Appendix C.   Detailed segmentation statistics.

The tables is this appendix show distribution statistics, by finger position, for the segmentation algorithms tested as compared to the hand marked ground truth for 3-inch slap images. The differences between the segmentation algorithm and ground truth are sorted into bins based on the tolerances allowed for correct segmentation. Specifically, the left/right edges must be within -32/+64 pixels of the ground truth, top edge -64/+64 and bottom edge -64/+128. For each finger position there is a column for each of the four segmentation box edges (L, R, T and B).

The first row ("No Finger Found") shows the counts for when a finger was not detected by the segmentation algorithm. The next four rows show statistics for segmentation edges that are within the specified minimum (MN) and maximum (MX) pixel tolerances compared to the ground truth, so these are considered good segmentations. Rows 1 (MN <= d < 0) and 3 (0 <= d <= MX) show the average value for all differences in that range and rows 3 and 5 show the total count occurring in that range.

Rows 6-9 also show average difference values and bin counts but for ranges MN-32 <= d < MN and MX < d <= MX+32, which are just outside the accepted tolerance ranges. Rows 10-13 tally everything greater than 32 pixels away from the accepted tolerance range, d < MN-32 and d > MX+32.

The last three rows show the total count for each bin, the overall average difference value and the standard deviation of all the difference values.
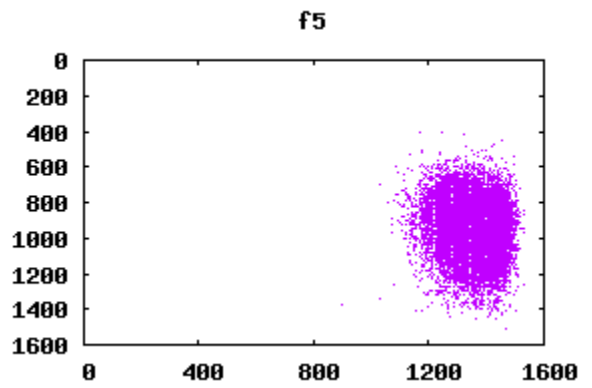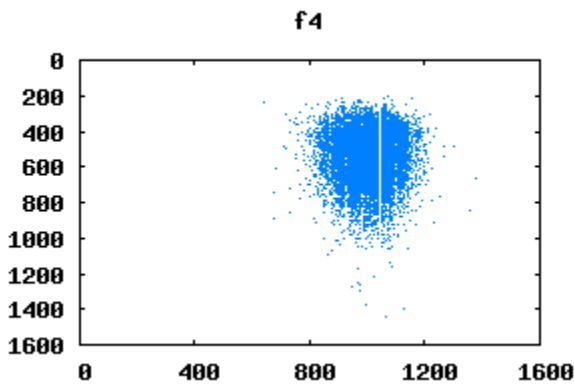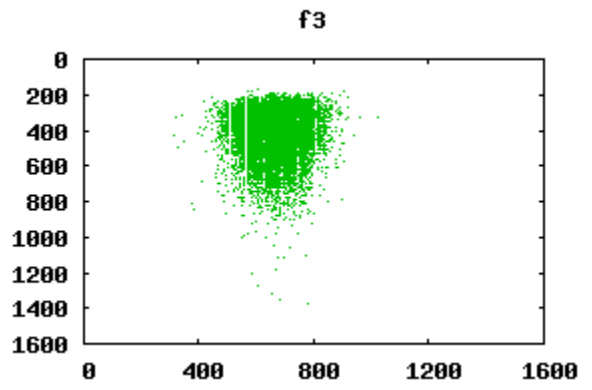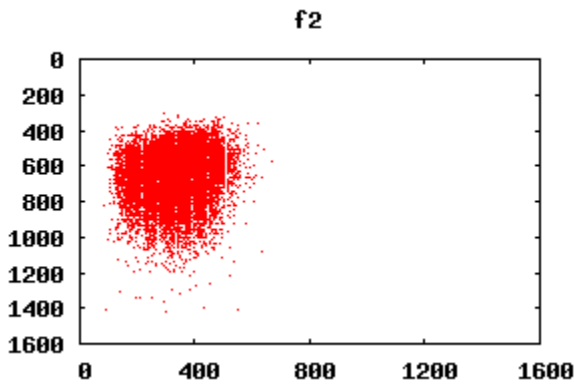
Q = Lakota

