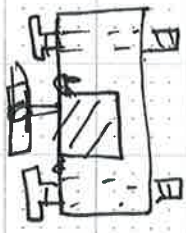
$V_{out} R_1 = 5_v R_w - V_{out} R_w$

$$R_1 = \frac{R_w (5 - V_{out})}{V_{out}}$$

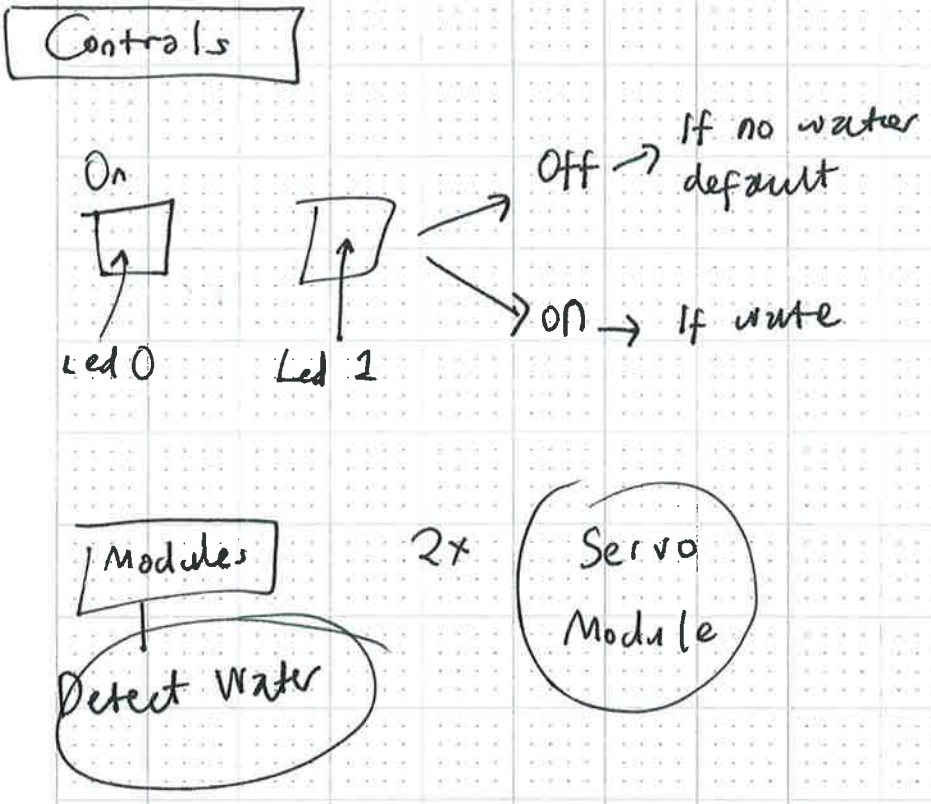
But The current through must be less than 20mA

