Calibration of 3d load cells

0. Search for / create calibrated weights. I used water bottles with a weight of 0.5 kg and 1.5 kg.

- -

1. At the top of the file set the right parameters:

```
#define I_LOADCELL      5
#define I_AXIS          2
```

Whereby I_LOADCELL is the load cell number and I_AXIS can have the value 0, 1, 2 for the x, y and z axis respectively.

- -

2. Add this block to the if statement in setup():

```
 else if (I_LOADCELL == %number%){
   cal_gain[0]   = 15030;
   cal_gain[1]   = 15150;
   cal_gain[2]   = 13625;
   cal_offset[0] = -0.30231389;
   cal_offset[1] = 0.07867452;
   cal_offset[2] = 0.287924;
 }
```

- -

3. First the offset will be determined:

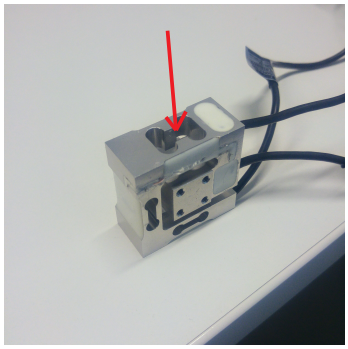
The offset can be determined in three directions:

Neutral	Direction of measured axis is perpendicular to gravity
+	Gravity exerts positive force on the measured axis.
-	Gravity exerts negative force on the measured axis.

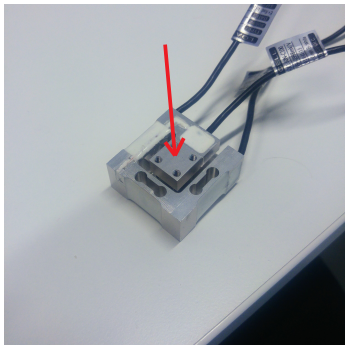
First z-axis offset in neutral and positive orientation (zn, z+) are measured:

a. Set the correct settings (adjust lines of step 1) and push the code.

b. Position load cell in the following manner (red arrow = direction of gravity):

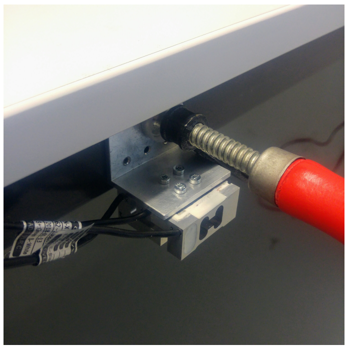


z neutral

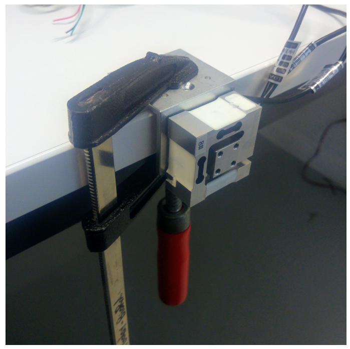


z +

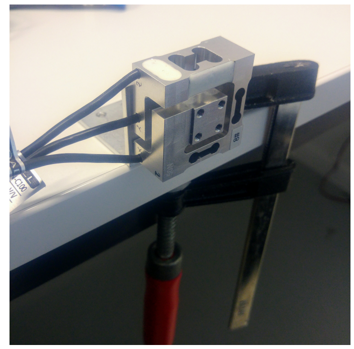
c. Type in the Serial Monitor ‘r’ (reset offset) and enter. Repeat this a few times until you have a good approximation of the offset.
d. If necessary: type ‘p’(pause) to see the offset value.
e. Copy the value of the offset to the spreadsheet
g. Repeat from step 3 a in all of these orientations:



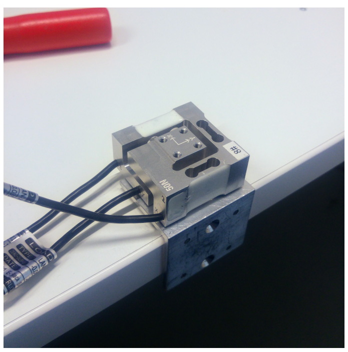
z-



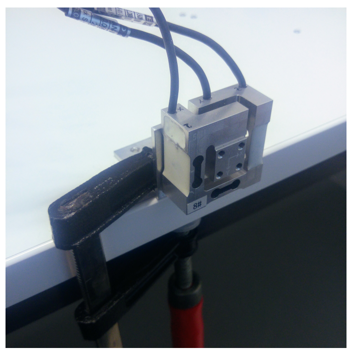
x+



x-



xn, yn



y-

y+

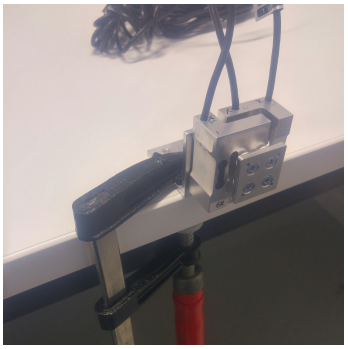
- -

4. Compare the neutral offset with the mean offset (mean over negative and positive direction). It should be in the same range. Pick one of them (neutral/mean) and substitute them in the cal_offset array of step 2. The offset part is now finished, let’s continue with determining the gain.

- -

5. To adjust the gain value ‘+’ and ‘-’ can be entered as commands in the Serial Monitor. The gain will then increase or decrease by steps of 10. The procedure for determining the gain is:

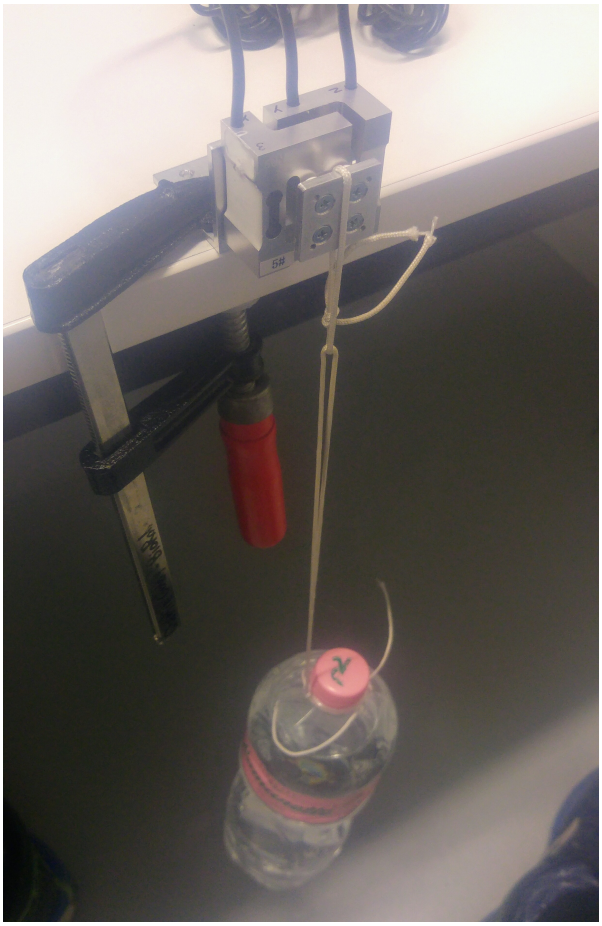
a. Mount the plate with spacers as depicted here:



b. Make sure the code is pushed with the right settings (step 2)
c. Determine target value. The mounted plate already exerts some weight on the load cell, so a zero value is not to be expected. Take this little weight into consideration when calibrating.

For example:	weight neutral direction without plate	:	0	kg
	weight positive direction with plate	:	0.02	kg
	target value with 1.5 kg weight	:	1.52	kg

d. Attach the weight:



e. Adjust the gain using '+' and '-' to reach the target value.
f. Use 'p' to obtain the gain value.
g. Repeat from step 5 b for any of the positive and negative directions (see 3 f)

Note: z in positive direction is harder to do since you have to compress the load cell. I only measured this direction with a weight of 0.5 kg. The 1.5 kg bottle couldn't be placed stable on the surface.

- -

6. Compare the gains and determine the gain that you will use. Fill in the values of cal_gain in the if statement (step 2).

Note: I noticed that sometimes the gains were the same in all directions and for all weights along a certain axis. Then it seems to be reliable. However, sometimes there were quite big differences in gain. What I did in those cases was to do step 5 again but I took the other offset (neutral / mean, see step 4). Sometimes this helped a lot!

- -