No Finger Found

	R. Thumb 64				R. Index 361				R Middle 37				R. Ring 25				R. Little 61			
	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B
MN <= d < 0	-10.40	-8.04	-12.29	-15.31	-6.83	-7.34	-11.51	-15.74	-7.53	-7.10	-9.90	-17.38	-6.59	-7.15	-8.06	-18.55	-6.85	-8.50	-11.01	-14.31
#	5143	4490	13866	3713	8453	3794	15799	7986	6630	4520	11241	7505	9166	5316	10747	7723	6767	6698	15123	7956
0 <= d <= MX	14.61	15.44	12.66	29.41	6.37	11.37	13.64	22.58	6.74	11.45	15.51	33.05	7.76	13.74	15.71	32.40	6.76	9.50	13.15	20.25
#	18386	19648	10425	17135	16328	21083	9072	16473	18212	20371	13670	16338	15616	19350	14143	15688	17992	17902	9723	16222
MN-32 <= d < MN	-44.63	-41.63	-77.78	-78.10	-42.66	-42.95	-77.87	-75.70	-42.52	-39.83	-71.38	-76.38	-43.41	-39.30	-74.88	-77.29	-43.91	-40.63	-73.35	-77.80
#	463	98	32	121	103	39	23	149	67	29	8	363	82	106	8	498	113	192	23	167
MX < d <= MX+32	76.50	75.13	84.00	143.80	77.19	74.33	73.87	141.72	74.20	74.15	71.62	141.58	74.17	73.98	73.09	142.58	71.50	77.87	75.77	143.65
#	10	99	3	1153	26	9	15	156	25	20	13	401	35	144	23	456	27	98	13	238
d < MN-32	-143.38	-338.4	-449.55	-338.32	-147.24	-225.57	-570.90	-174.13	-174.65	-222.13	-466.81	-123.09	-152.69	-226.38	-464.00	-121.61	-128.30	-486.88	-442.28	-212.15
#	373	51	59	118	29	28	35	51	26	12	29	98	63	12	39	195	55	37	62	118
d > MX+32	246.07	585.90	656.34	213.81	229.41	345.27	222.35	300.66	272.56	283.75	164.50	226.10	302.25	231.66	207.31	222.94	964.04	181.80	429.27	254.45
#	47	36	37	2182	29	15	24	153	8	16	7	263	6	40	8	408	14	41	24	267
Total #	24422	24422	24422	24422	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968
Average	6.28	11.24	-1.76	42.18	1.85	8.40	-2.94	11.78	2.78	8.14	3.55	19.46	2.08	9.64	4.82	18.37	3.15	4.10	-2.26	11.16
Std Dev	33.74	36.82	41.12	80.41	14.23	16.46	29.75	45.44	13.66	15.66	24.57	48.17	16.63	21.82	25.70	52.91	27.42	34.03	31.94	47.61

No Finger Found

	L. Thumb 64				L. Index 175				L. Middle 15				L. Ring 41				L. Little 158			
	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B
MN <= d < 0	-7.31	-10.36	-13.50	-14.30	-6.98	-9.28	-11.67	-16.29	-4.72	-8.07	-9.94	-18.92	-4.50	-8.44	-7.63	-20.48	-7.56	-8.78	-11.12	-15.72
#	2586	6499	13858	3362	3174	7051	15038	7767	5751	6173	10271	8146	5195	7245	9505	9484	6862	5310	13827	9716
0 <= d <= MX	16.93	14.46	12.88	32.49	8.64	9.56	14.50	22.51	10.53	10.53	15.72	33.56	12.98	10.67	16.78	31.95	9.05	10.18	13.63	19.58
#	21462	17304	10415	16561	21675	17461	9814	16600	19081	18624	14620	15468	19372	17485	15366	13678	17692	19398	10966	14424
MN-32 <= d < MN	-40.30	-43.48	-73.38	-75.78	-45.31	-40.55	-74.80	-76.65	-40.24	-40.40	-73.33	-76.91	-40.94	-41.97	-72.67	-76.87	-43.69	-42.44	-73.71	-77.06
#	46	322	20	82	29	341	25	185	25	106	9	503	17	155	6	772	109	175	36	212
MX < d <= MX+32	74.55	76.42	76.00	144.10	74.71	75.79	73.26	142.82	75.97	73.95	76.57	142.14	76.75	72.61	74.08	143.35	77.27	72.38	72.09	142.49
#	186	24	5	1528	39	43	19	192	60	19	15	395	287	18	24	388	189	12	23	238
d < MN-32	-390.32	-139.26	-413.52	-364.46	-438.93	-285.77	-462.46	-190.34	-381.71	-194.50	-491.28	-123.36	-259.03	-253.51	-471.72	-136.02	-156.07	-194.94	-439.22	-251.80
#	109	155	64	128	34	32	46	54	24	29	37	136	16	49	44	288	34	56	82	102
d > MX+32	186.21	306.21	543.93	211.71	513.04	490.71	238.93	291.78	240.59	813.92	152.50	239.00	187.61	515.21	241.74	239.11	158.35	381.46	450.90	280.87
#	33	118	60	2761	13	36	22	166	23	13	12	316	77	12	19	354	78	13	30	272
Total #	24422	24422	24422	24422	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964
Average	13.11	7.58	-1.96	50.85	6.35	3.98	-1.99	11.96	6.96	5.95	4.48	17.67	10.40	4.57	6.83	11.40	5.01	5.54	-1.11	7.93
Std Dev	32.89	33.30	42.37	85.25	28.75	35.53	28.22	44.65	22.32	26.69	26.87	52.32	22.36	24.96	28.39	57.12	19.27	20.41	37.39	53.82

