# Measured data and analysis

1. **Square FSR**

Measured data:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Square | | | | | | | |
| Weight(g) | 1 | 2 | 3 | Average Measurement(g) | Error | Resolution | Resolution |
| 112 | 112.29 | 111.76 | 115.36 | 113.14 | 1.01% |  | 4.770667 |
| 118 | 113.14 | 110.79 | 118.45 | 114.13 | -3.28% | 0.99 |
| 120 | 115.51 | 114.72 | 115.51 | 115.25 | -3.96% | 1.12 |
| 125 | 117.89 | 117.09 | 116.3 | 117.09 | -6.33% | 1.85 |
| 126 | 121.08 | 120.28 | 121.08 | 120.81 | -4.12% | 3.72 |
| 128 | 136.06 | 138.29 | 136.62 | 136.99 | 7.02% | 16.18 |

Analysis:

Slowly add water to the bottle until the data changes. And we need to wait the data to be stable.

When the mass of the object is small, the sensor does not seem to be very sensitive, so the data will change only when a lot of water is added each time.

We only choose the data after 100g because we can not measure the data accurately before the mass becomes larger.

We all know that the resolution is the minimum increment in stimulus to which a sensor can respond. Ideally, there is no difference between the actual mass and the measured mass, so the resolution is infinitely small.

And we get the resolution of the initial data is 4.7707. which is much bigger than infinitely small.

This means that the larger the weight is, the larger the data of the sensor will be.

Measured data:

The maximum is 50000g

The minimum is 0.76g

Analysis:

Our minimum force measured is 0.76g, which is basically the same number for objects with very small mass, or there is no data directly.

The largest data we can measure is 50000g, which is the result of almost the whole person pressing on the sensor.

I think the reason why there is no range below 100g may be that the weight of the object is too small, and the resistance value of the sensor is too large, resulting in the current is too small to measure accurately.

Measured data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Square | | | | | | |
| Weight(g) | 1 | 2 | 3 | Average Measurement(g) | Error | Sensitivity |
| 12 | 2.29 | 0.76 | 5.36 | 2.8 | -76.64% | 0.23 |
| 20 | 15.51 | 14.72 | 15.51 | 15.25 | -23.77% | 1.56 |
| 25 | 17.89 | 17.09 | 16.3 | 17.09 | -31.63% | 0.37 |
| 26 | 21.08 | 20.28 | 21.08 | 20.81 | -19.95% | 3.72 |
| 27 | 17.09 | 17.89 | 17.09 | 17.36 | -35.72% | -3.46 |
| 62 | 25.11 | 25.93 | 25.93 | 25.66 | -58.62% | 0.24 |
| 97 | 111.24 | 109.25 | 110.24 | 110.24 | 13.65% | 2.42 |
| 176 | 258.25 | 260.95 | 259.6 | 259.6 | 47.50% | 1.89 |
| 357 | 535.2 | 537.37 | 539.55 | 537.37 | 50.52% | 1.53 |
| 687 | 1052.24 | 1006.23 | 1002.24 | 1020.24 | 48.51% | 1.46 |

Analysis:

Although the sensor range starts at 100g, I still select some data below 100g for analysis.

It is proved that the sensitivity of data after 100g is closer to 1 than that before 100g, which means that the data after 100g is more accurate. Therefore, it is better to measure objects above 100g with this sensor.

1. **Long Flex/Bend Sensor**

Measured data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Long | | | | | | |
| Bending Angle(º) | 1 | 2 | 3 | Average Measurement(º) | Error | Sensitivity |
| 30 | 248 | 241 | 255 | 248 | 726.67% | 8.266667 |
| 40 | 13 | 49 | 42 | 34.67 | -13.33% | -21.3333 |
| 50 | 42 | 53 | 42 | 45.67 | -8.67% | 1.1 |
| 60 | 49 | 57 | 64 | 56.67 | -5.56% | 1.1 |
| 70 | 64 | 57 | 64 | 61.67 | -11.90% | 0.5 |
| 80 | 79 | 86 | 71 | 78.67 | -1.67% | 1.7 |
| 90 | 101 | 109 | 101 | 103.67 | 15.19% | 2.5 |
| 100 | 103 | 110 | 111 | 108 | 8.00% | 0.433333 |
| 110 | 120 | 137 | 146 | 134.33 | 22.12% | 2.633333 |
| 120 | 233 | 225 | 225 | 227.67 | 89.72% | 9.333333 |
| 130 | 164 | 137 | 111 | 137.33 | 5.64% | -9.03333 |

Analysis:

We tested the data from 30 degrees to 130 degrees. From the data in the table, we can see that when the Angle is very small and the Angle is very large, the measured data is not very stable and accurate. I think the bending position of the sensor is changed because of different angles, and it does not bend in the same place.

As a result, the sensitivity of the sensor deviates greatly from 1 when the Angle is small and large, while the sensitivity of the moderate bending Angle is close to 1.

Measured data:

The maximum is 255°

The minimum is 4°

Analysis:

We measured a maximum of 255 and a minimum of 4.

We spent a lot of time trying to find the minimum 0, but we didn't find it.

I think the error is caused by the damage caused by the bending of the sensor for many times.

1. **Circular Soft Potentiometer**

Measured data:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Circle | | | | | |
| Angle(º) | 1 | 2 | 3 | Average Measurement(º) | Error |
| 30 | 21.11 | 20.06 | 20.76 | 20.64 | -31.19% |
| 60 | 58.06 | 58.42 | 58.77 | 58.42 | -2.64% |
| 90 | 92.55 | 92.55 | 92.9 | 92.67 | 2.96% |
| 120 | 122.82 | 123.87 | 123.17 | 123.29 | 2.74% |
| 150 | 157.3 | 156.25 | 155.54 | 156.36 | 4.24% |
| 180 | 188.27 | 188.62 | 187.92 | 188.27 | 4.59% |
| 270 | 274.49 | 275.54 | 275.19 | 275.07 | 1.88% |
| 360 | 360 | 360 | 360 | 360 | 0.00% |

Analysis:

This set of data is the most happy data among my three sensors, and the error of the data is reasonable except for the first data.

We can see that except for the first set of data, all the other data errors are within five percent.

The reason why the error of the first set of data is so large, I think it is caused by the poor electrical contact in that area.

As we can see it is almost linear.