$$\therefore \frac{V_{out}}{R_{Total}} \leq 20 \times 10^{-3} A$$

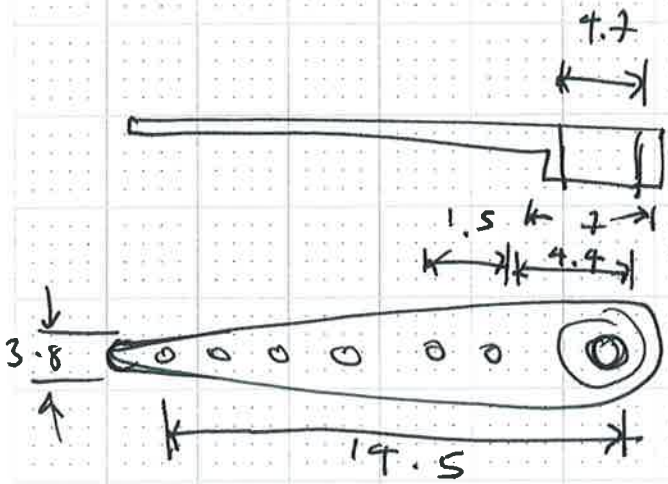

Jaw
Servo

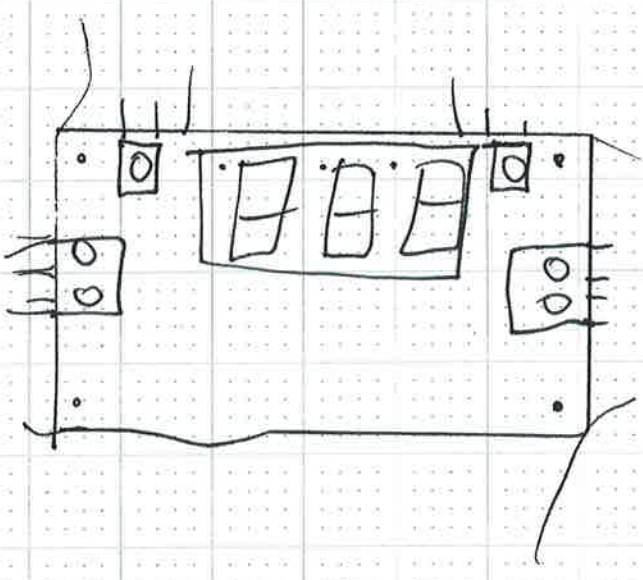


22 LabVIEW myRIO Program



Little servo demension





21 December 2016

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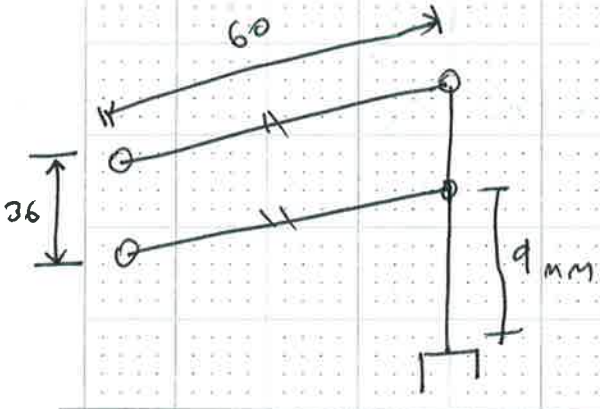
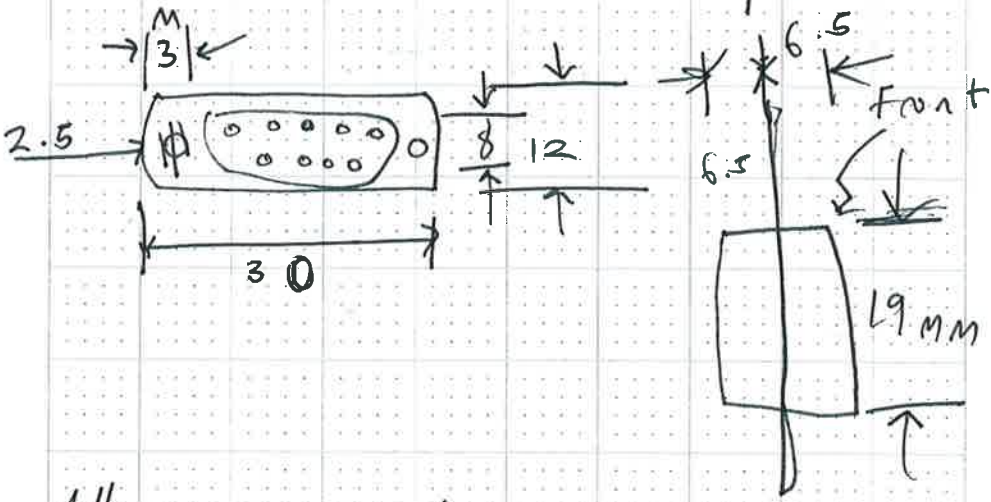
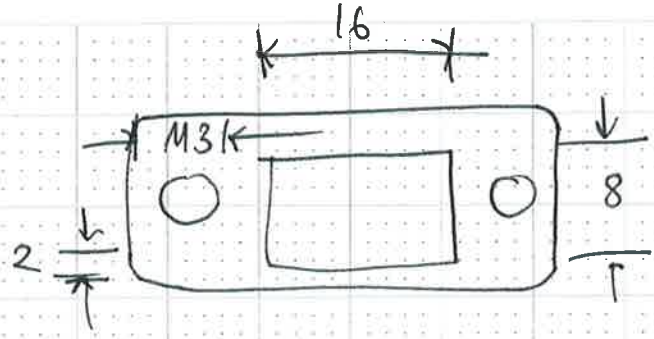
New parrallel arm design for the water sensor



External Connector D-type



All measurements in mm.



External Connector.