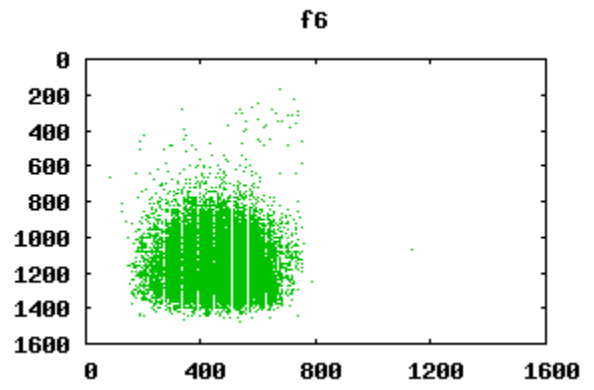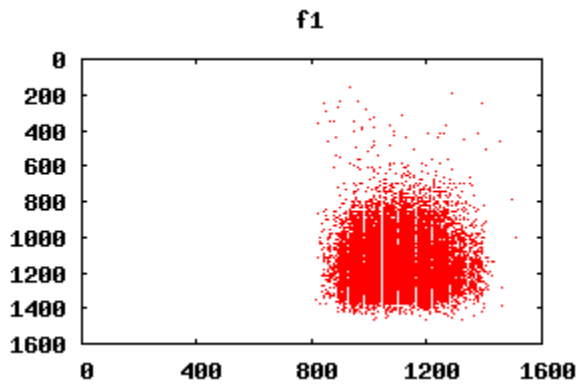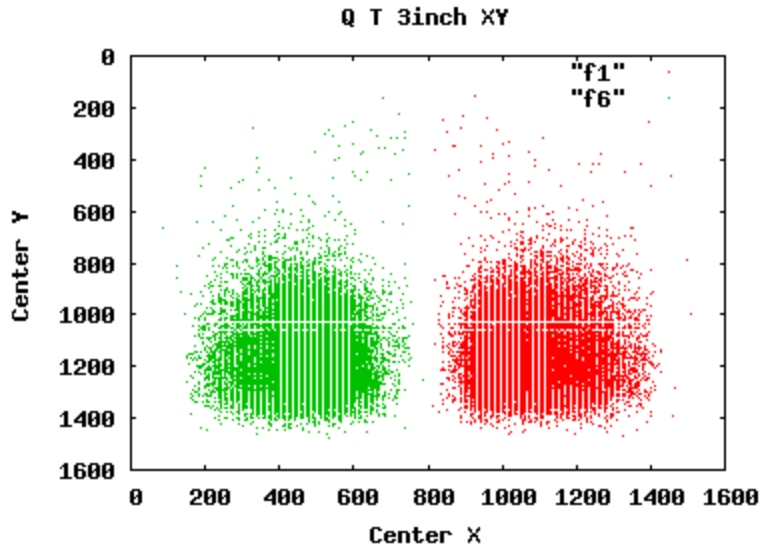# Appendix D.   Plots of 3-inch segmentation box centers.

