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.

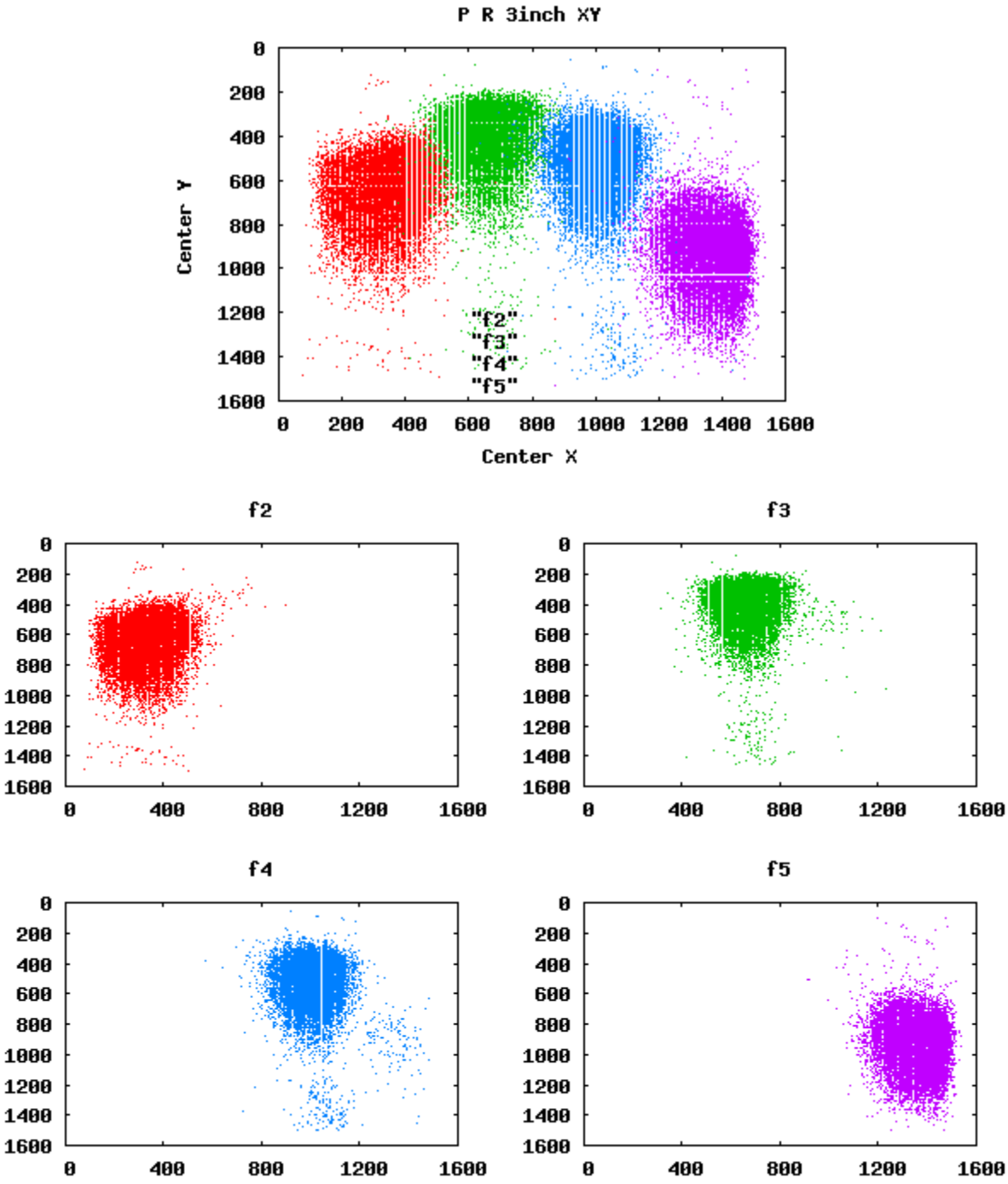
P = Lakota

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	-10.18	-9.86	-13.90	-16.95	-6.89	-7.33	-11.70	-15.92	-7.56	-7.07	-10.04	-17.45	-6.48	-7.23	-8.10	-18.51	-6.74	-8.64	-11.12	-14.68
#	9284	9699	14708	4612	8788	3814	16070	8299	6768	4558	11444	7635	9011	5395	10894	7823	6944	6906	15156	8340
0 <= d <= MX	9.67	11.76	12.93	32.10	6.09	11.17	13.18	22.20	6.42	11.30	15.20	32.81	7.45	13.49	15.29	31.77	6.37	9.19	12.56	19.87
#	14621	13984	9385	16180	15955	21028	8756	16059	17982	20239	13323	16102	15598	19087	13739	15332	17661	17478	9490	15571
MN-32 <= d < MN	-38.47	-41.59	-76.47	-78.18	-42.93	-43.43	-75.14	-74.90	-42.95	-41.84	-75.24	-76.89	-46.22	-38.94	-75.25	-77.42	-42.13	-40.91	-73.81	-77.15
#	244	379	63	185	109	35	22	182	83	43	17	370	107	111	12	493	86	216	26	222
MX < d <= MX+32	83.42	75.54	#DIV/0!	143.72	75.93	74.00	73.75	141.51	75.60	76.61	70.17	141.98	75.17	74.92	82.40	142.08	69.83	77.14	69.25	142.74
#	12	56	0	1272	14	15	4	147	10	23	6	385	6	155	5	453	6	87	4	213
d < MN-32	-208.94	-400.1	-170.97	-721.26	-205.10	-189.65	-725.33	-226.86	-253.91	-240.93	-645.04	-133.18	-253.59	-285.97	-675.49	-158.50	-146.05	-1260.43	-455.91	-702.25
#	154	242	29	365	84	24	58	108	111	22	170	92	231	34	290	216	49	241	34	385
d > MX+32	516.42	251.05	784.03	202.91	215.08	309.69	311.46	378.40	308.32	333.15	231.13	380.30	429.27	278.66	266.50	366.85	1142.98	181.26	684.01	233.41
#	107	62	237	1808	18	52	58	173	14	83	8	384	15	186	28	651	222	40	258	237
Total #	24422	24422	24422	24422	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968
Average	2.52	-0.98	3.81	29.20	0.79	8.74	-3.93	10.92	1.51	8.76	-0.84	22.23	0.04	10.73	-2.69	22.95	12.38	-7.92	4.41	-0.59
Std Dev	47.19	62.76	82.59	127.74	17.56	19.80	43.46	54.12	23.05	24.88	63.65	70.63	32.19	34.13	80.09	81.71	111.30	133.56	75.53	111.51

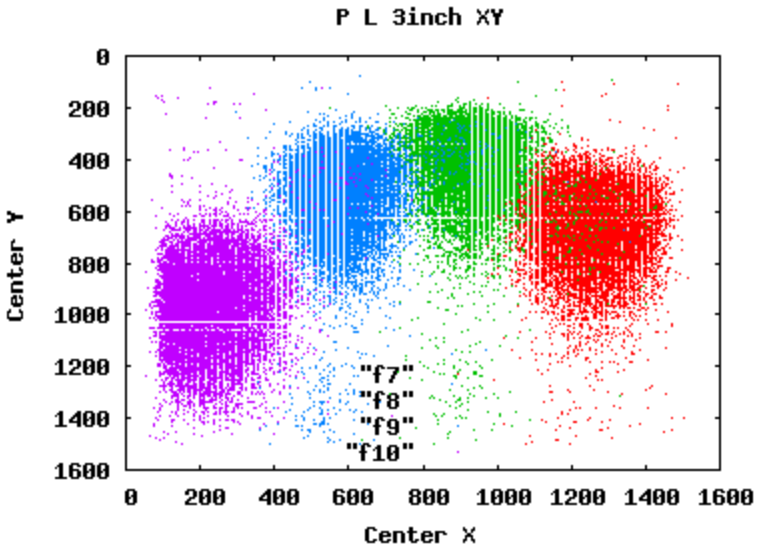
