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.

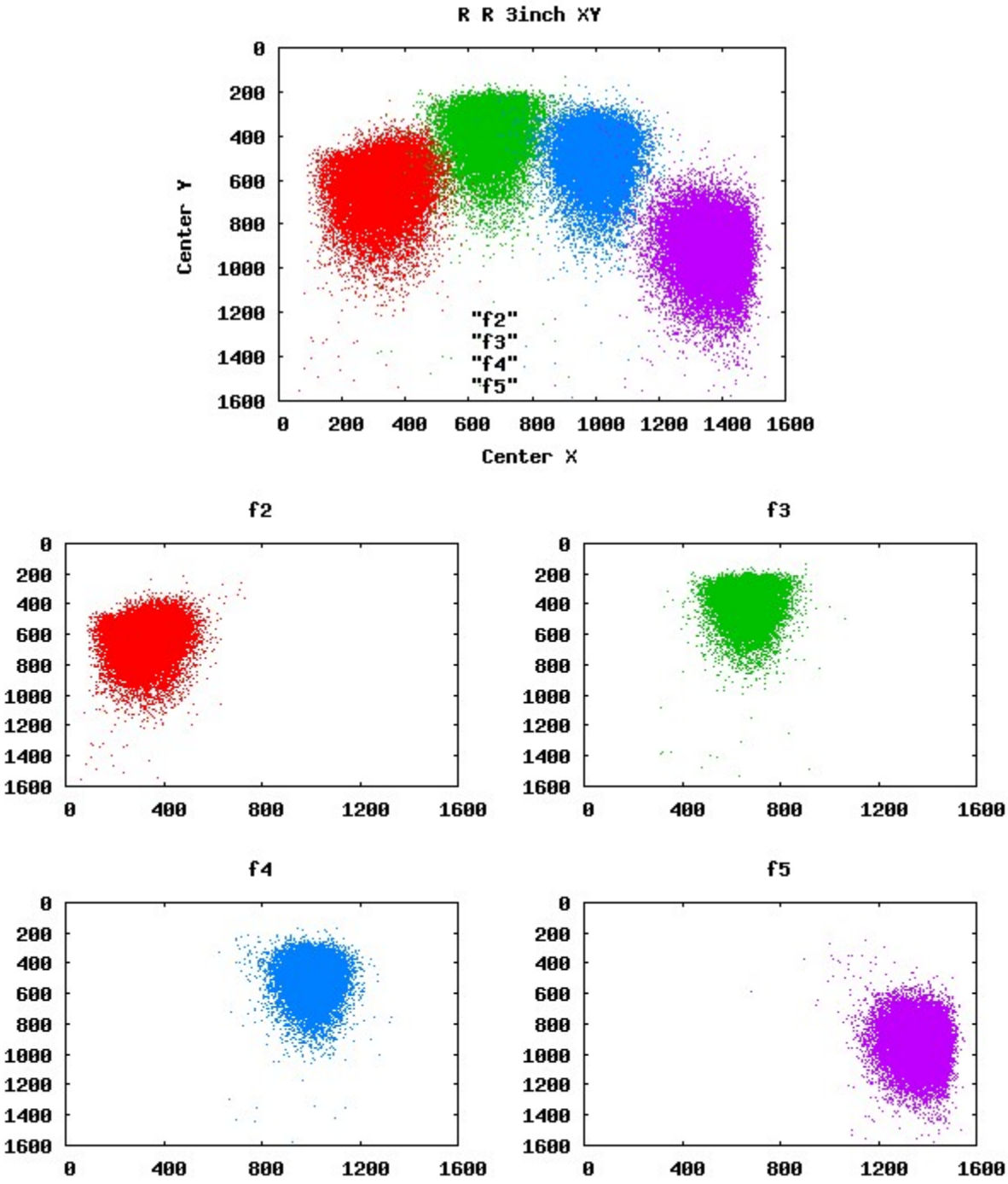
R = C-DAC

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	-5.60	-5.69	-9.59	-22.50	-4.44	-6.85	-12.38	-28.80	-5.48	-5.97	-12.47	-30.80	-4.40	-7.99	-12.52	-32.28	-4.55	-8.18	-12.65	-28.90
#	7065	1707	12151	3942	6821	1071	19042	13728	9436	788	18017	13418	4759	1861	18105	12736	5853	1526	17581	13168
0 <= d <= MX	7.88	14.69	6.29	57.10	7.12	15.68	8.55	27.57	6.99	14.78	8.61	28.10	7.66	14.53	8.27	27.76	7.12	16.59	8.33	26.53
#	17235	22367	12131	17640	18028	23763	5771	8676	15448	24131	6898	7341	20150	22998	6793	6287	19014	23317	7260	8934
MN-32 <= d < MN	-43.48	-42.84	-76.65	-76.03	-41.45	-40.26	-76.35	-76.55	-39.28	-42.79	-74.95	-77.70	-45.83	-40.93	-72.35	-78.00	-43.06	-39.45	-73.89	-77.17
#	23	51	26	287	31	31	44	1994	43	12	11	3074	6	28	13	3964	18	28	35	2127
MX < d <= MX+32	79.50	75.01	#DIV/0!	142.55	82.13	74.17	68.50	143.56	73.79	78.17	79.90	143.45	67.00	77.60	79.00	139.30	72.00	73.03	73.25	142.17
#	4	152	0	1364	4	3	2	16	7	3	5	43	1	25	3	15	1	15	4	12
d < MN-32	-262.85	-408.5	-338.04	-564.50	-169.21	-406.94	-716.57	-201.49	-314.81	-306.38	-523.90	-116.92	-331.72	-520.85	-659.39	-122.98	-240.18	-382.74	-506.39	-137.07
#	55	76	23	176	21	82	28	523	16	21	30	1063	16	42	18	1945	45	40	51	677
d > MX+32	503.11	237.12	750.47	204.56	247.79	250.33	353.05	735.95	312.94	417.92	340.00	586.71	496.99	372.39	231.07	615.19	415.93	311.39	429.45	593.66
#	40	69	91	1013	63	18	81	31	18	13	7	29	36	14	36	21	37	42	37	50
Total #	24422	24422	24422	24422	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968
Average	4.15	12.83	0.75	49.09	4.37	13.43	-7.25	-15.58	2.23	14.04	-7.17	-21.91	5.84	12.15	-7.00	-30.84	4.51	14.91	-6.97	-14.78
Std Dev	29.01	40.34	50.81	90.55	15.97	27.65	36.22	64.37	15.18	17.09	27.09	51.68	25.25	31.79	25.17	54.03	26.46	31.53	33.24	55.42

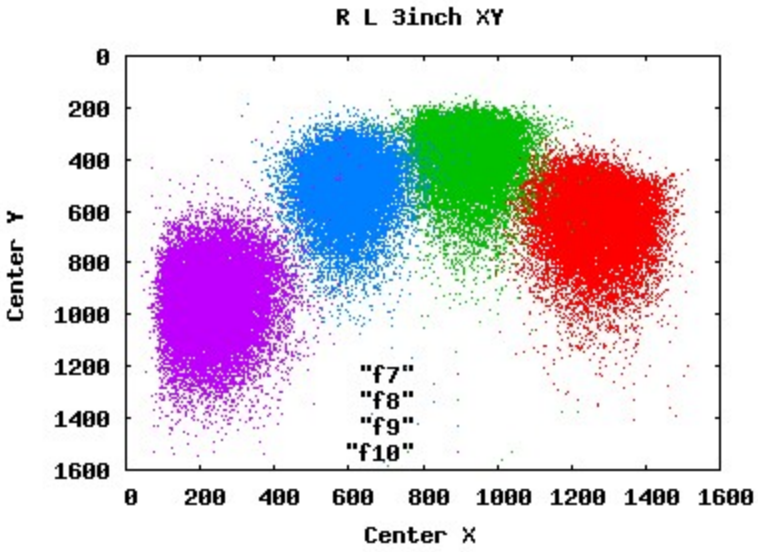