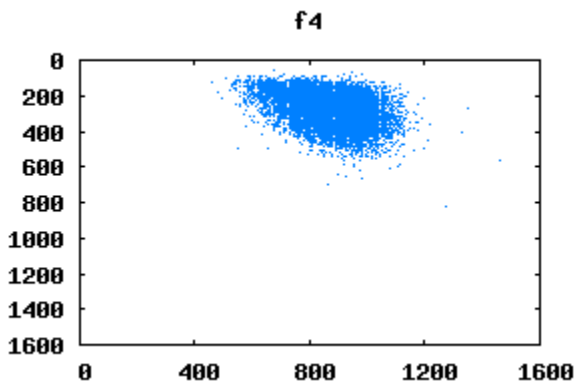The plots in this appendix show the distribution of the segmentation box centers (x,y) for the 3-inch data. There is a combined plot for each slap image and then a smaller plot for each finger position. The individual finger plots are better for seeing the full "spread" of x,y positions detected. The plot for the ground truth (GT) is included as a baseline for comparison. The blank lines that appear in some of the plots are most likely caused by the segmentation algorithm doing some level of sampling of the input image. The reason the lines are not evenly distributed in some plots is an artifact of the sampling when scaling the images for displaying in the report.

Q R 3inch XY

f2 f3 f4 f5

Q = Lakota

Q L 3inch XY

f7

f8

f9

f10

Q = Lakota

Q T 3inch XY

f1

f6
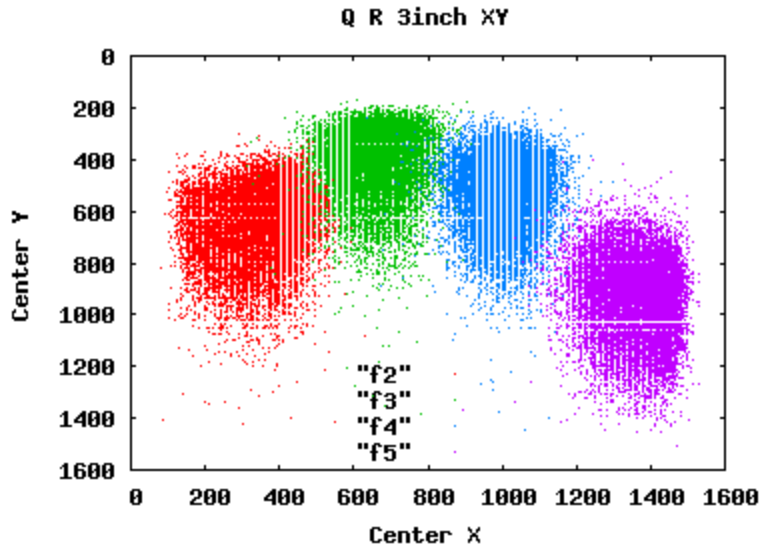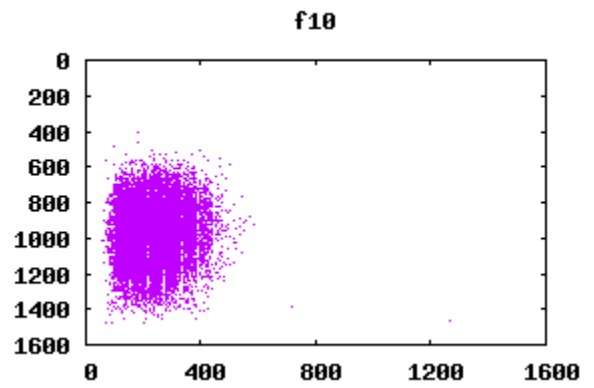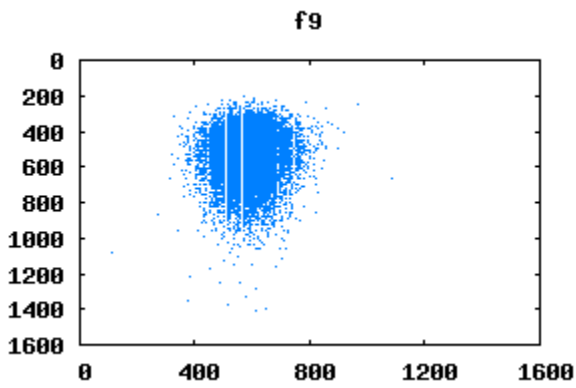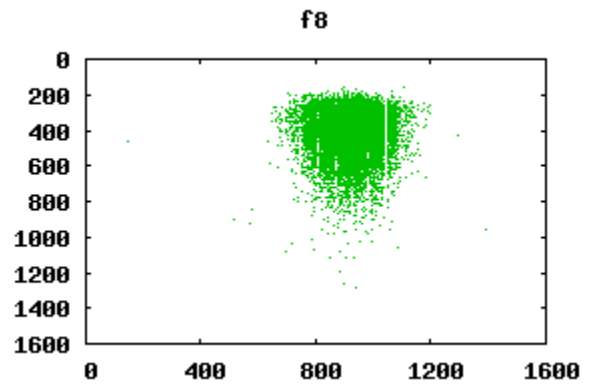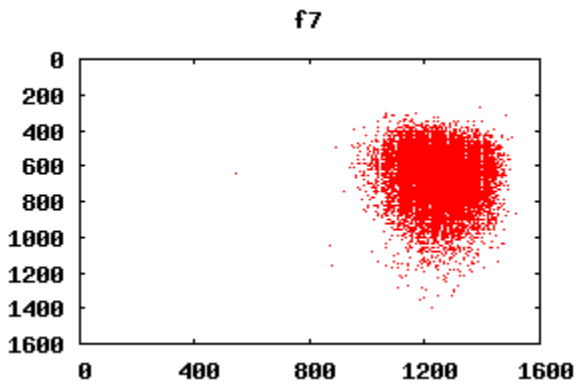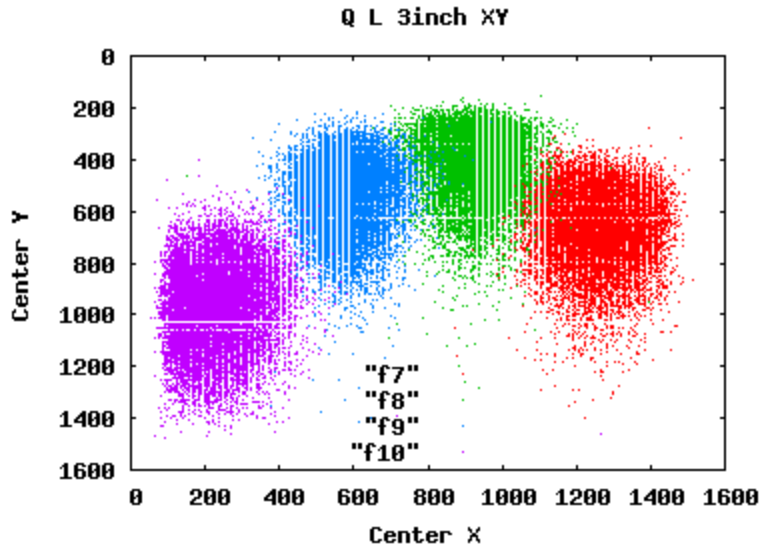
Q = Lakota

