



SHADOWSENSE PERFORMANCE
REPORT: SIZE DETECTION



DOCUMENT REVISION HISTORY

Revision	Date	Author	Comments
1.0	Sept\02\2016	Frazier Clarke	Created the document

1.0 Objective

The purpose of this experiment is to measure and evaluate the capability of a ShadowSense touch frame to detect the size of objects.

1.1 Equipment

The equipment used during the entire test:

- Baanto SDW403, SDW565 and SDW813 ShadowSense touch frames with firmware version 9.02
- Baanto Dashboard software
- TouchSize software
- Calipers
- Flame retardant green tape roll (diameter of 73.7 mm)
- Baanto ShadowSense touch eraser (diameter of 59.6 mm)
- Vinyl electrical tape roll (diameter of 49.3 mm)
- Copper tube (diameter of 15.0 mm)



Figure 1: The three objects (arranged from left to right) have diameters of 73.7 mm, 59.6 mm and 49.3 mm.

2.0 Method

ShadowSense touch technology uses the shadows cast by an object blocking LEDs to determine its location and diameter. To measure the accuracy of the size detection, objects of different sizes were placed at various locations across the screen to obtain a broad set of results.

The three different sizes of touch frames tested were a 40.3", a 56.5" and an 81.3". On each frame, eight different positions were tested using four circular objects of various diameters. This data was compiled to determine the accuracy of ShadowSense with respect to screen size, location and object size.

The eight different test locations are shown in Figure 2. Locations 1-4 were located close to the corners of the frame, while locations 5-8 were closer to the middle of the frame. Each trial consisted of one object being placed briefly on each of these eight locations. The TouchSize software was used to output a real time value of the measured diameter. To test for consistency and repeatability, five trials were performed for each object, at each location. The target duration for each touch was between one and two seconds. The same process was repeated on all three sizes of touch frames under test.

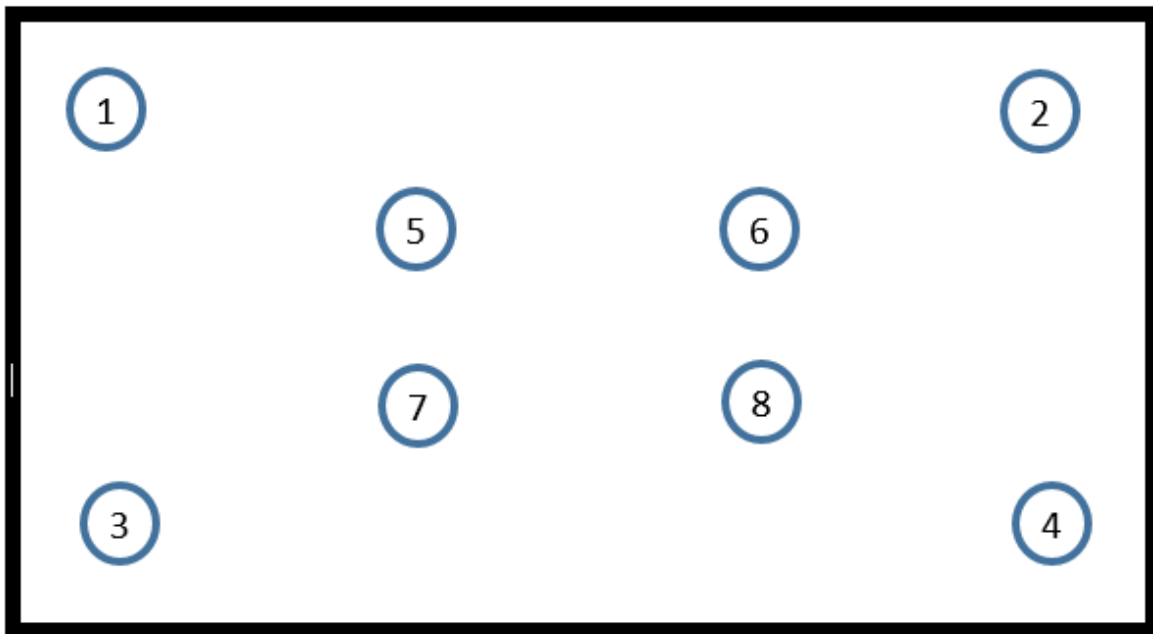


Figure 2: ShadowSense frame with the eight test positions labelled

2.1 Results

As an example, the raw data for the 49.3 mm object on all three screens is shown in Tables 1, 2, and 3. Based on this data the specification for diameter recognition was calculated.

