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.

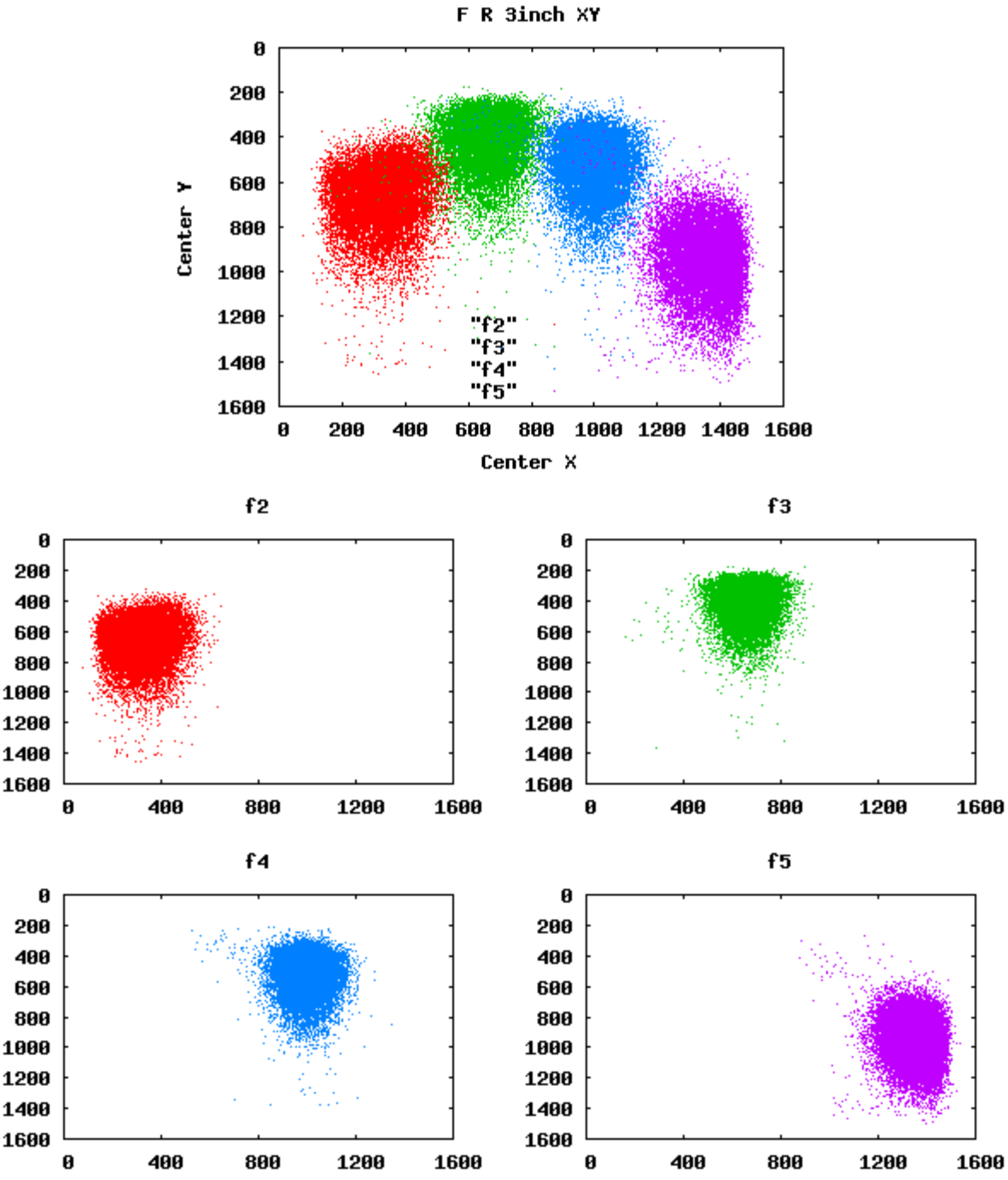
F

	R. Thumb				R. Index				R Middle				R. Ring				R. Little			
No Finger Found	9				102				58				41				91			
	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B
MN <= d < 0	-4.32	-5.55	-9.82	-15.60	-4.57	-6.29	-9.73	-10.64	-2.81	-6.30	-9.95	-11.92	-3.40	-7.35	-10.08	-11.92	-4.35	-4.67	-10.20	-12.00
#	367	263	13876	7318	770	192	15863	1124	797	221	15174	1949	282	719	14590	1543	451	1136	14268	688
0 <= d <= MX	20.67	22.66	7.57	23.63	23.04	28.28	11.20	31.31	23.41	26.21	11.81	29.54	23.96	24.53	11.97	31.60	21.18	20.71	11.73	35.77
#	24010	23949	10488	16163	23777	24196	8937	23392	23655	24297	9686	22595	24390	23843	10270	22930	24233	23507	10451	23829
MN-32 <= d < MN	-53.50	-49.00	-78.04	-77.25	-41.00	-44.17	-79.50	-74.62	#DIV/0!	-36.50	-71.70	-76.42	-51.50	-41.00	-70.83	-77.27	-49.12	-40.25	-76.11	-77.37
#	1	6	14	290	2	3	11	26	0	2	5	94	5	2	6	87	29	4	19	15
MX < d <= MX+32	72.64	73.58	75.75	143.56	74.70	75.84	74.64	142.71	74.85	75.05	74.23	140.83	74.18	76.16	75.72	143.59	73.67	74.82	65.50	142.90