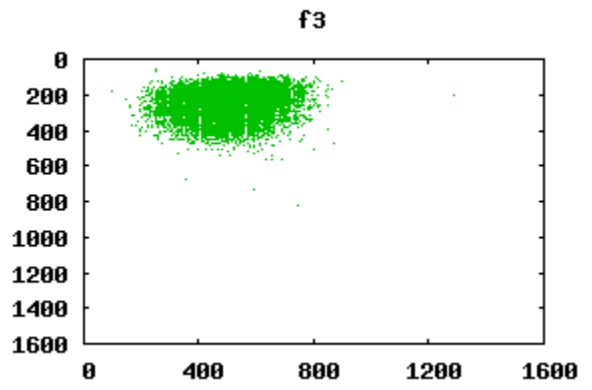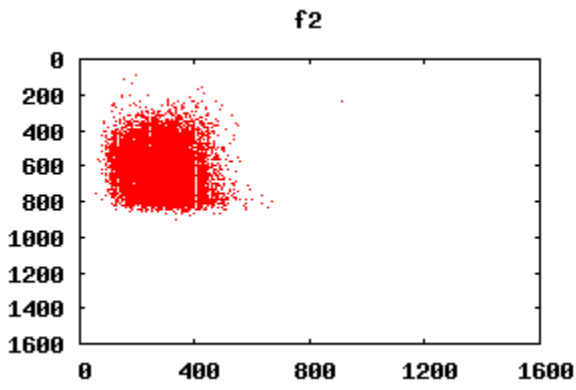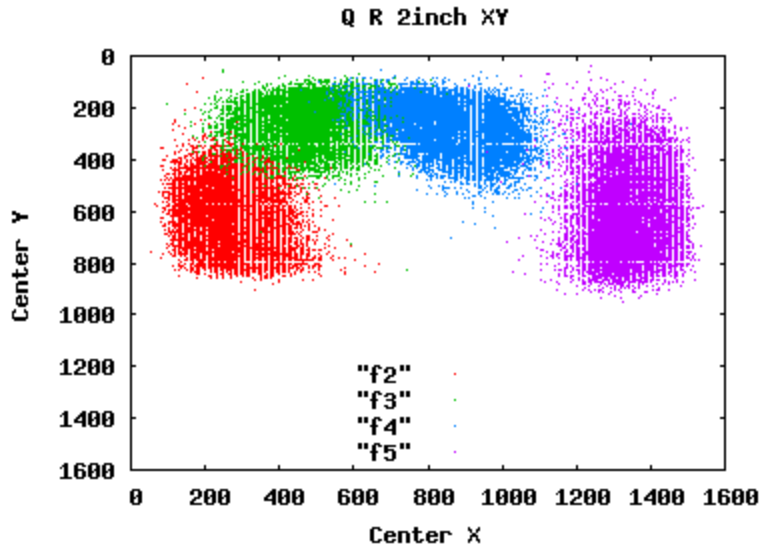# Appendix E.   Plots of 3-inch segmentation box widths and heights.