Control Circuitry

7-15V → Vin
GND → Gnd
ServoControl_1 → S_1
ServoControl_2 → S_2
ServoControl_3 → S_3
Sensor_Water_ → W_S
Led → L

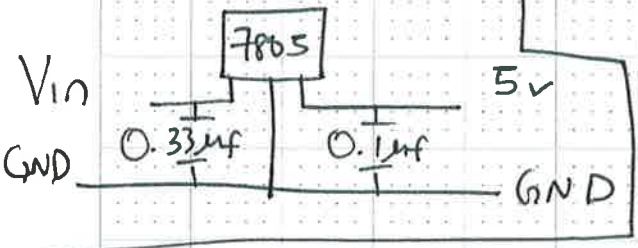
P.T.O

All measurement in mm

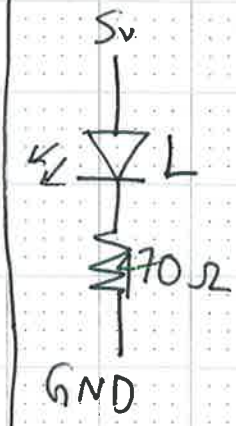
17:40 21 December 2014

26

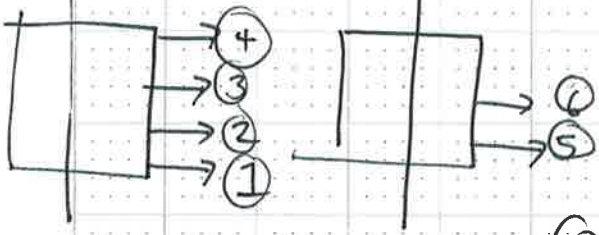
Power regulation

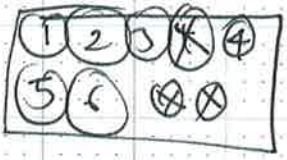


Indicator



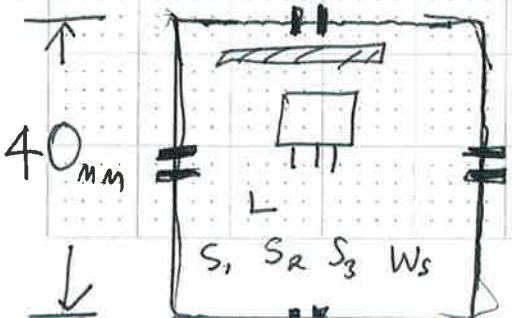
D Connector





① S_1
② S_2
③ S_3
④ W_s
⑥ GND
⑤ V_{out}

Board Size

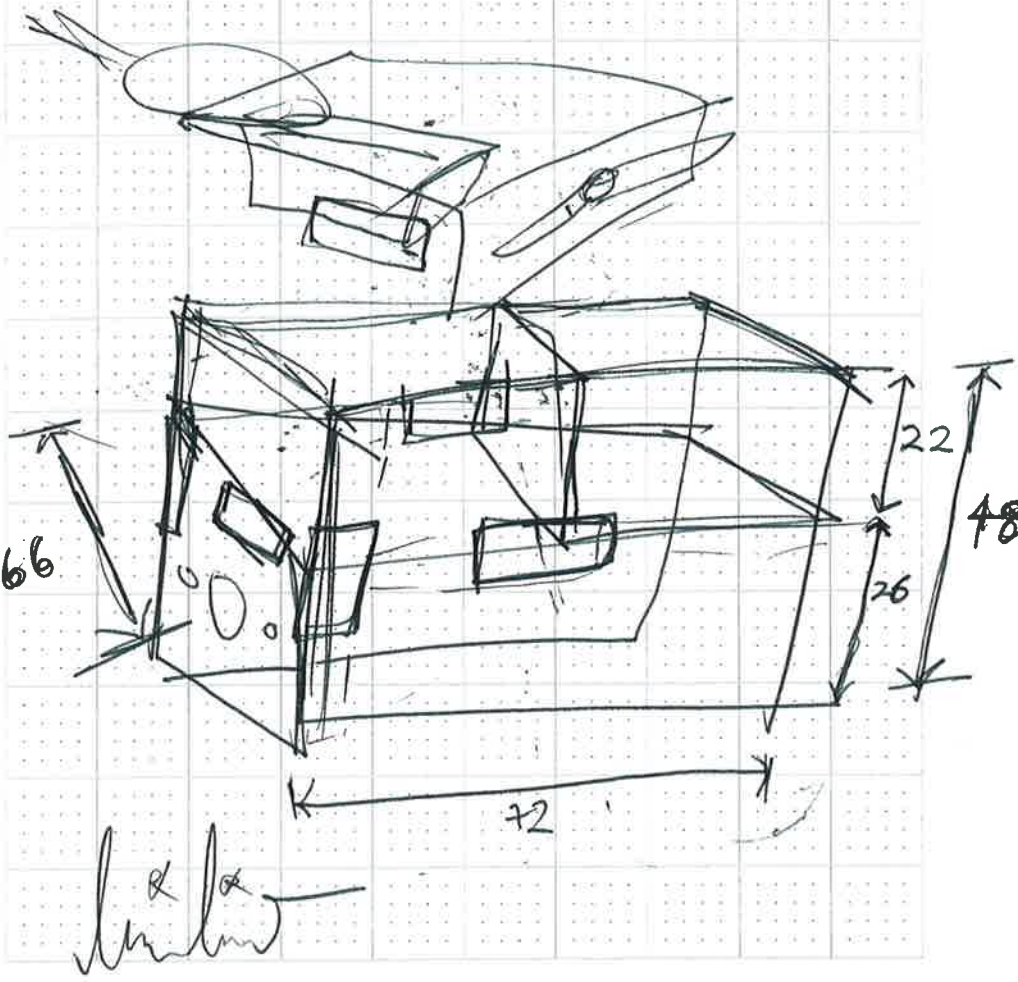


Drawn to Scale

22 December 2016

New Hand Design

All measurements in mm



22/12/16

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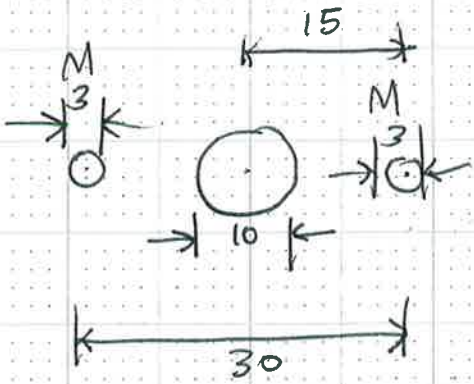
