BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATION ENGINEERING

**Design and development of an innovative
drawing robot for @Bristol science museum**

Escuela Técnica Superior de Ingeniería del Diseño

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

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Tutor : Dr. D. Victor Santiago Praderas

Cotutor: D. Matthew Venn

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1. Introduction

- Matt Venn Engineering

- At-Bristol

- Rs components

1. Introduction

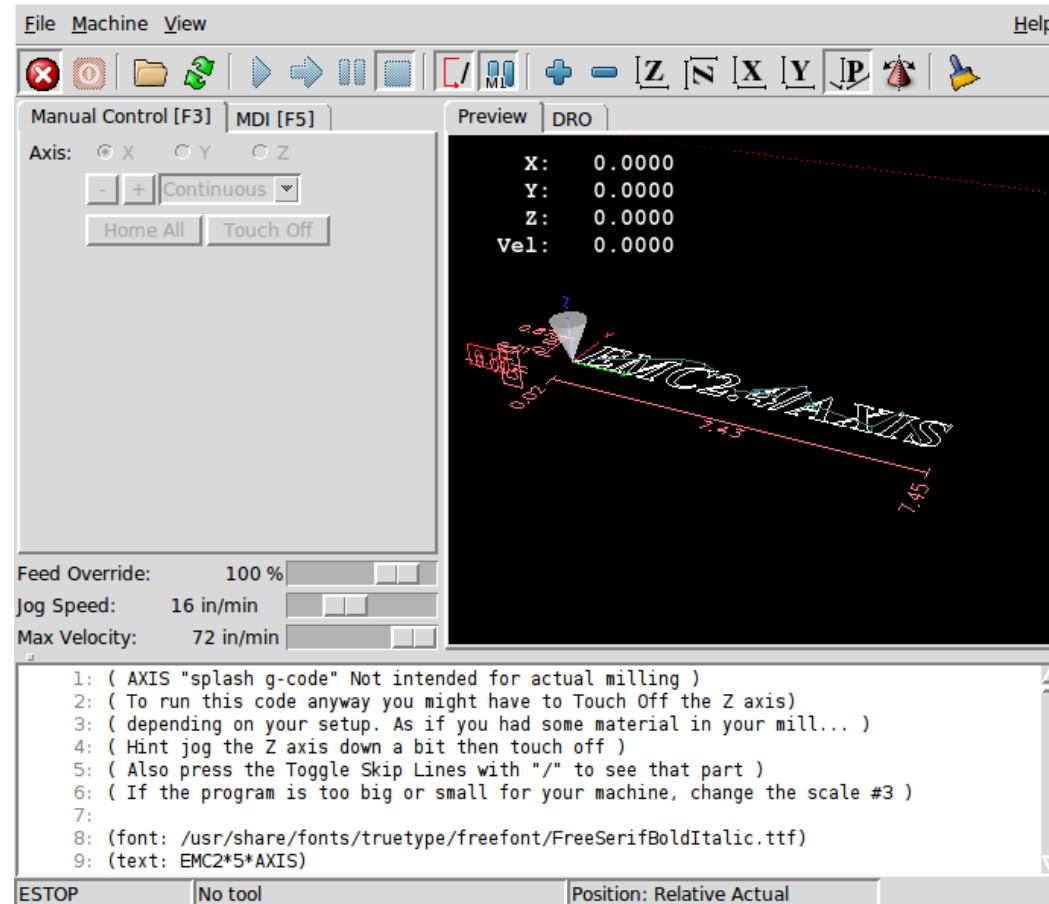- RS video

2.Objetives

- Reliable

- Eye-caching

- Autonomous

- Upgradable

- Open source

3.Development

- Software
  - Machinekit
    - Python interface
    - Xbee
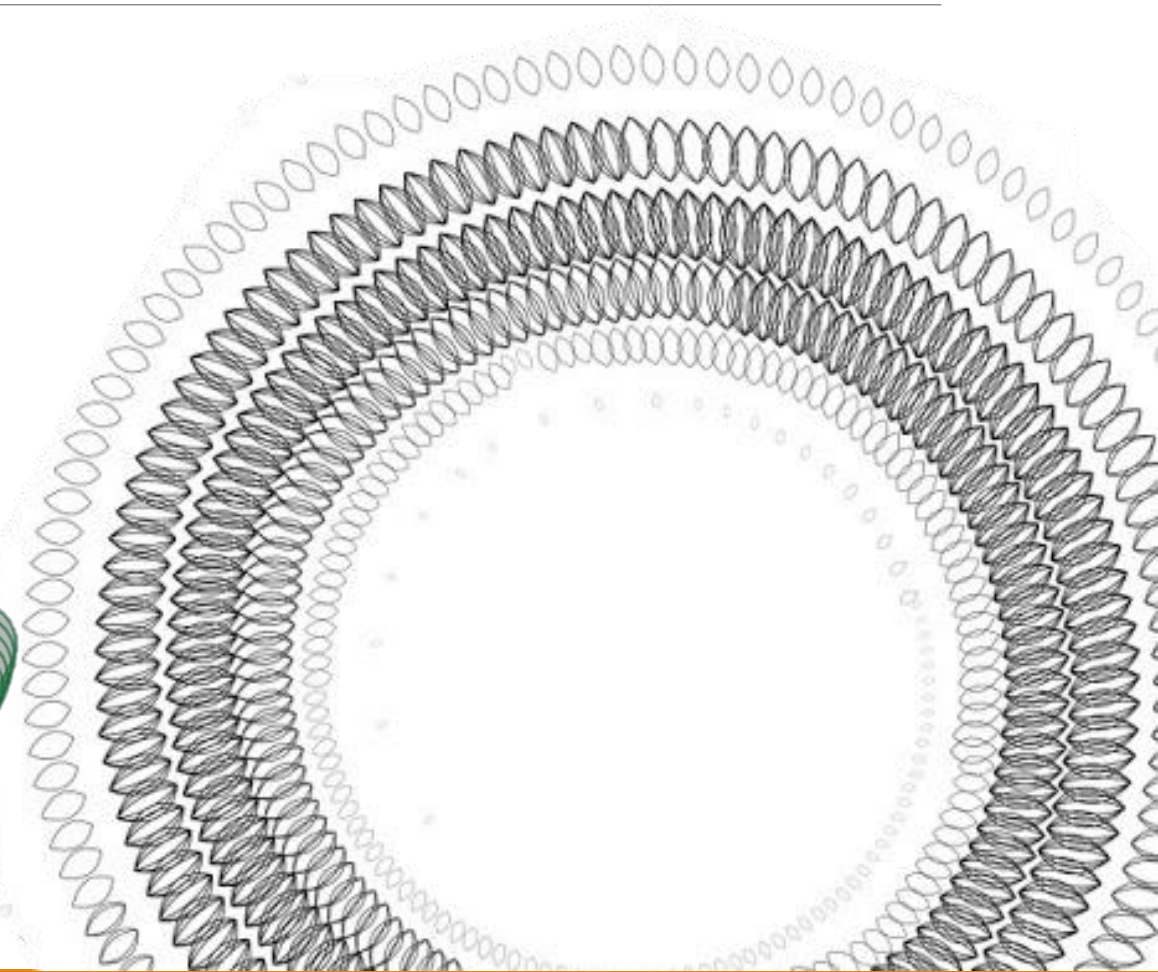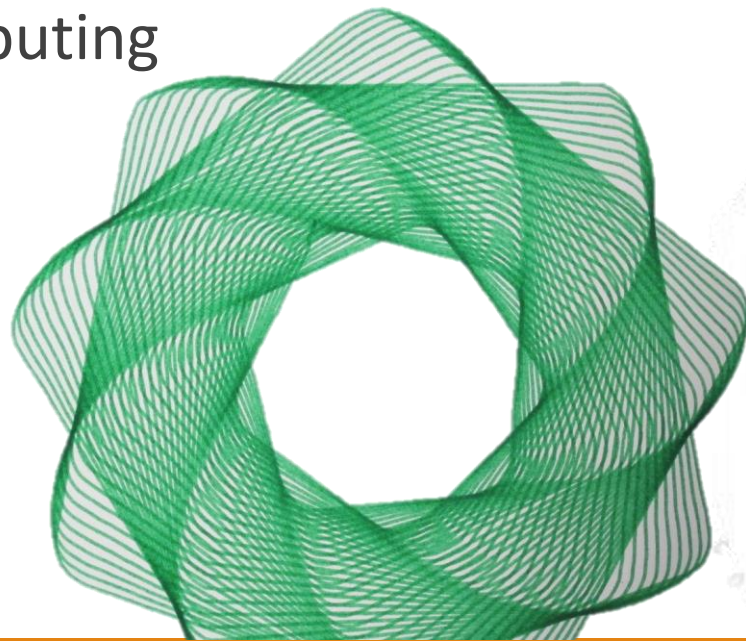 - Arduino