The plots in this appendix show the distribution of the segmentation box widths and heights for the 3-inch data. There is a combined plot for each slap image and then a smaller plot for each finger position. The individual finger plots are better for seeing the full "spread" of widths and heights detected. The widths are "spread out" on the plot by adding 350, 750 and 1050 to the 2nd, 3rd, and 4th widths plotted. The plot for the ground truth (GT) is included as a baseline for comparison. The blank lines that appear in some of the plots are most likely caused by the segmentation algorithm doing some level of sampling of the input image. The reason the lines are not evenly distributed in some plots is an artifact of the sampling when scaling the images for displaying in the report.

Q R 3inch WH

"f2"
"f3"
"f4"
"f5"

Q L 3inch WH

"f7"
"f8"
"f9"
"f10"

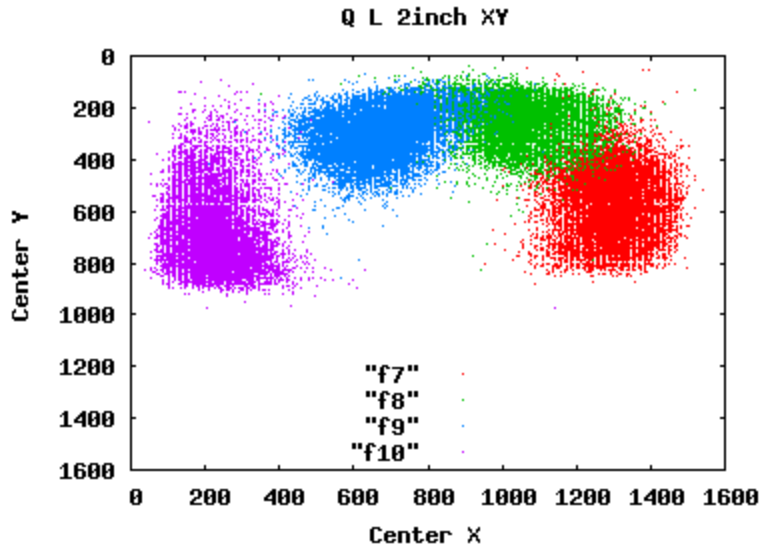**Q T 3inch WH**

"f1"
"f6"

Q = Lakota

Appendix F.   Plots of 2-inch segmentation box centers.