No Finger Found	L. Thumb 64				L. Index 175				L. Middle 15				L. Ring 41				L. Little 158			
	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B
MN <= d < 0	-5.69	-4.71	-10.33	-22.66	-5.05	-9.04	-12.53	-29.80	-5.37	-6.96	-12.57	-32.10	-5.66	-7.19	-12.58	-34.09	-5.19	-7.92	-12.96	-31.03
#	7037	1215	14069	4078	8657	1363	18616	14562	9692	1194	17418	13396	9913	708	16691	12462	7306	856	15948	14237
0 <= d <= MX	10.61	13.75	6.04	56.93	6.93	17.37	8.33	25.58	7.69	16.21	8.00	27.33	7.97	18.26	8.58	25.20	8.67	18.36	8.46	23.59
#	17026	23072	10201	17407	16203	23489	6215	7304	15205	23695	7494	6182	14950	24181	8198	4522	17505	23951	8816	6517
MN-32 <= d < MN	-43.29	-43.11	-75.50	-76.35	-42.40	-38.45	-72.90	-76.68	-42.32	-44.63	-74.72	-77.78	-40.48	-40.60	-74.25	-78.61	-40.58	-39.27	-72.78	-77.27
#	50	14	22	327	29	31	42	2435	19	16	9	3828	25	10	6	5000	49	15	46	3149
MX < d <= MX+32	77.18	72.58	90.67	142.76	82.25	74.86	#DIV/0!	143.44	72.00	75.20	87.50	139.77	69.86	85.83	76.36	147.63	74.30	68.00	82.25	139.17
#	156	6	3	1406	2	7	0	8	4	10	1	37	11	3	7	4	10	2	2	9
d < MN-32	-222.25	-399.60	-364.04	-590.31	-558.46	-1095.06	-420.45	-156.88	-450.92	-495.68	-484.11	-119.66	-306.20	-633.93	-679.74	-123.22	-231.11	-217.47	-505.37	-191.75
#	70	89	13	219	23	54	37	628	26	22	31	1482	32	30	23	2952	45	104	55	991
d > MX+32	255.81	448.38	752.96	201.09	954.27	715.63	313.31	636.69	464.86	523.54	257.59	503.38	406.00	372.61	247.71	734.38	172.61	366.63	650.03	525.24
#	83	26	114	985	50	20	54	27	18	27	11	39	33	32	39	24	49	36	97	61
Total #	24422	24422	24422	24422	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964
Average	6.39	11.77	-0.16	46.81	4.10	14.03	-7.34	-20.59	2.44	15.19	-6.88	-28.49	2.66	17.19	-5.83	-42.04	4.43	16.95	-4.01	-27.56
Std Dev	26.72	36.26	56.08	97.75	50.05	62.39	28.86	55.20	23.10	28.96	25.28	52.91	21.68	29.32	27.96	56.66	16.63	23.55	51.71	78.45