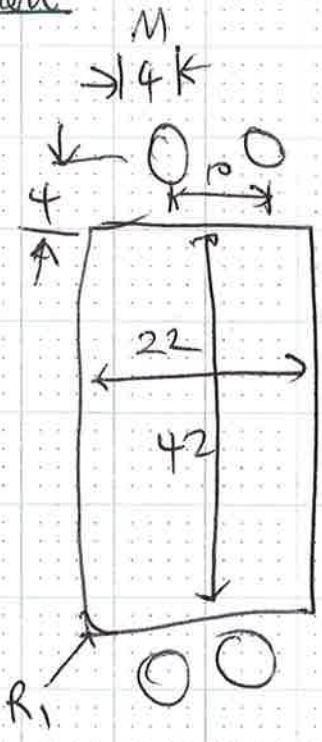
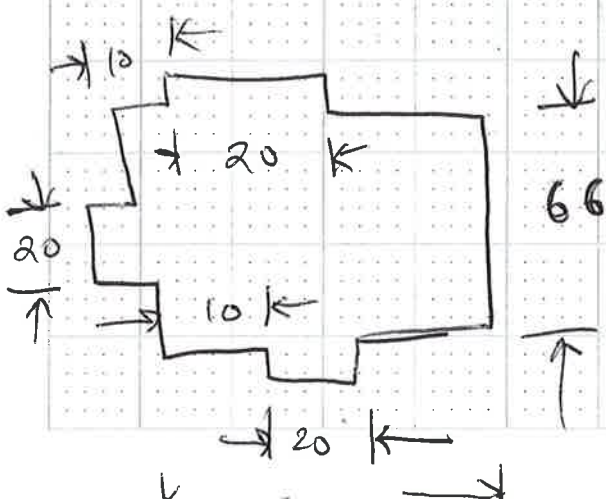
Body Roll Control Attachment





All measurements in mm

Top plate



LabVIEW Code Review

27 Jan 2017

Structure of Code

1. Initialization
2. Main loop
3. My RIO Reset

Initialization

1a) Define all variables, and

1b) initialize all modules/sensors/light controls

2 Main loop

2a Detect Sensor button

2b Detect Gripper button

2c Detect Pour button

if any button detected

2d actuate servo to the demanded position

2e

Strobe lights

Detect Water

2f

Reset myRio

3a Close / End all Pins / Servos / modules

3b Reset myRio

Labview Front Panel

Water Detected!