The plots in this appendix show the distribution of the segmentation box centers (x,y) for the 2-inch data. There is a combined plot for each slap image and then a smaller plot for each finger position. The individual finger plots are better for seeing the full "spread" of x,y positions detected. The plot for the ground truth (GT) is included as a baseline for comparison. The blank lines that appear in some of the plots are most likely caused by the segmentation algorithm doing some level of sampling of the input image. The reason the lines are not evenly distributed in some plots is an artifact of the sampling when scaling the images for displaying in the report.
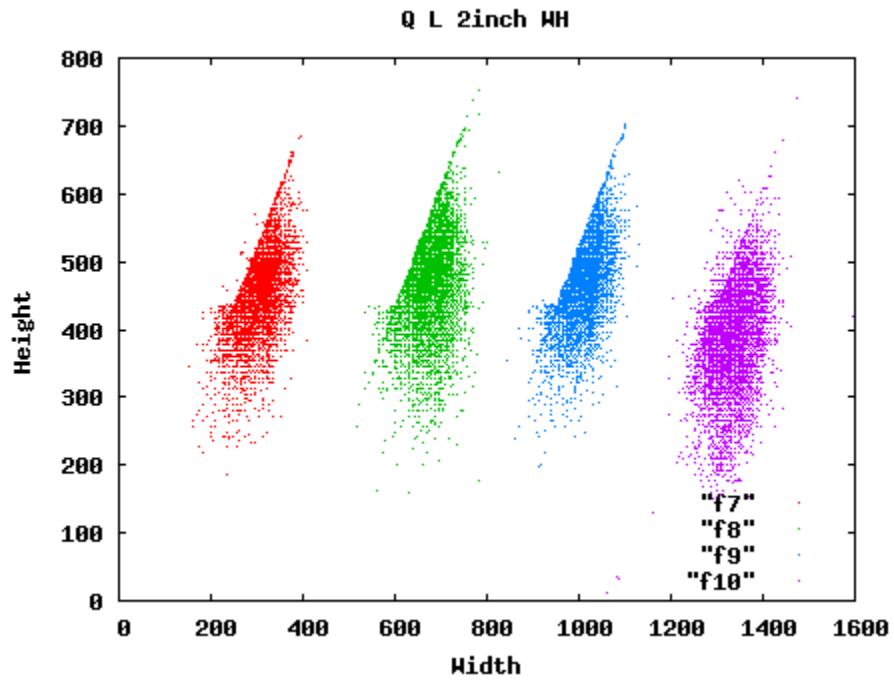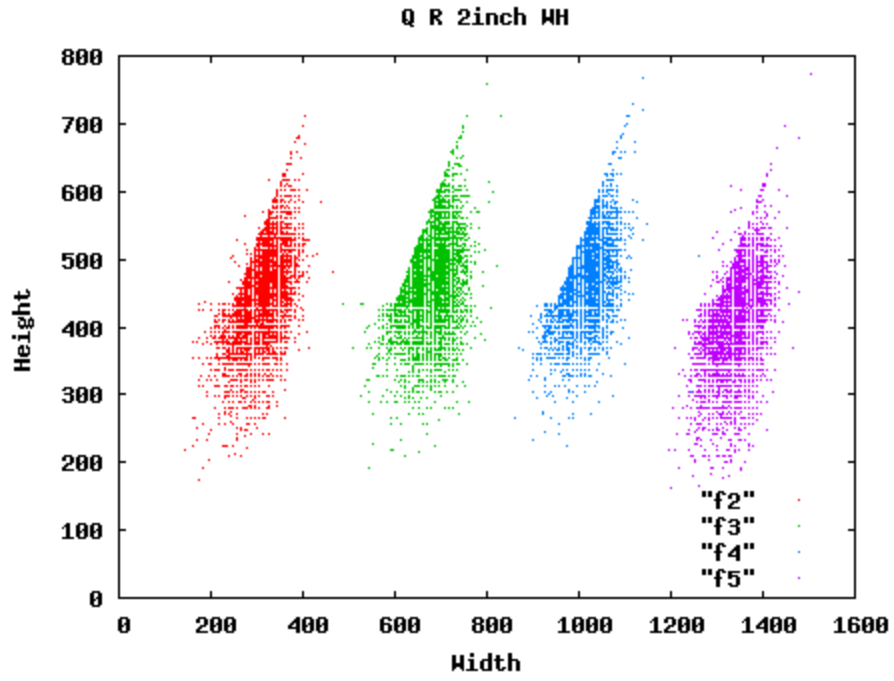
Q R 2inch XY