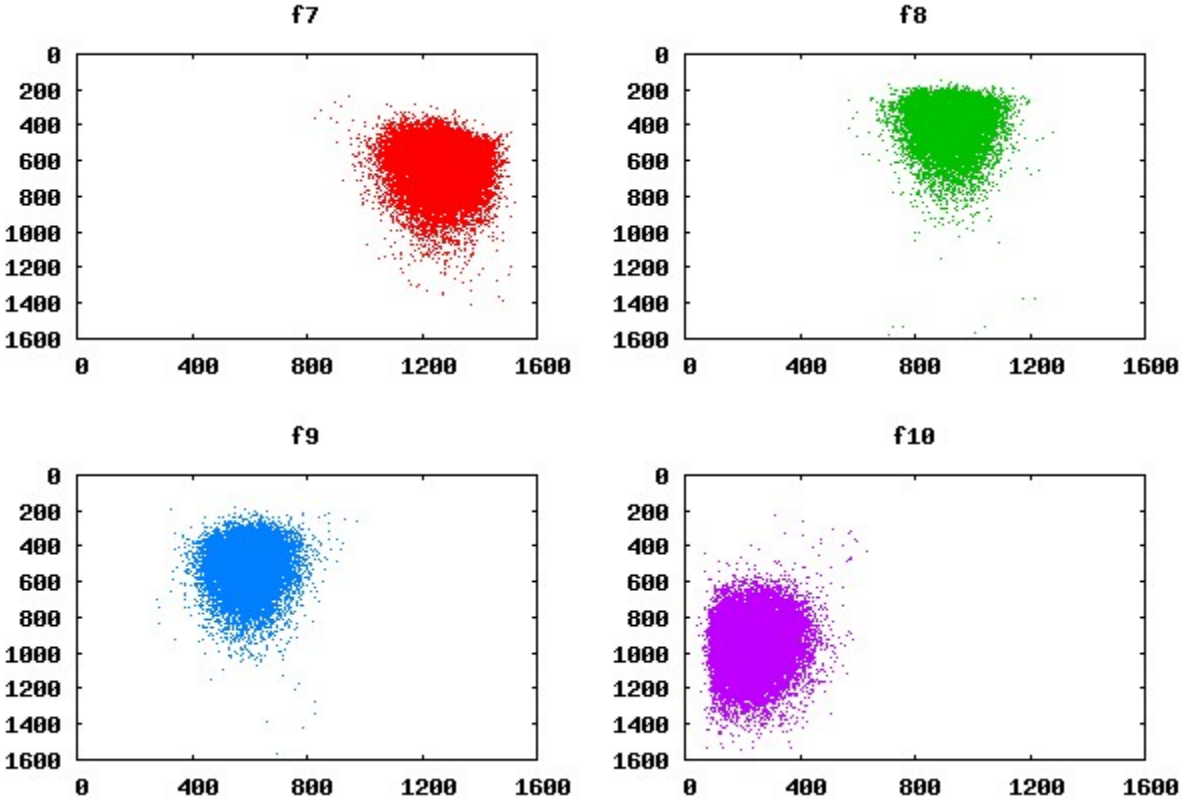
Appendix D. Plots of 3-inch segmentation box centers.