→ Shows Red when water not in Cup

→ Show Green when water in Cup

Information!

→ Shows Current State of the program

→ ~~Count~~

Counter:

Shows what led is on

Stop:

Stops the program

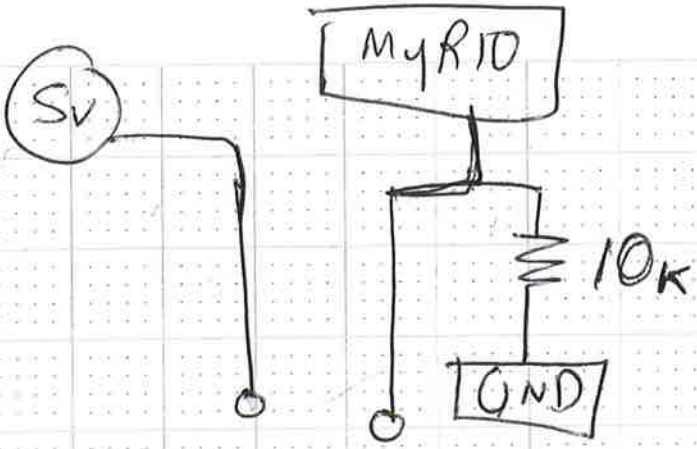
Gripper:

34 1/02/17

Report Plan

* Format

- Description of tasks
  - → little survey of solutions available
  - → brief description of our approach
  - → brief explanation of features and concepts
  - → brief program over_view
  - → links to video and code repository