f2

f3

f4

f5

Q = Lakota

Q L 2inch XY

f7

f8

f9

f10
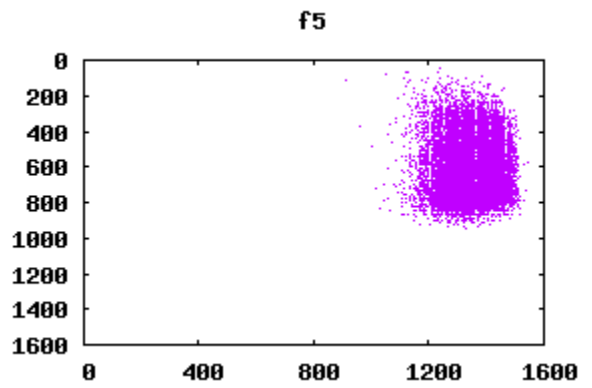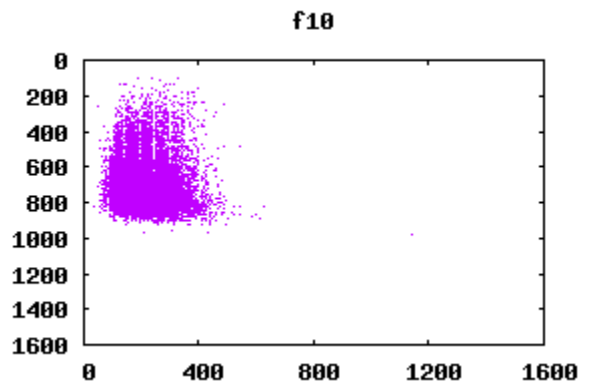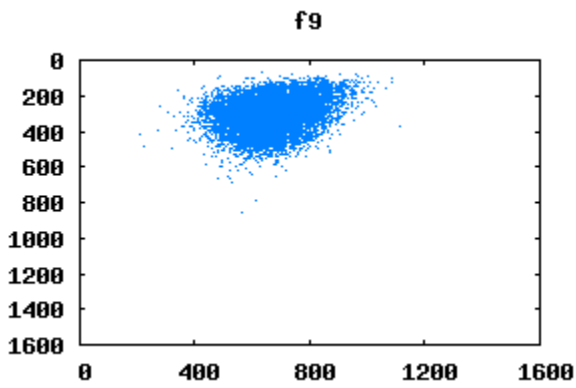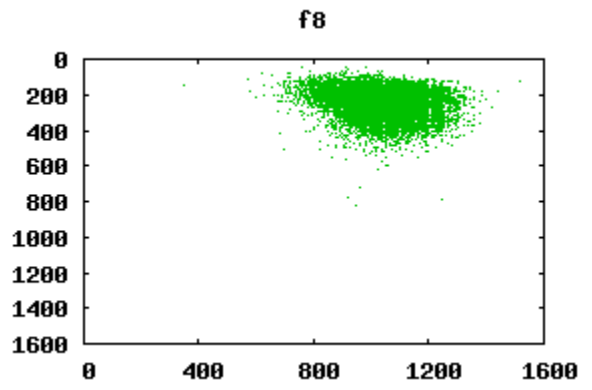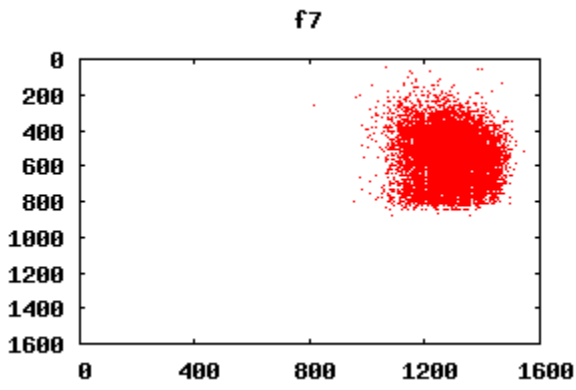
Q = Lakota

Appendix G.   Plots of 2-inch segmentation box widths and heights.

The plots in this appendix show the distribution of the segmentation box widths and heights for the 2-inch data. There is a combined plot for each slap image and then a smaller plot for each finger position. The individual finger plots are better for seeing the full "spread" of widths and heights detected. The widths are "spread out" on the plot by adding 350, 750 and 1050 to the 2nd, 3rd, and 4th widths plotted. The plot for the ground truth (GT) is included as a baseline for comparison. The blank lines that appear in some of the plots are most likely caused by the segmentation algorithm doing some level of sampling of the input image. The reason the lines are not evenly distributed in some plots is an artifact of the sampling when scaling the images for displaying in the report.

Q R 2inch WH

"f2"
"f3"
"f4"
"f5"

Q L 2inch WH

"f7"
"f8"
"f9"
"f10"

Q = Lakota