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.

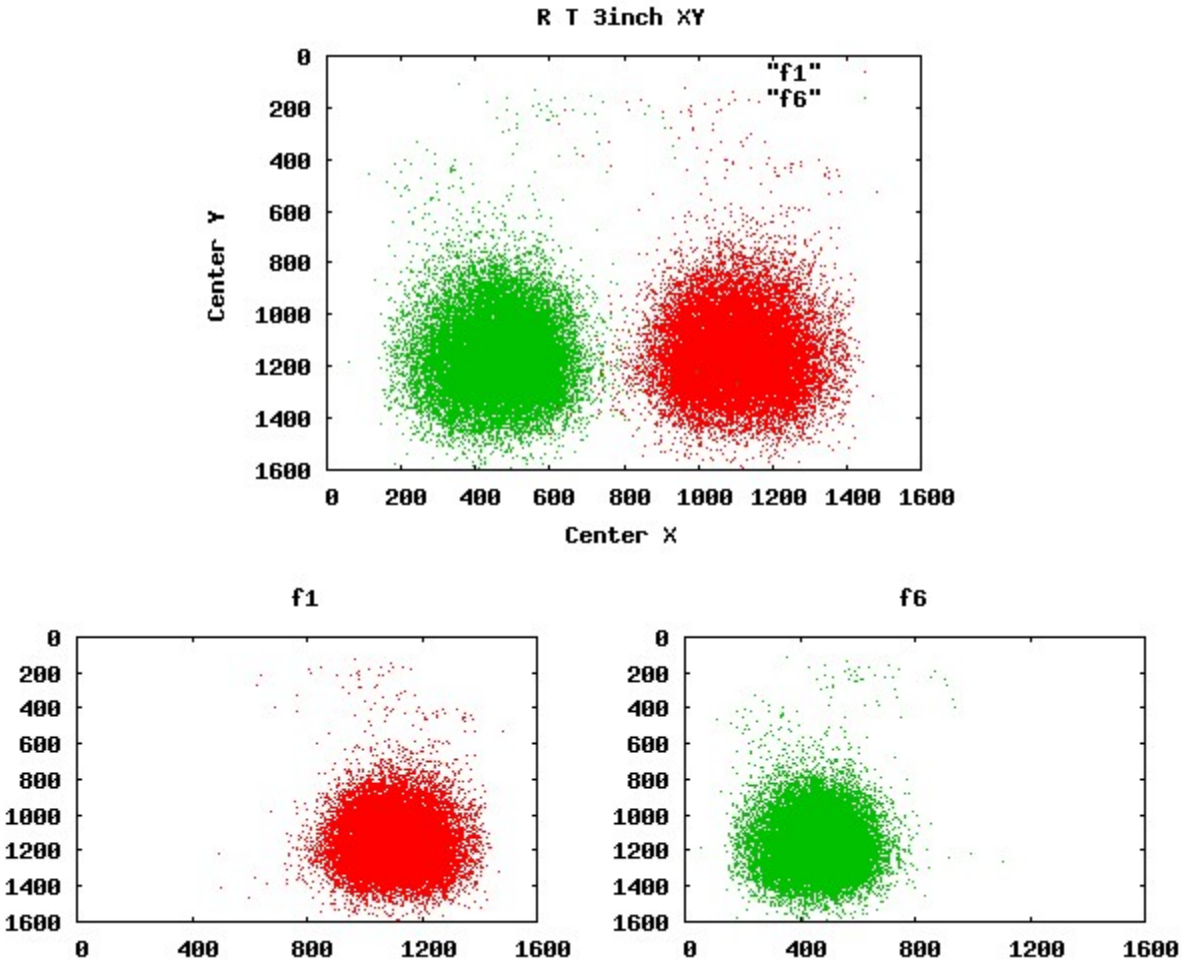


R = C-DAC





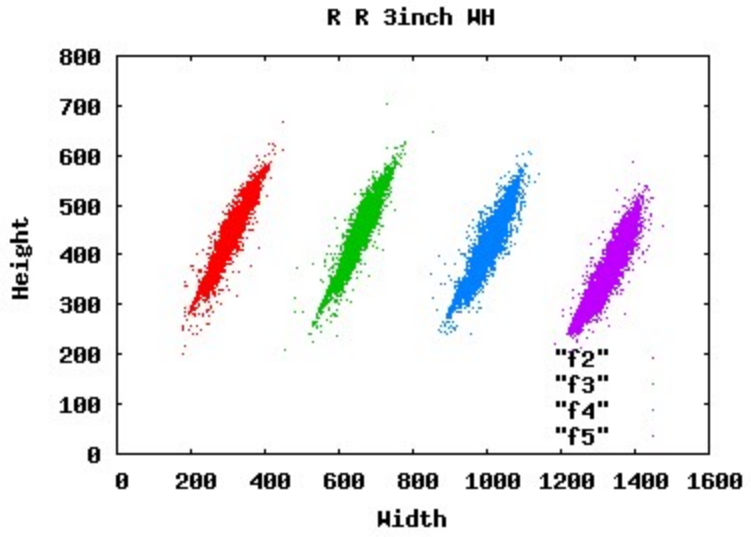
R = C-DAC

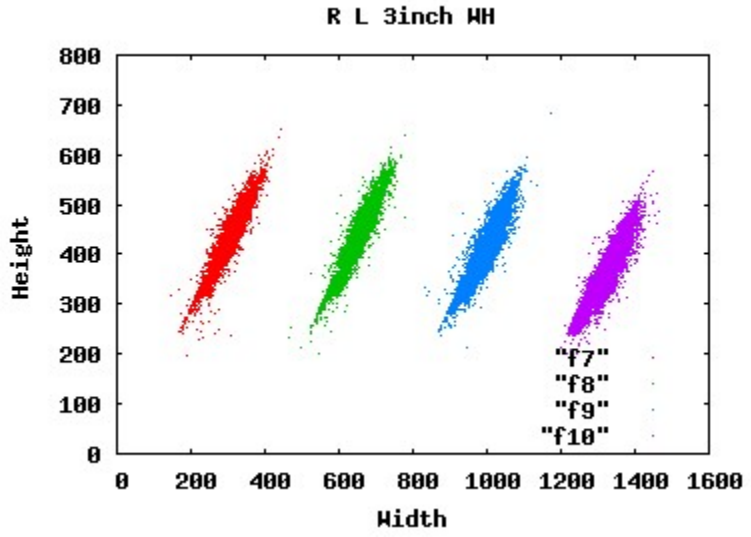