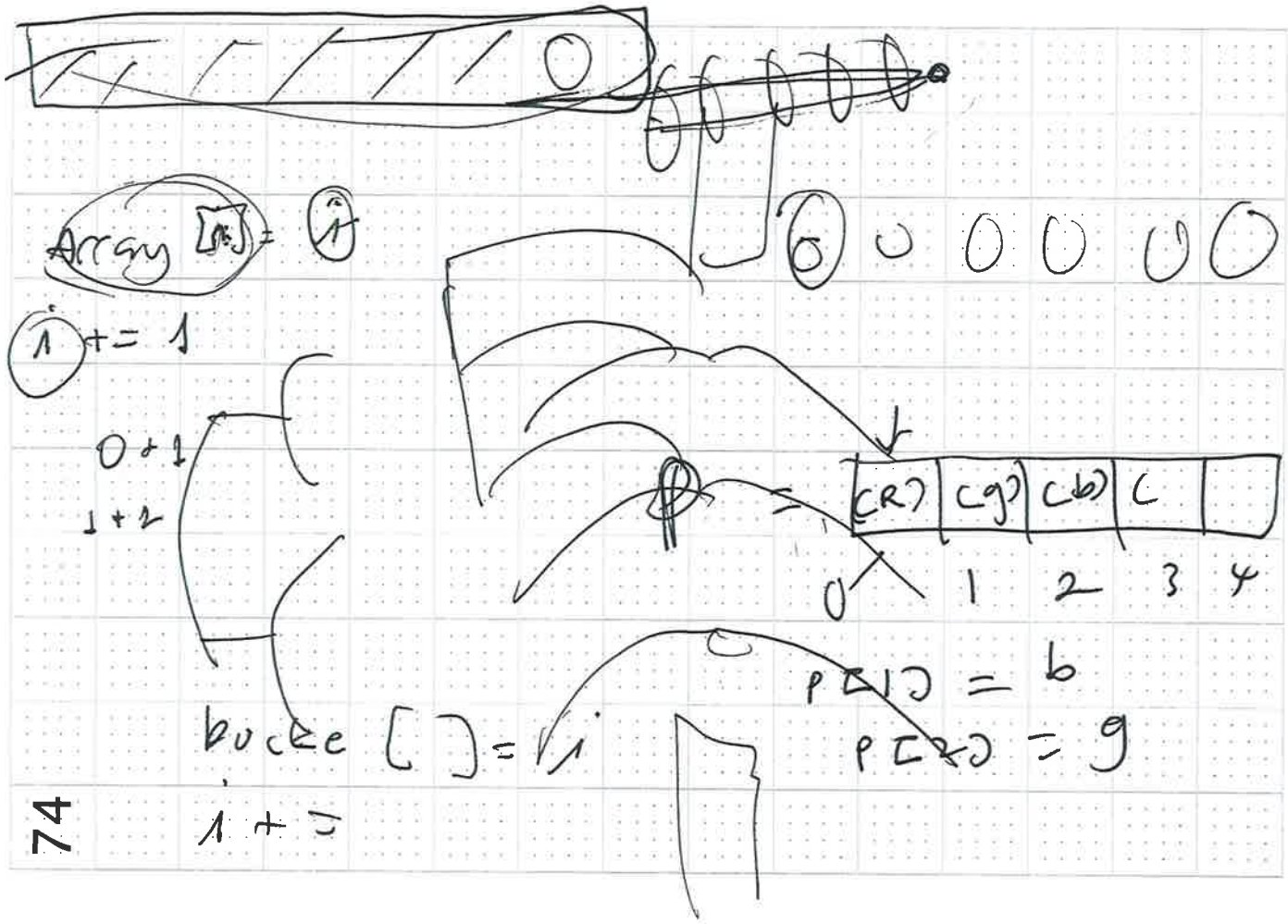


5V

10K

GND

$I = \frac{5}{1000}$


Array [i] = i
i += 1
0 + 1
1 + 2
bucke [ ] = i
i +=
R
g
b
0
1
2
3
4
p[1] = b
p[2] = g

RESISTOR COLOUR CODE

0	1	2	3	4	5	6	7	8	9
black	brown	red	orange	yellow	green	blue	purple	grey	white

1st Band	2nd Band	3rd Band - multiplier						
Digit 1	Digit 2	gold	black	brown	red	orange	yellow	green
brown	black	1R0	10R	100R	1K0	10K	100K	1M0
brown	red	1R2	12R	120R	1K2	12K	120K	1M2
brown	green	1R5	15R	150R	1K5	15K	150K	1M5
red	red	2R2	22R	220R	2K2	22K	220K	2M2
red	purple	2R7	27R	270R	2K7	27K	270K	2M7
orange	orange	3R3	33R	330R	3K3	33K	330K	3M3
orange	white	3R9	39R	390R	3K9	39K	390K	3M9
yellow	purple	4R7	47R	470R	4K7	47K	470K	4M7
green	blue	5R6	56R	560R	5K6	56K	560K	5M6
blue	grey	6R8	68R	680R	6K8	68K	680K	6M8
grey	red	8R2	82R	820R	8K2	82K	820K	8M2

4TH Band - Tolerance			
+/- 1%	+/- 2%	+/- 5%	+/- 10%
brown	red	gold	silver

Keeping a Logbook

- Use this logbook to record *everything* you do on a project:
    - Annotated sketches & doodles
    - Customer needs & requirements
    - Class notes
    - Project objectives
    - Meeting notes
    - Action Items
    - Half-baked Ideas
    - Maths calculations
    - Block diagrams
    - System diagrams
    - Sketched circuit schematics
    - Stripboard layouts (the dots are printed at the right spacing)
    - Code snippets
    - Design alternatives
    - Research findings
    - Sources of ideas (including URLs of websites)
    - Results of experiments
    - Evaluation of data/results
    - Design reviews
    - Decision criteria
    - Design process
    - Rationale for decisions
    - Project reflections
    - Physically cut-and-pasted photos, scans etc.

- Write in the logbook as you go - do not write things elsewhere with the intention of writing it up in the logbook later.
- No loose bits of paper – they'll fall out and you'll lose them.
- Record the date on each page. Start each day on a new page.
- Use ink, not pencil. Do not erase. Delete an entry by neatly crossing it out.
- Do not remove pages.
- Do not leave pages blank, expecting to fill them later. If you realize you have left something out, just write it on the next available page.
- Use the page numbers in the top corner as references. E.g. "the load on the motor was calculated using equation 5 on page 57"
- Do not paste too many bits of paper into your logbook – it'll get unmanageably thick.
- Do not paste large sheets or multiple printed pages in your logbook. Save the information in a file, give it a sensible name and store it in a sensible location. Refer to the name and location in your logbook. E.g. "datasheet for this part is stored in /myDocuments/finalproject/datasheet/555.pdf"