No Finger Found	L. Thumb 64				L. Index 175				L. Middle 15				L. Ring 41				L. Little 158			
	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B
MN <= d < 0	-8.95	-10.78	-15.38	-17.07	-6.86	-9.33	-11.79	-16.40	-4.80	-8.07	-10.02	-19.03	-4.63	-8.36	-7.69	-20.49	-7.68	-8.83	-11.25	-16.01
#	8636	10654	15817	5280	3234	7092	15155	7960	5837	6225	10411	8213	5339	7126	9649	9615	7286	5302	14024	10116
0 <= d <= MX	11.26	9.92	12.17	31.78	8.40	9.27	14.06	21.96	10.24	10.26	15.35	33.25	12.54	10.47	16.41	31.32	8.62	9.88	13.10	19.18
#	15079	13194	8366	15614	21346	17102	9390	16077	18779	18323	14181	15129	19047	17381	14960	13307	17217	19351	10701	13892
MN-32 <= d < MN	-42.58	-38.31	-74.91	-76.22	-44.72	-40.78	-73.96	-76.29	-43.25	-41.68	-76.17	-76.69	-40.39	-43.15	-77.13	-77.14	-43.65	-41.64	-73.26	-77.04
#	376	390	49	183	29	366	23	199	36	129	12	514	23	154	8	806	131	148	41	255
MX < d <= MX+32	75.56	82.50	85.50	143.99	77.24	80.47	74.40	142.79	77.81	76.61	87.50	142.31	76.68	77.40	81.07	143.46	76.83	74.38	81.50	143.18
#	70	8	2	1296	23	32	5	179	54	18	6	391	276	5	15	383	153	4	2	224
d < MN-32	-262.62	-264.17	-382.30	-607.25	-322.37	-1139.44	-767.33	-691.12	-310.76	-252.03	-484.20	-159.08	-314.31	-118.38	-835.79	-146.41	-264.58	-137.54	-520.42	-327.07
#	205	89	38	244	23	345	69	374	232	57	343	149	186	122	184	373	117	53	62	234
d > MX+32	237.17	478.05	741.99	210.60	1016.91	296.44	403.48	393.89	357.81	345.48	257.27	362.25	135.89	358.71	193.03	399.27	136.14	359.12	515.85	293.50
#	56	87	150	1805	309	27	322	175	26	212	11	568	93	176	148	480	60	106	134	243
Total #	24422	24422	24422	24422	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964
Average	1.69	0.81	-1.97	33.19	18.60	-12.22	1.16	1.74	4.17	7.72	-2.02	21.83	7.55	6.60	1.87	14.00	3.03	6.78	0.66	4.48
Std Dev	37.32	41.92	66.60	105.72	117.29	146.42	66.06	105.53	37.24	40.52	71.31	78.64	34.61	35.81	77.51	81.78	25.03	27.89	52.15	62.44