R T 3inch XY
"f1"
"f6"
Center Y
Center X
0
200
400
600
800
1000
1200
1400
1600
f1
f6

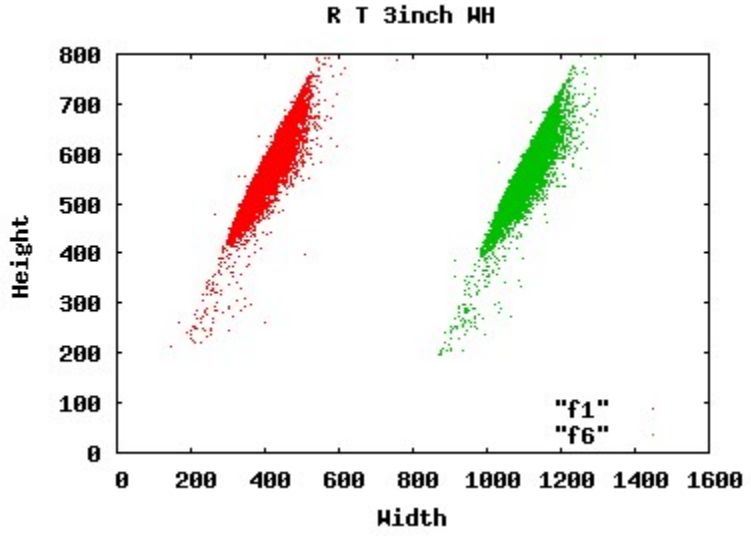
R = C-DAC

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.