3.Development

- Software
  - Remote monitoring

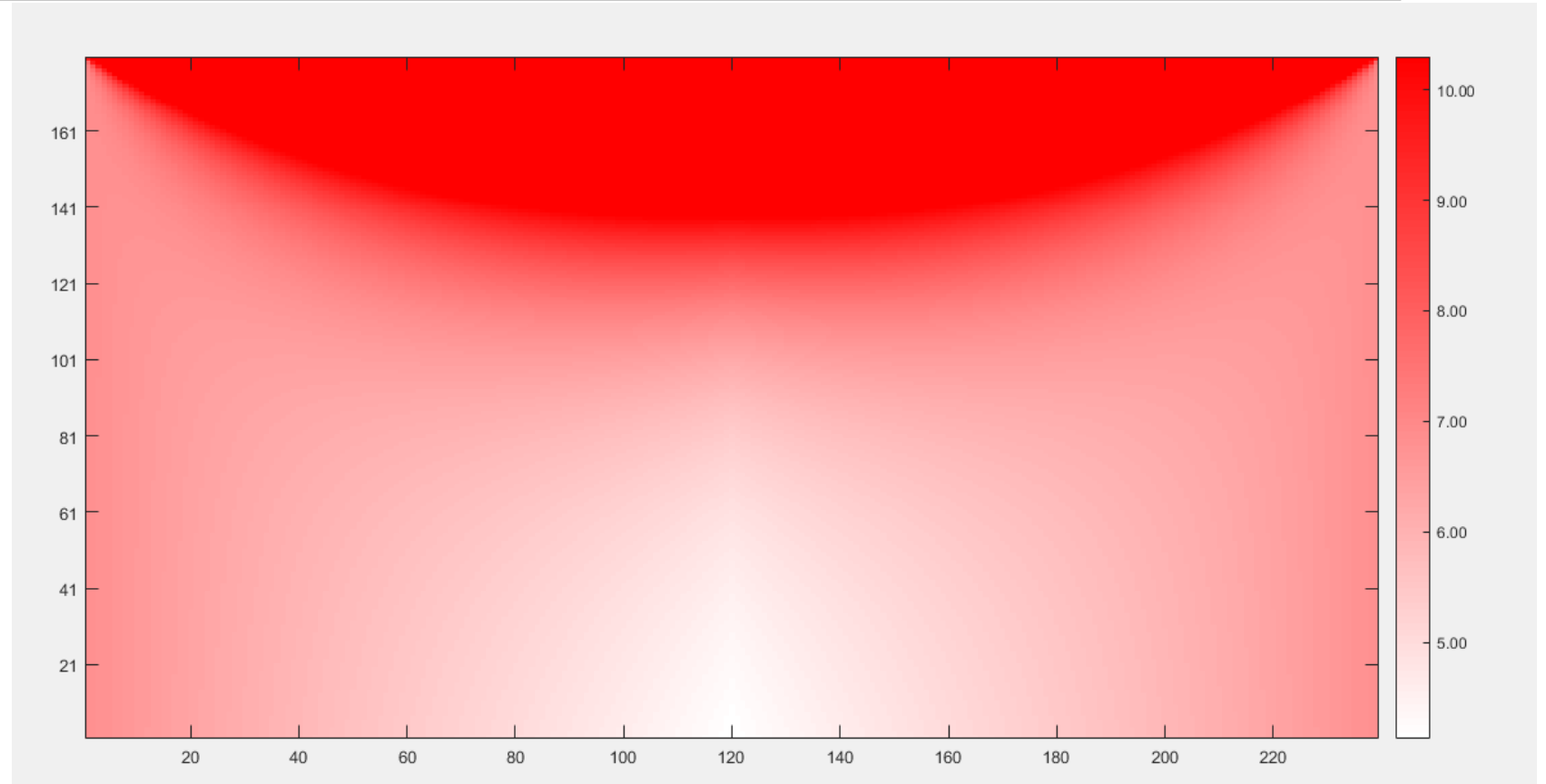# 3.Development

- Software
  - Pattern generation
    - Matlab
    - Cloud computing
    - SolidWorks