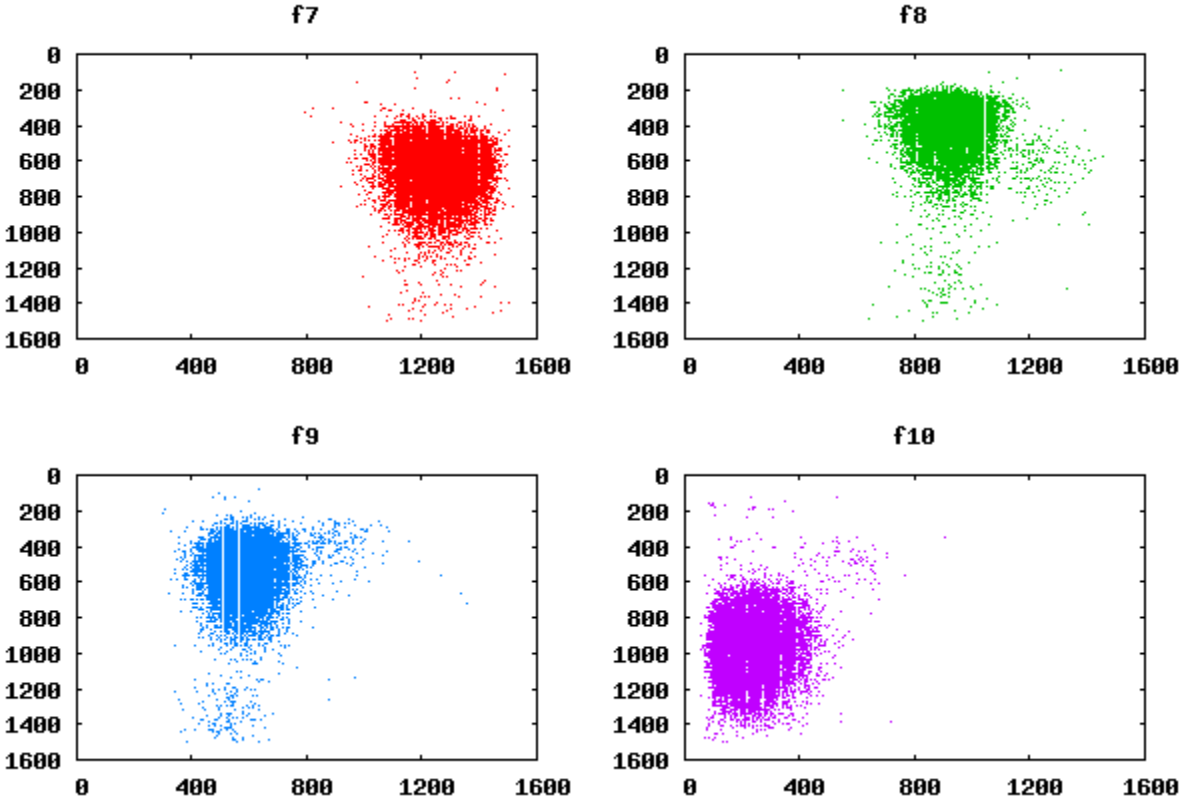
Appendix D. Plots of 3-inch segmentation box centers.