R R 3inch WH
Height
Width
"f2"
"f3"
"f4"
"f5"

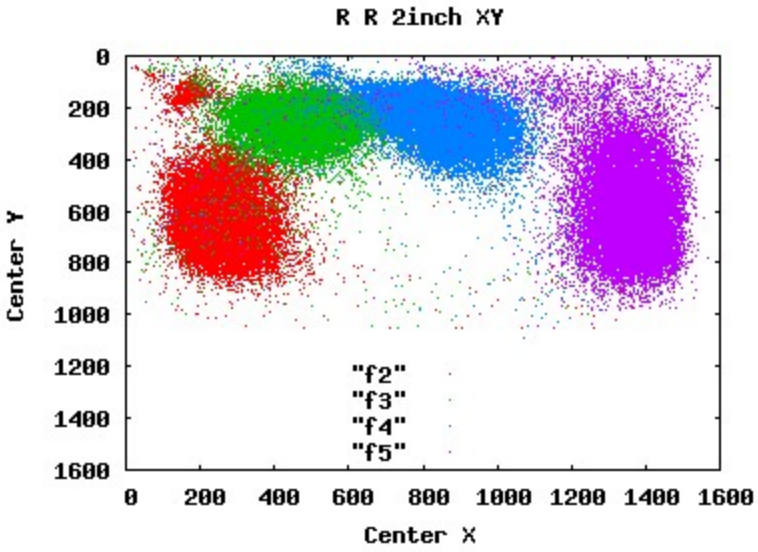

R L 3inch WH
Height
Width
"f7"
"f8"
"f9"
"f10"

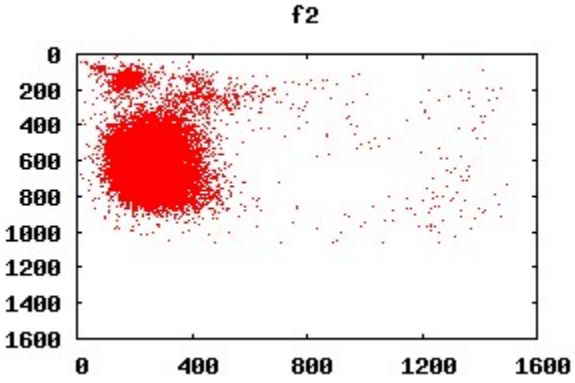

R T 3inch WH
Height
Width
"f1"
"f6"

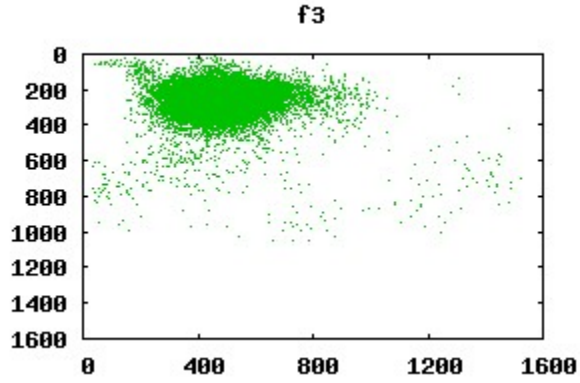
R = C-DAC

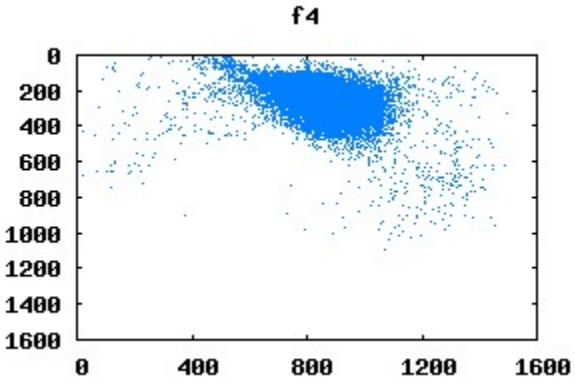
Appendix F. Plots of 2-inch segmentation box centers.

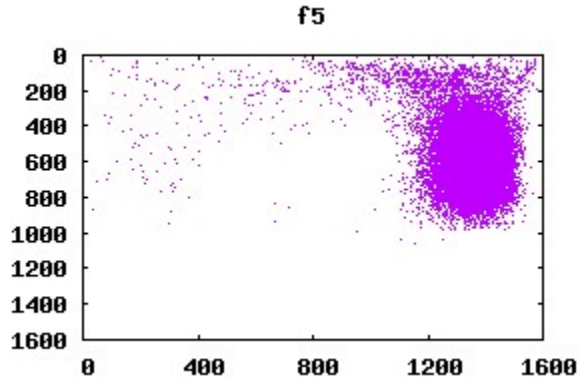
The plots in this appendix show the distribution of the segmentation box centers (x,y) for the 2-inch data. There is a combined plot for each slap image and then a smaller plot for each finger position. The individual finger plots are better for seeing the full "spread" of x,y positions detected. The 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.