Table 1: Measurements for 49.3 mm Object Using SDW403

49.3 mm Object Data						
Location	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
1	47.98	49.93	49.28	48.19	48.63	48.802
2	48.41	47.98	48.41	47.76	49.5	48.412
3	42.77	45.37	43.42	48.41	44.07	44.808
4	49.93	49.71	47.98	50.58	48.85	49.41
5	50.37	50.58	49.28	50.58	49.71	50.104
6	48.19	48.85	49.06	48.19	47.98	48.454
7	47.33	47.11	47.98	48.41	48.41	47.848
8	47.33	47.33	47.98	47.98	47.54	47.632
Average	47.78875	48.3575	47.92375	48.7625	48.08625	48.18375

Table 2: Measurements for 49.3 mm Object Using SDW565

49.3 mm Object Data						
Location	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
1	48.72	51.46	50.55	50.85	50.25	50.366
2	50.85	50.85	49.03	44.76	50.55	49.208
3	46.29	45.07	40.81	44.46	45.98	44.522
4	47.2	45.07	45.07	45.68	44.41	45.486
5	49.94	49.94	49.94	49.94	50.25	50.002
6	49.94	49.64	49.03	49.33	49.94	49.576
7	46.29	48.11	46.59	48.42	46.29	47.14
8	49.33	49.64	50.25	45.07	48.72	48.602
Average	48.57	48.7225	47.65875	47.31375	48.29875	48.11275

Table 3: Measurements for 49.3 mm Object Using SDW813

49.3 mm Object Data						
Location	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Average
1	46.52	44.32	50.47	52.22	48.71	48.448
2	47.39	48.27	49.59	49.15	49.59	48.798
3	45.64	50.47	51.34	46.52	51.34	49.062
4	47.83	46.95	45.2	48.27	47.83	47.216
5	49.15	49.59	49.15	48.71	50.03	49.326
6	48.71	50.47	51.34	50.03	48.71	49.852
7	46.52	49.15	49.59	46.52	47.39	47.834
8	45.64	46.95	48.27	47.83	48.27	47.392
Average	47.175	48.27125	49.36875	48.65625	48.98375	48.491

2.2 Summary of Results

The summary of the errors for all objects under test are shown in Figures 3, 4 and 5.