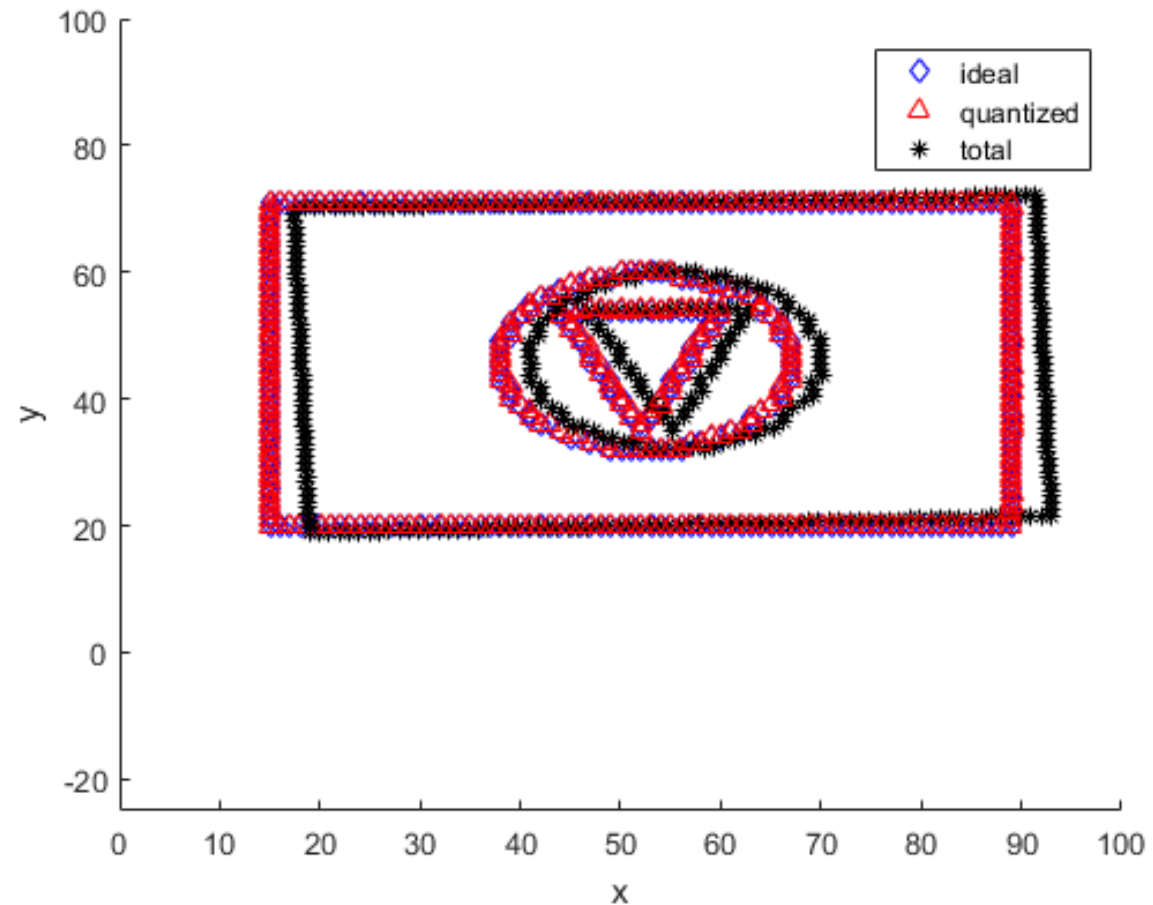# 3.Development

- Simulation
  - Matlab
    - <u>Tension</u>
    - Errors

3.Development

- Simulation
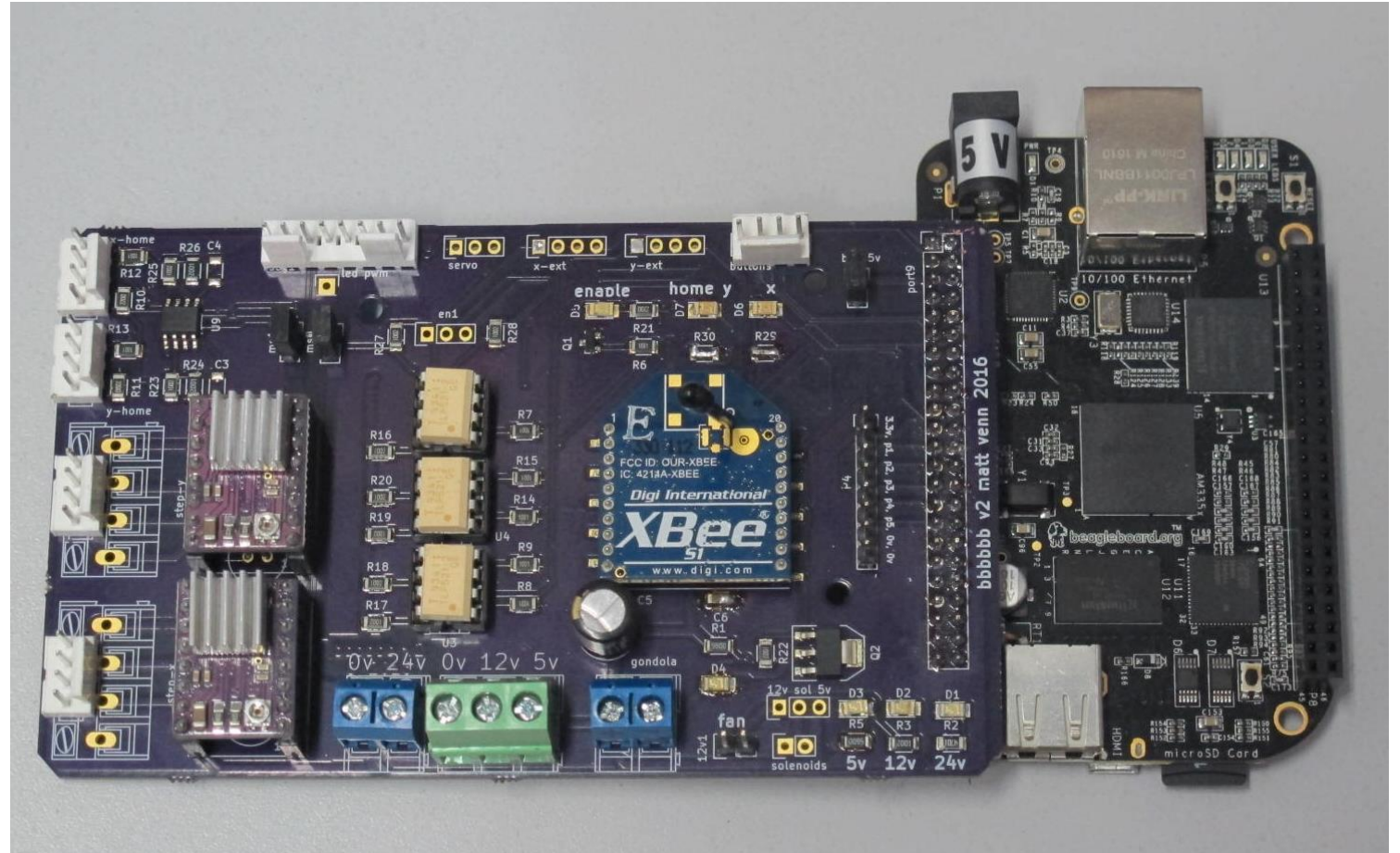 - Matlab
    - Tension
    - Errors

3.Development

- Simulation
  - Excel

Configuration	Dual 240 x 180								
Gondola Weight (g)	500			1000			1500		
Working area (%)	0.90	0.75	0.5%	0.90	0.75	0.5	0.90	0.75	0.5
Maximum tension (N)	36,86	13,60	7,01	73,71	27,20	14,02	110,58	40,80	21,03
Mimimum tension (N)	0,37	1,02	2,04	0,75	2,04	4,08	1,11	3,06	6,12
Average tension (N)	5,14	4,48	4,19	10,29	8,96	8,38	15,42	13,44	12,57
Minimum Holding Torque (Ncm)	64,51	23,80	12,27	128,99	47,60	24,54	193,52	71,40	36,80
Holding torque with microstepping (Nc	168,55	62,19	32,06	337,06	124,38	64,11	505,66	186,57	96,17
Minimum Holding Torque (Ncm) WITH	93,64	34,55	17,81	187,26	69,10	35,62	280,92	103,65	53,43