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.

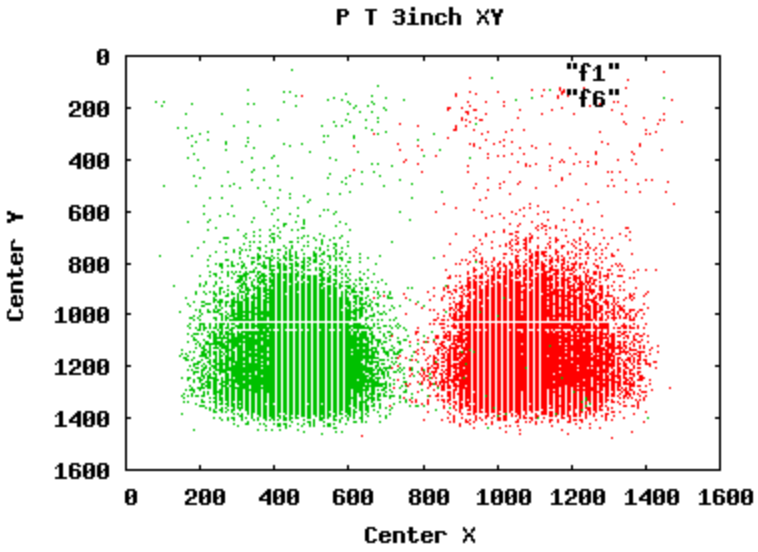


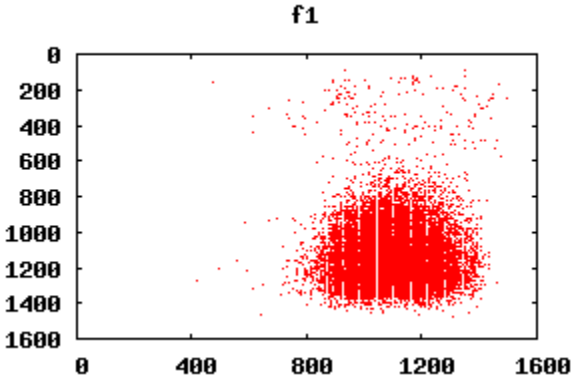
P = Lakota

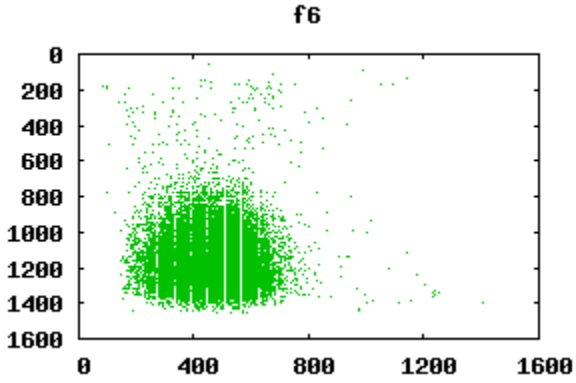

P L 3inch XY
Center Y
Center X
"f7"
"f8"
"f9"
"f10"
0
200
400
600
800
1000
1200
1400
1600