#	14	154	6	181	291	417	7	145	371	286	15	108	182	277	9	186	87	130	1	53
d < MN-32	-692.11	-619.17	-377.64	-188.03	-255.63	-442.55	-723.63	-730.89	-360.50	-587.45	-364.11	-394.74	-261.08	-680.40	-591.28	-393.34	-154.03	-926.17	-416.39	-747.28
#	19	12	25	148	4	96	49	101	3	85	44	84	6	72	25	79	20	136	110	119
d > MX+32	435.68	514.20	592.65	235.70	191.60	142.38	358.45	350.90	331.27	129.29	194.66	266.05	482.54	148.55	245.63	265.53	821.56	156.59	585.22	318.55
#	11	38	13	322	124	64	101	180	142	77	44	138	103	55	68	143	148	55	119	264
Total #	24422	24422	24422	24422	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968
Average	19.96	23.11	-2.42	13.08	23.58	27.29	-2.16	29.18	25.04	24.71	-1.73	26.27	25.83	22.42	-0.88	29.37	25.42	14.97	-0.02	33.88
Std Dev	25.99	35.03	24.98	52.26	19.82	33.85	43.09	65.26	31.56	41.64	24.75	43.17	38.05	47.35	28.69	45.25	71.51	83.53	52.91	70.76

	L. Thumb				L. Index				L. Middle				L. Ring				L. Little			
No Finger Found	5				89				40				47				92			
	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B