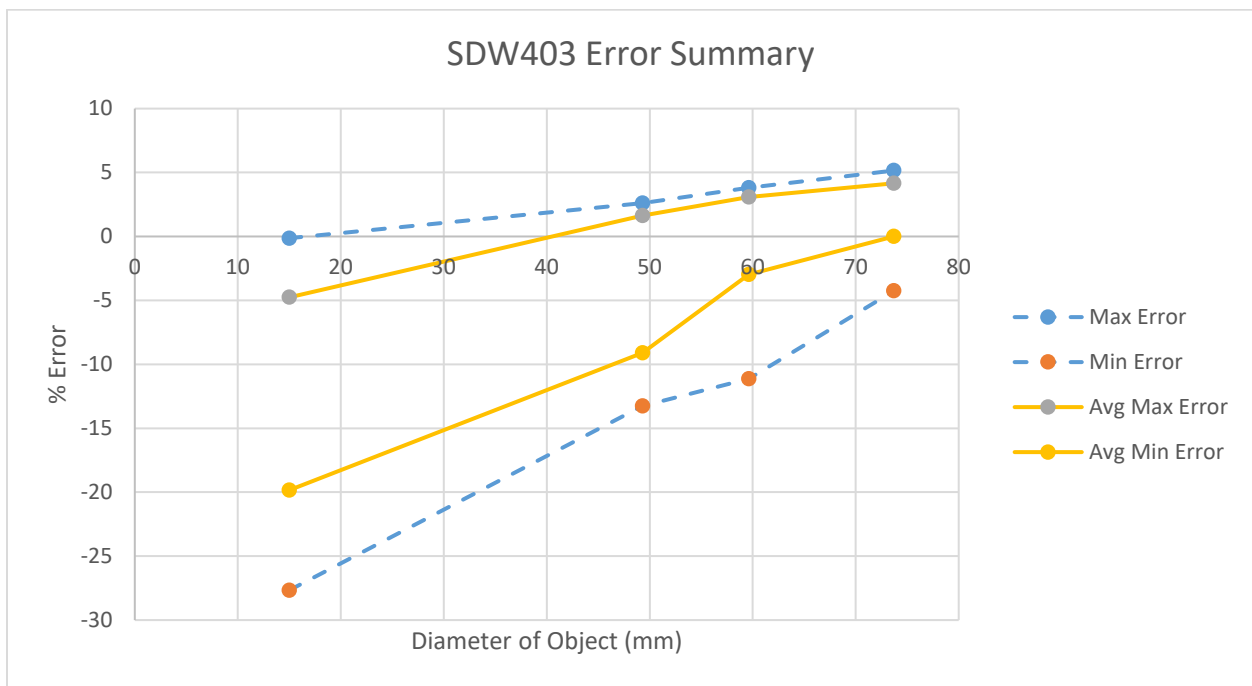


Figure 3: Error Summary for SDW403

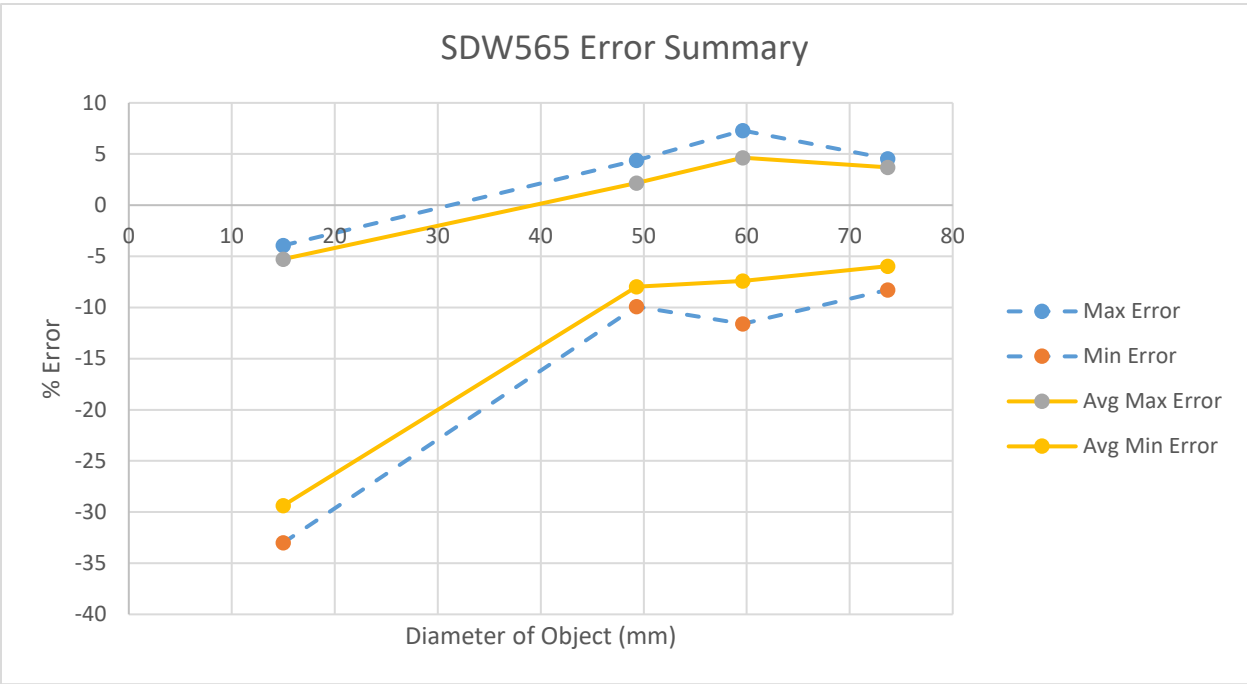


Figure 4: Error Summary for SDW565

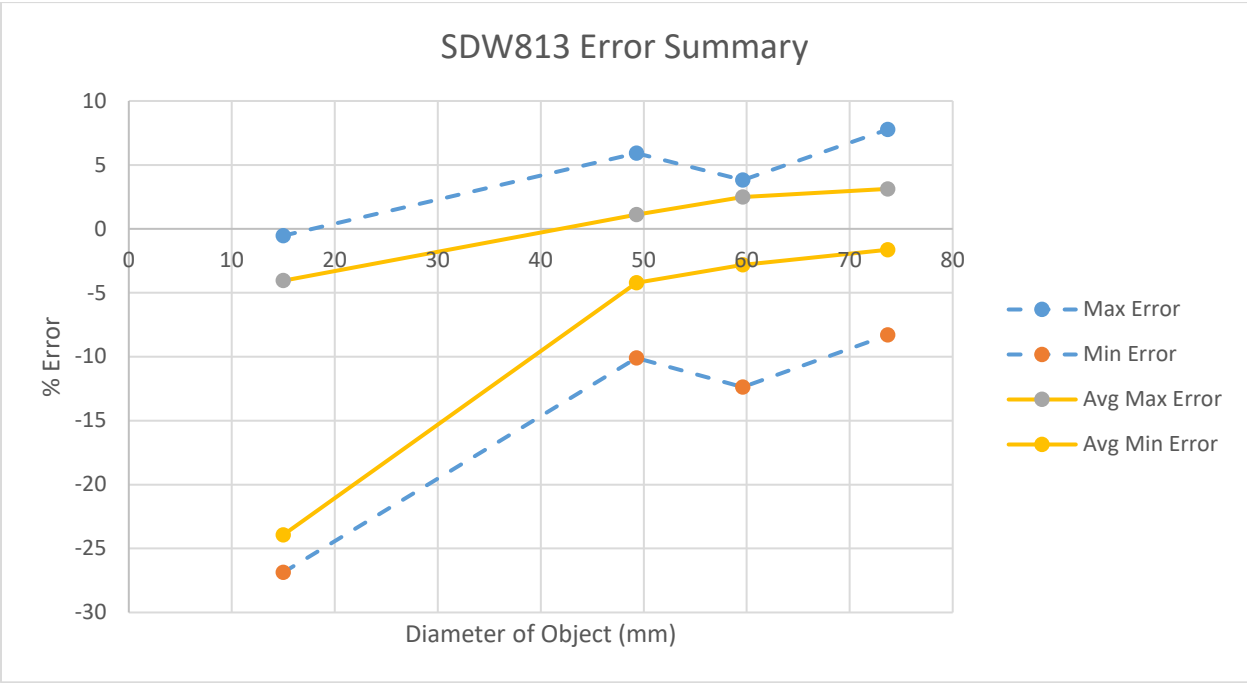


Figure 5: Error Summary for SDW813

3.0 Conclusion

The absolute measurement error is between -4 mm to +2 mm across all frame sizes, positions and variances in diameters. Since the absolute error is consistent across all object sizes, the smaller the object the larger the percentage error. Conversely, as the object size increases the percentage error decreases. These ranges are as follows:

- Larger diameter objects give a measurement error of +5% to -10%.
- Smaller diameter objects give a measurement error of 0% to -25%.

The error is consistent and does not scale significantly as the size of the touch screen increases. When comparing the error between the SDW403 and the SDW813, there is no noticeable increase.