f7
f8
f9
f10
0
400
800
1200
1600

P = Lakota


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

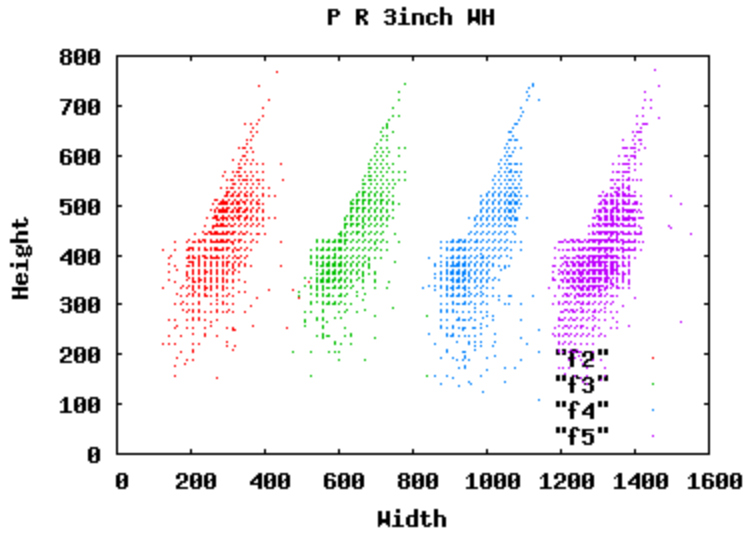

f1
0
200
400
600
800
1000
1200
1400
1600

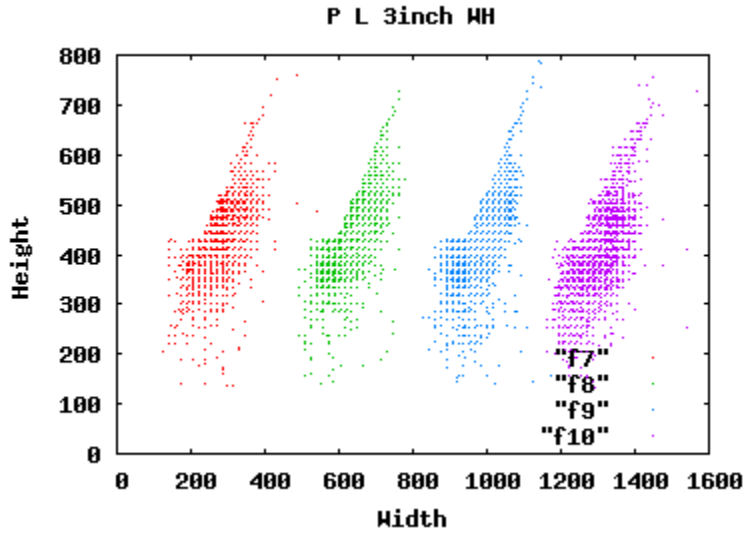

f6
0
200
400
600
800
1000
1200
1400
1600

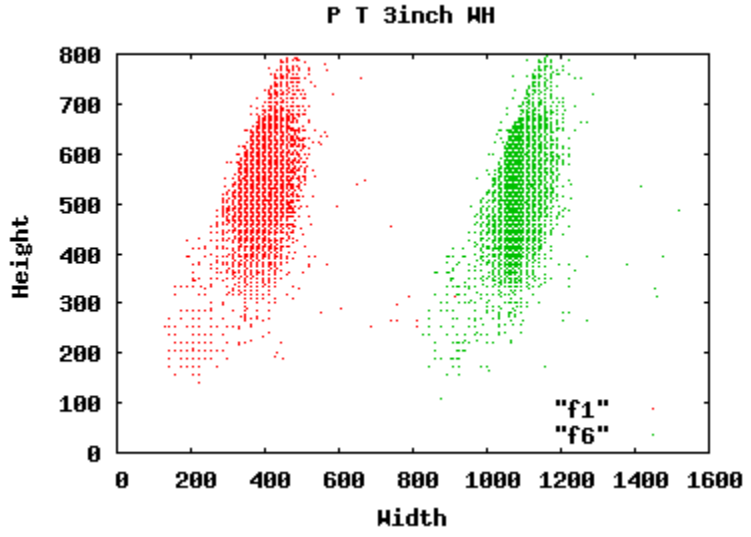
P = Lakota

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.