MN <= d < 0	-5.22	-3.99	-11.03	-15.99	-2.83	-8.63	-9.85	-9.90	-2.27	-7.26	-10.13	-11.96	-2.64	-7.61	-10.04	-11.26	-7.90	-8.74	-10.44	-11.16
#	380	167	15726	7299	509	666	15589	1183	797	339	14662	2285	989	237	13781	2272	2327	378	13367	1029
0 <= d <= MX	21.16	22.96	7.39	23.65	23.74	27.70	11.54	30.40	22.54	28.67	11.72	28.14	21.81	29.32	12.59	28.06	20.22	27.36	12.39	31.85
#	23757	24202	8637	16133	23984	23752	9224	23337	23814	23894	10212	22238	23588	24324	11080	22188	22244	24245	11323	23419
MN-32 <= d < MN	-46.07	-41.75	-77.88	-78.09	#DIV/0!	-39.38	-77.90	-78.12	-42.17	-46.50	-75.63	-77.57	#DIV/0!	-45.07	-74.25	-78.55	-43.25	-46.54	-70.35	-75.85
#	7	4	12	218	0	8	5	34	3	1	8	106	0	7	4	55	4	26	30	17
MX < d <= MX+32	74.87	77.37	71.63	143.46	74.30	74.48	72.79	141.93	75.26	74.40	83.27	141.87	75.25	73.96	82.75	142.33	74.98	74.85	68.83	141.55
#	229	23	16	226	323	403	7	132	233	574	13	119	273	288	4	190	199	155	3	51
d < MN-32	-459.63	-394.46	-383.80	-168.39	-813.75	-1322.07	-577.41	-737.39	-354.96	-927.09	-417.22	-352.88	-271.13	-665.54	-667.36	-426.76	-295.63	-324.52	-5121.60	-846.03
