Device testing report

Test 1
move the head to 3deg and then to 2.95deg and measure the distance change
horizontal distance to the wall is 320cm and vertical distance to the lowest point is 135cm. The total change for 0.05deg angle change is between 11mm and 12mm.

distance between mirror and lowest point

$$angle_1 := atan\left(\frac{1350mm}{3200mm}\right) = 22.874 \cdot deg$$

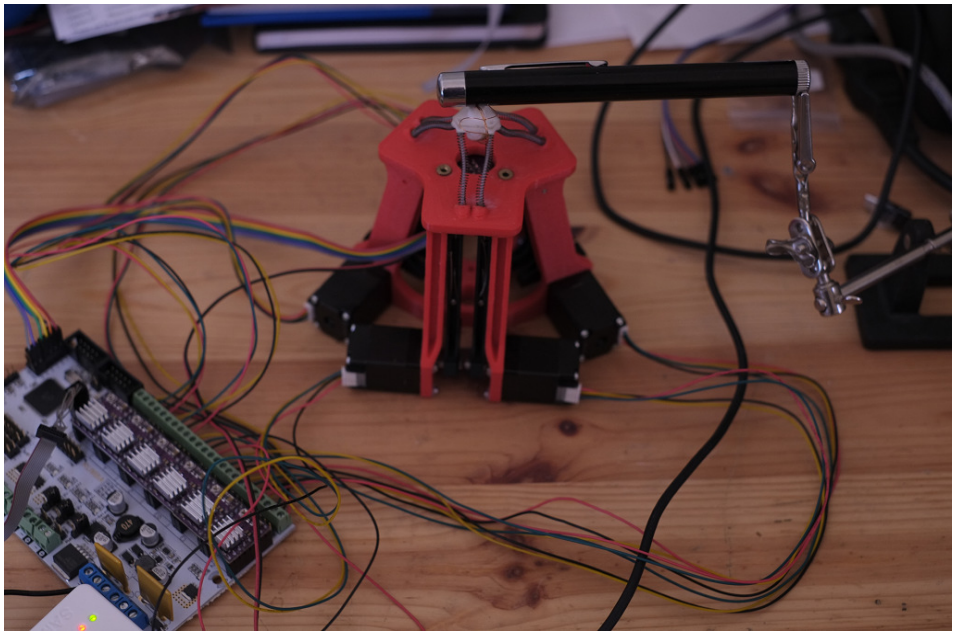
$$deflection := 11mm$$

$$angle_2 := atan\left(\frac{1350mm + 11mm}{3200mm}\right) = 23.041 \cdot deg$$

$$angle_{diff} := angle_2 - angle_1 = 0.167 \cdot deg$$

Too many variables, so changing method for direct connection of laser pointer to the actuator head, the laser pointer beam is quite wide and the distance measured to the wall is valid to the nearest 10mm.

The following tests either have the laser directly mounted to the head or one end supported and the other pin supported to allow it to rotate when the head translates.



Test 2
laser pointer one end on device, other pinned. requested vertical (UZ) deflection was 0.5mm

$$\text{angle}_1 := \text{atan}\left(\frac{13\text{mm}}{3200\text{mm} + 123\text{mm}}\right) = 0.224\cdot\text{deg}$$

$$\text{distance} := 123\text{mm}\cdot\tan\left(\text{angle}_1\right) = 0.481\cdot\text{mm}$$

Test 3
laser pointer one end on device, other pinned. requested vertical (UZ) deflection was 0.05mm

$$\text{angle}_1 := \text{atan}\left(\frac{1.5\text{mm}}{3200\text{mm} + 123\text{mm}}\right) = 0.026\cdot\text{deg}$$

$$\text{distance} := 123\text{mm}\cdot\tan\left(\text{angle}_1\right) = 0.056\cdot\text{mm}$$