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

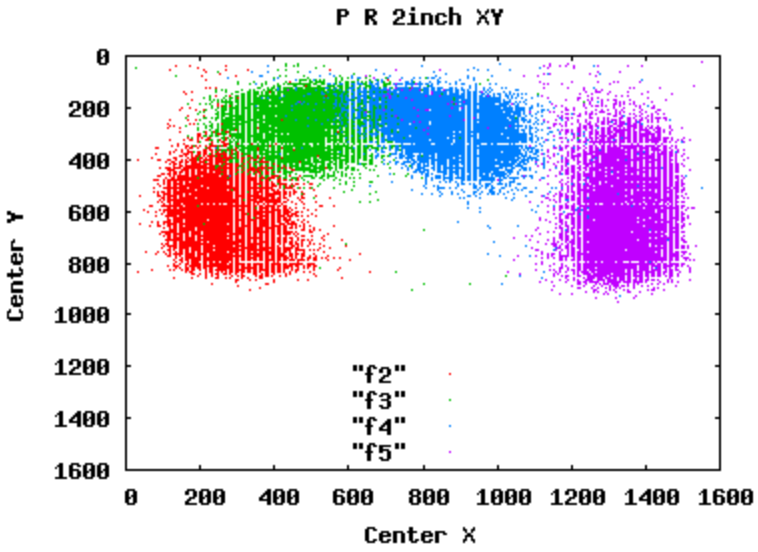

P L 3inch WH
Height
Width
"f7"
"f8"
"f9"
"f10"

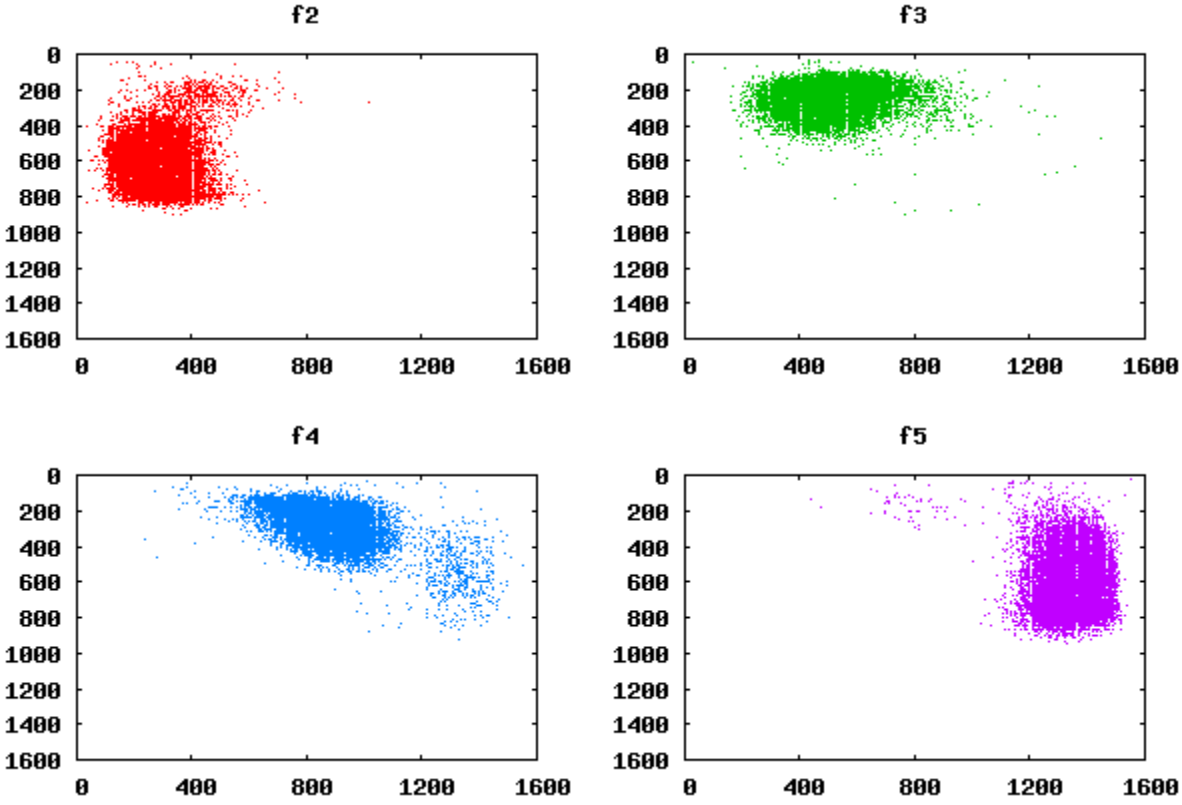

P T 3inch WH
Height
Width
"f1"
"f6"