[maximum, minimum, average] = valuesarea(xmax, ymax,w,p)

Configuration	Quad with wstab of 200g 240x180								
Gondola Weight (g)	500			1000			1500		
Working area (%)	0.90	0.75	0.5	0.90	0.75	0.5	0.90	0.75	0.5
Maximum tension (N)	51,60	19,04	9,82	88,46	32,64	16,84	125,31	46,24	23,85
Mimimum tension (N)	0,52	0,98	0,98	0,90	0,98	0,98	0,98	0,98	0,98
Average tension (N)	4,09	3,63	3,43	6,66	5,87	5,52	9,23	8,11	7,62
Minimum tension motor strings (N)	0,52	1,43	2,86	0,90	2,45	4,90	1,27	3,47	6,95
Average tension motor strings (N)	7,20	6,27	5,87	12,34	10,76	10,06	17,49	15,24	14,26
Minimum Holding Torque (Ncm)	90,30	33,32	17,19	154,81	57,12	29,47	219,29	80,92	41,74

[maximum, minimum, average,minmot,avgmot] = quadvaluesarea(xmax, ymax,w,wstab,p)
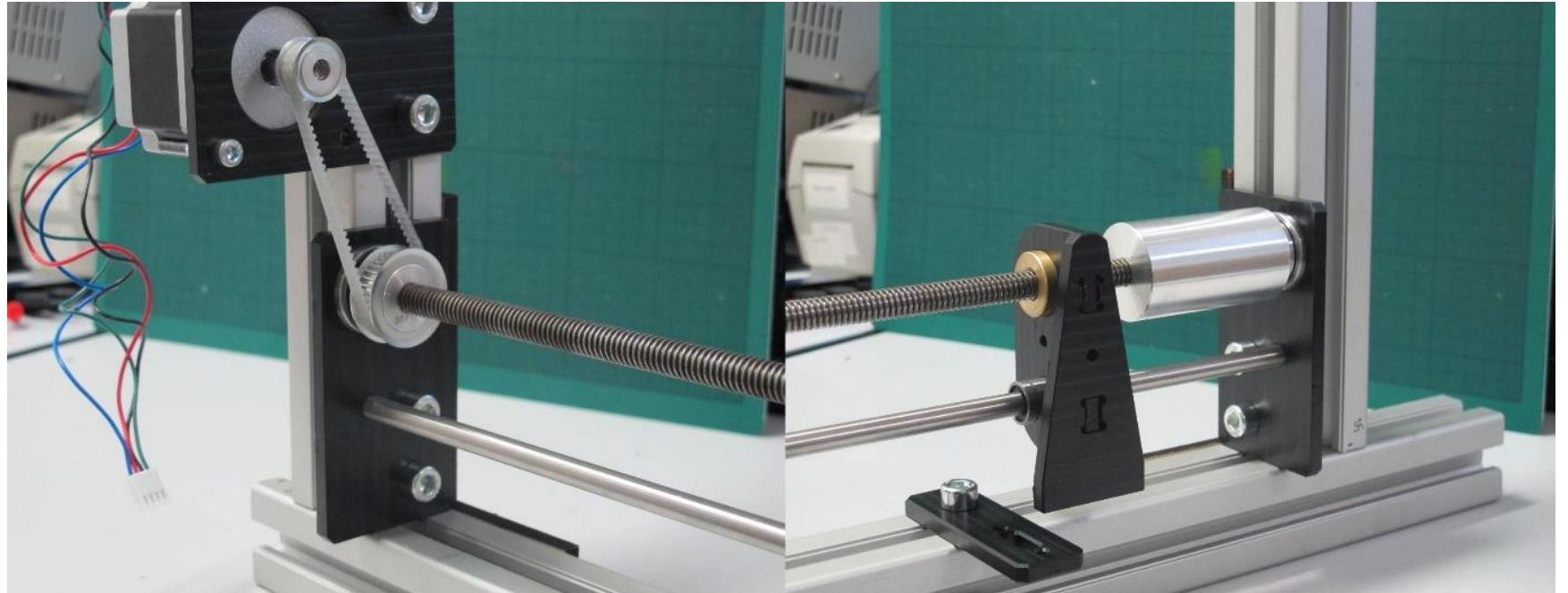
3.Development