Test 4
horizontal displacement or requested horizontal (UX) deflection was 0.5mm

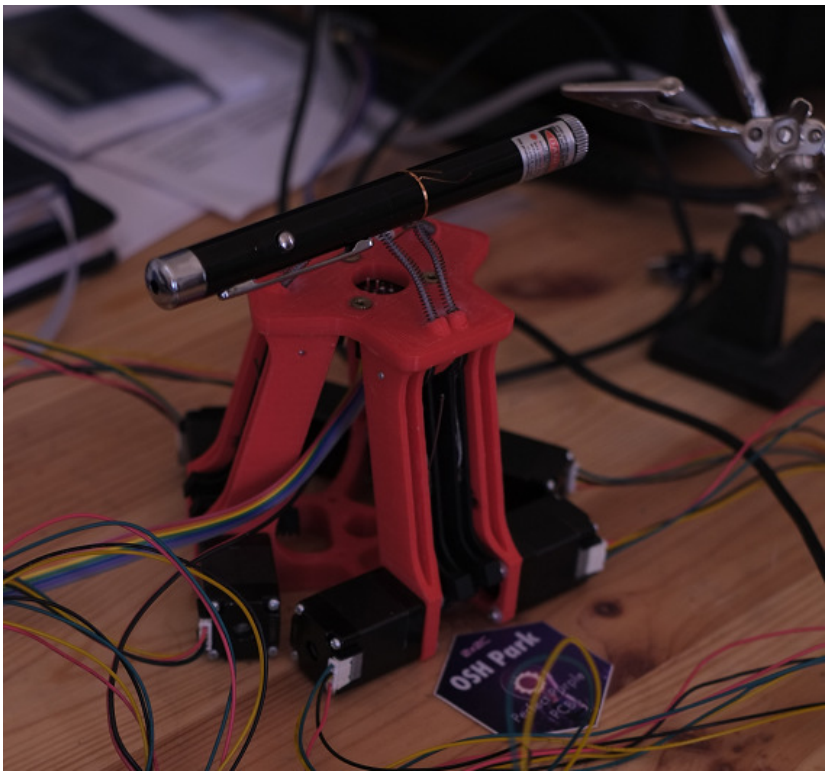
$$\text{angle}_1 := \text{atan}\left(\frac{13\text{mm}}{3200\text{mm} + 123\text{mm}}\right) = 0.224\cdot\text{deg}$$

$$\text{distance} := 123\text{mm}\cdot\tan\left(\text{angle}_1\right) = 0.481\cdot\text{mm}$$

Test 5
horizontal displacement or requested horizontal (UX) deflection was 0.05mm

$$\text{angle}_1 := \text{atan}\left(\frac{1.5\text{mm}}{3200\text{mm} + 123\text{mm}}\right) = 0.026\cdot\text{deg}$$

$$\text{distance} := 123\text{mm}\cdot\tan\left(\text{angle}_1\right) = 0.056\cdot\text{mm}$$



Test 6
angular change requested vertical deflection (RX) was 0.5deg

$$angle_1 := \operatorname{atan}\left(\frac{23\text{mm}}{3200\text{mm}}\right) = 0.412\cdot\text{deg}$$

Test 6
angular change requested vertical deflection (RX) was 0.05deg

$$angle_1 := \operatorname{atan}\left(\frac{5\text{mm}}{3200\text{mm}}\right) = 0.09\cdot\text{deg}$$

Test 6
angular change requested horizontal deflection (RZ) was 0.5deg

$$angle_1 := \operatorname{atan}\left(\frac{28.5\text{mm}}{3200\text{mm}}\right) = 0.51\cdot\text{deg}$$

Test 7
angular change requested horizontal deflection (RZ) was 0.25deg

$$angle_1 := \operatorname{atan}\left(\frac{20\text{mm}}{3200\text{mm}}\right) = 0.358\cdot\text{deg}$$

So the deflection tests show a pretty good level of match to the values calculated for the device parameters. As indicated by measured values for the requested positions and rotations.

The rotations are less reliable than the movement because the weight and moment of inertia of the laser pointer (2x AAA batterys) means that there was some vibration and movement shock loading to contend with.