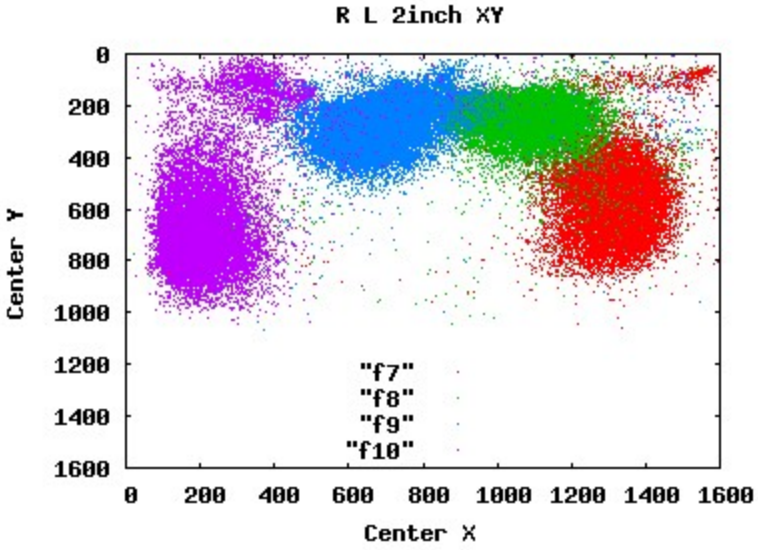


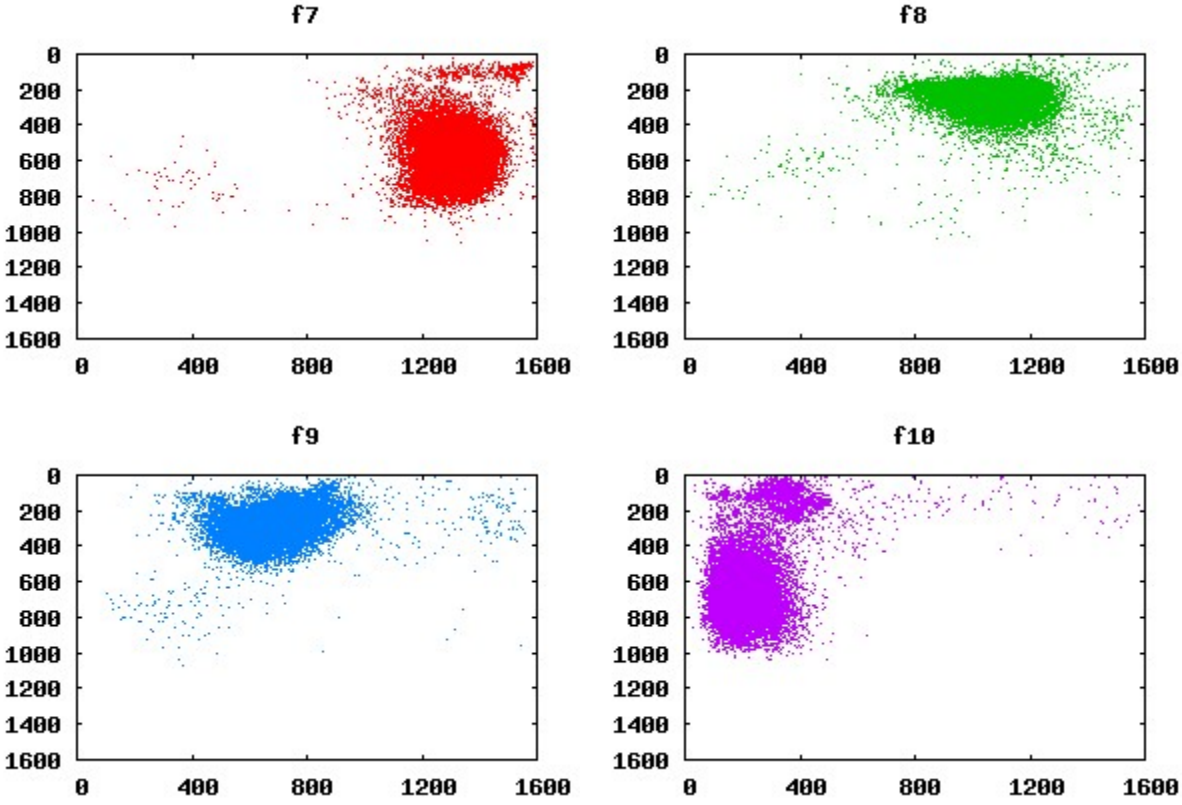






R = C-DAC

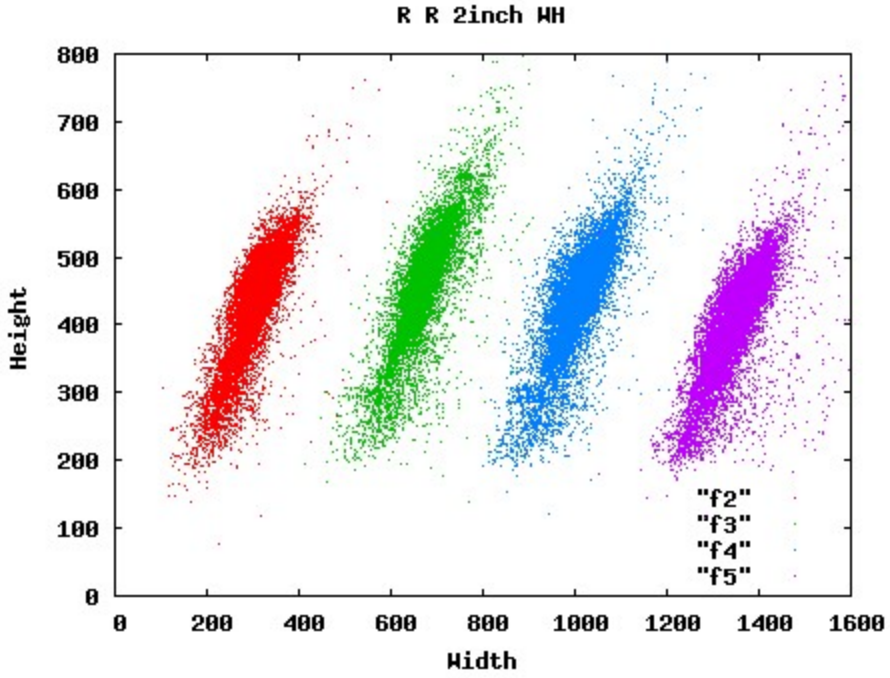


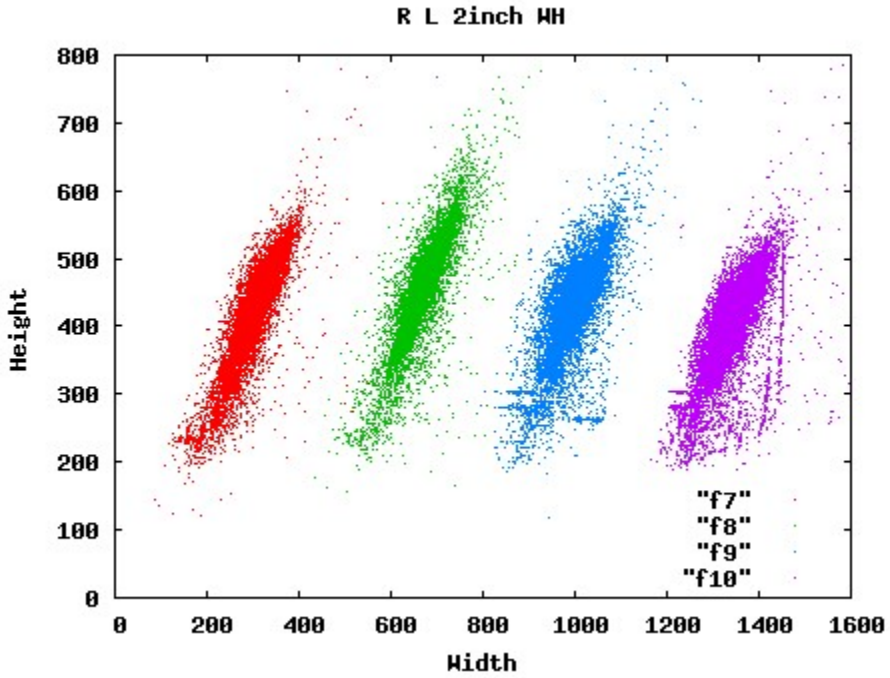


R = C-DAC

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.


R R 2inch WH
Height
Width
0
100
200
300
400
500
600
700
800
0
200
400
600
800
1000
1200
1400
1600
"f2"
"f3"
"f4"
"f5"


R L 2inch WH
Height
Width
0
100
200
300
400
500
600
700
800
0
200
400
600
800
1000
1200
1400
1600
"f7"
"f8"
"f9"
"f10"

Q = Lakota