P = Lakota

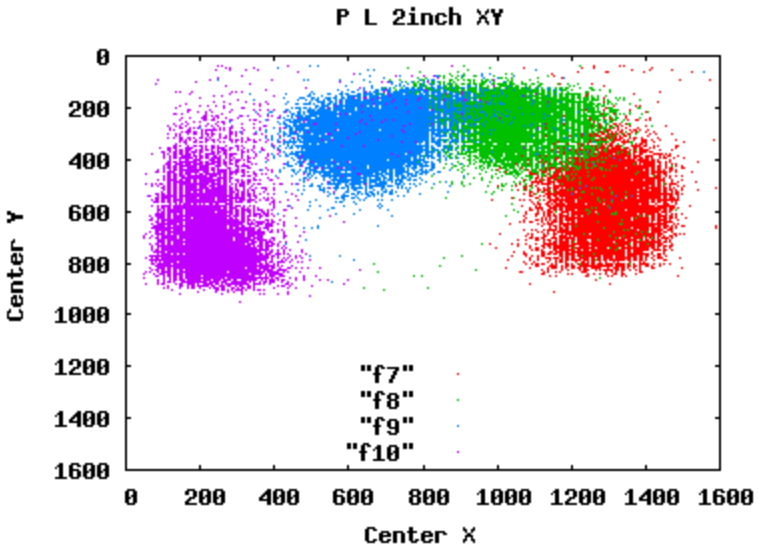
Appendix F. Plots of 2-inch segmentation box centers.

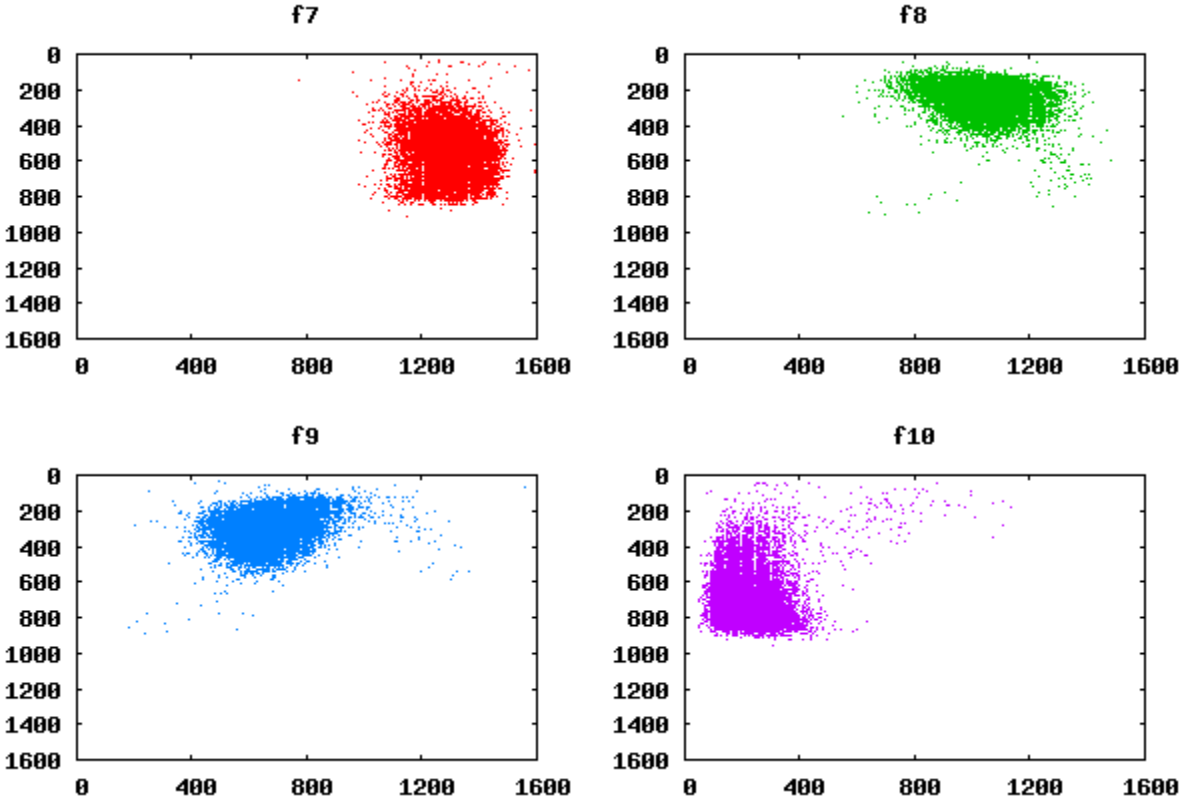
The plots in this appendix show the distribution of the segmentation box centers (x,y) for the 2-inch data. There is a combined plot for each slap image and then a smaller plot for each finger position. The individual finger plots are better for seeing the full “spread” of x,y positions detected. The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