- Hardware
  - BeagleBoneBlack
    - Break out board
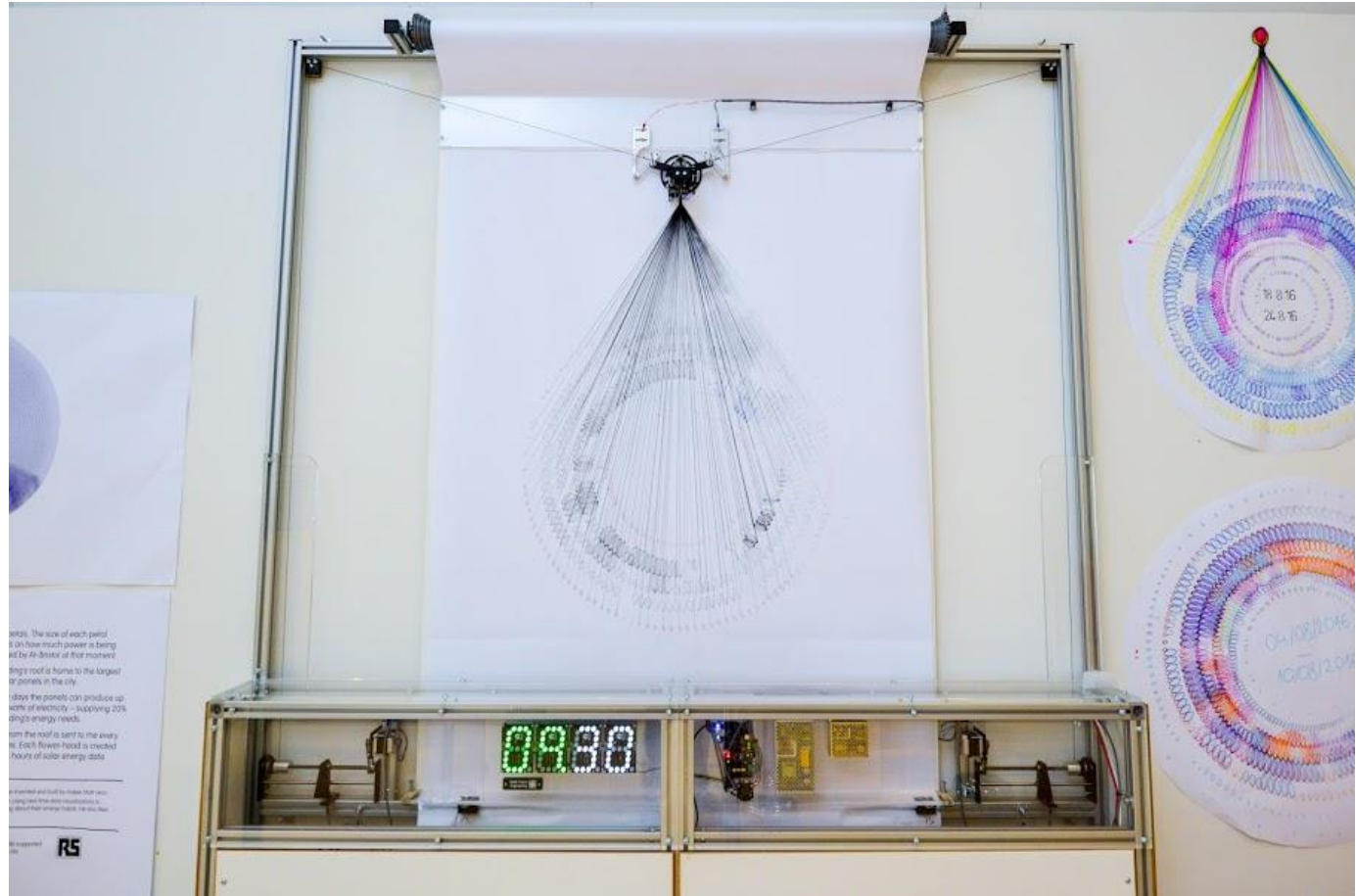
3.Development

- Hardware
  - Stepper motors

3.Development

- Hardware
  - Custom design
    - Frame
    - Gondola
    - Paper holder
    - Calibration tool
    - Charging station
    - LED displays
    - Others…

4.Conclusions

- Integration
- Innovative
- Objectives & deadlines
- Future work

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