P = Lakota

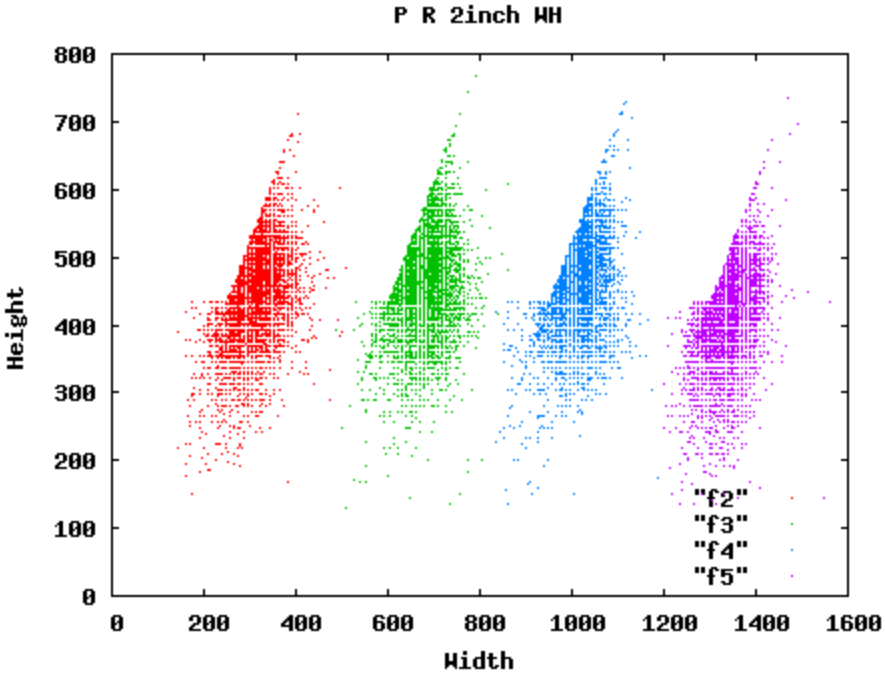


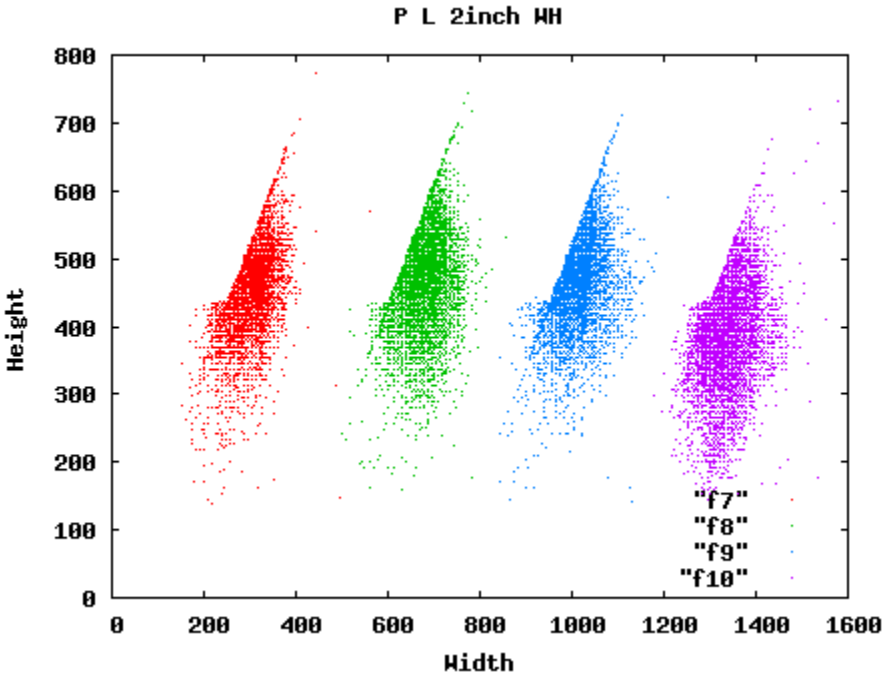


P = Lakota

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.


P R 2inch WH
Height
Width
"f2"
"f3"
"f4"
"f5"


P L 2inch WH
Height
Width
"f7"
"f8"
"f9"
"f10"

P = Lakota