#	16	12	20	121	8	88	46	89	26	44	36	69	26	48	29	84	40	100	132	113
d > MX+32	188.48	840.64	565.05	225.24	734.78	279.22	359.31	318.11	415.31	204.98	215.11	275.20	308.08	258.39	276.55	271.75	164.60	346.78	643.60	317.92
#	33	14	11	425	140	47	93	189	91	112	33	147	88	60	66	175	150	60	109	335
Total #	24422	24422	24422	24422	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964
Average	21.15	23.08	-4.54	14.56	27.57	23.18	-1.61	28.38	23.27	28.33	-1.46	24.96	22.13	28.68	0.00	25.29	18.38	26.39	-24.32	30.09
Std Dev	19.85	25.08	22.28	50.34	68.31	85.63	37.63	60.31	36.43	48.27	24.98	41.41	26.72	37.25	32.80	49.00	23.01	32.36	3930.11	76.32

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.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Center X
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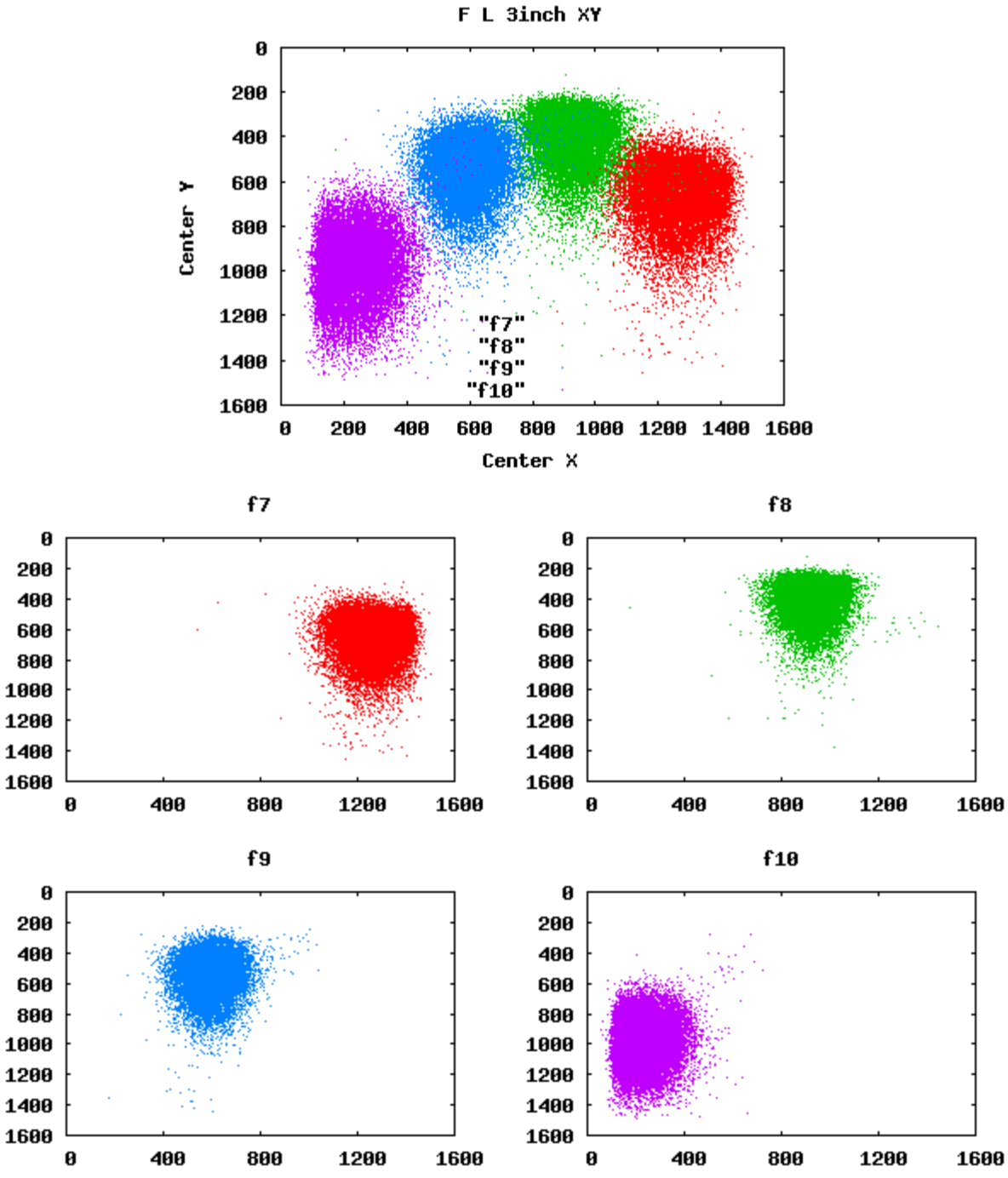
"f3"
"f4"
"f5"
f2
f3
f4
f5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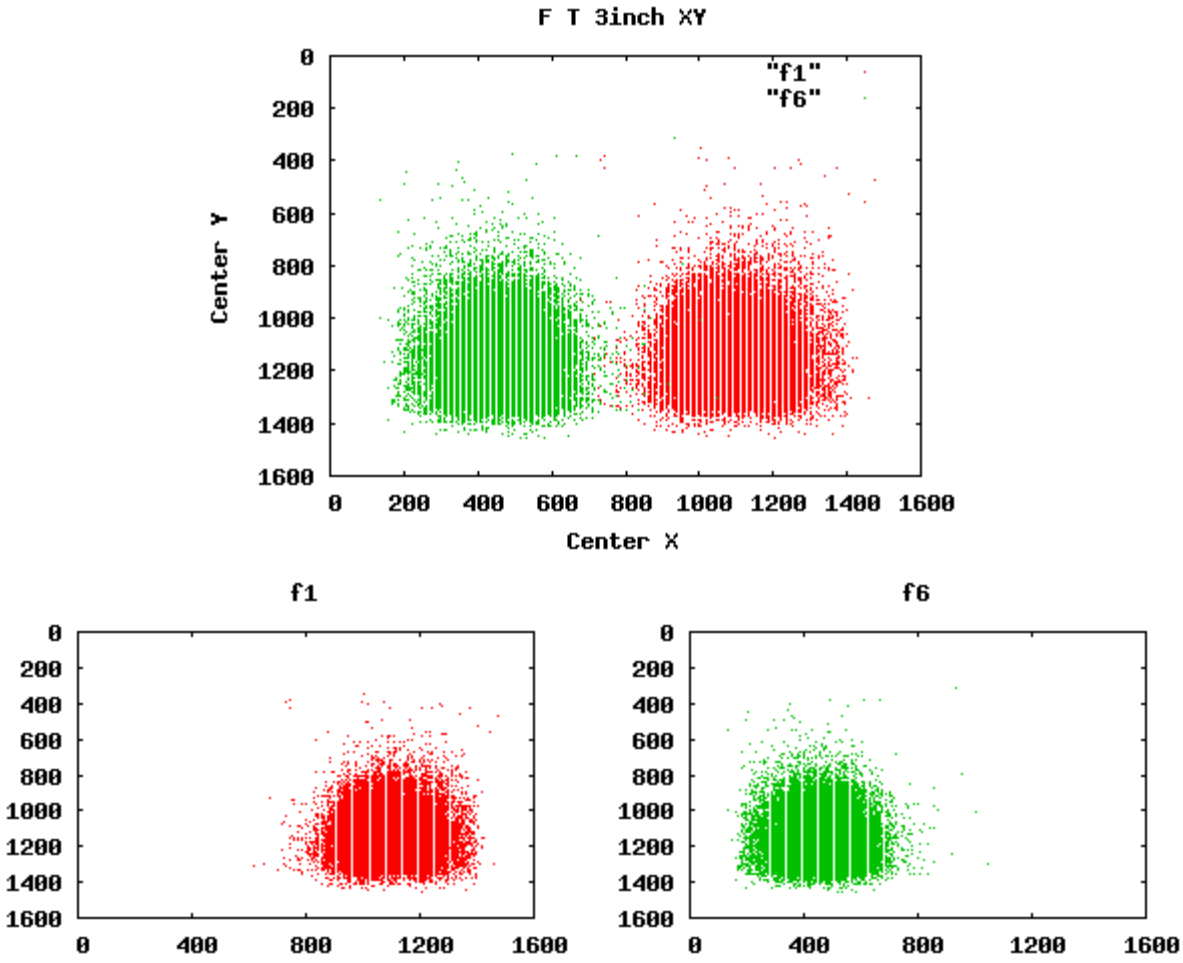
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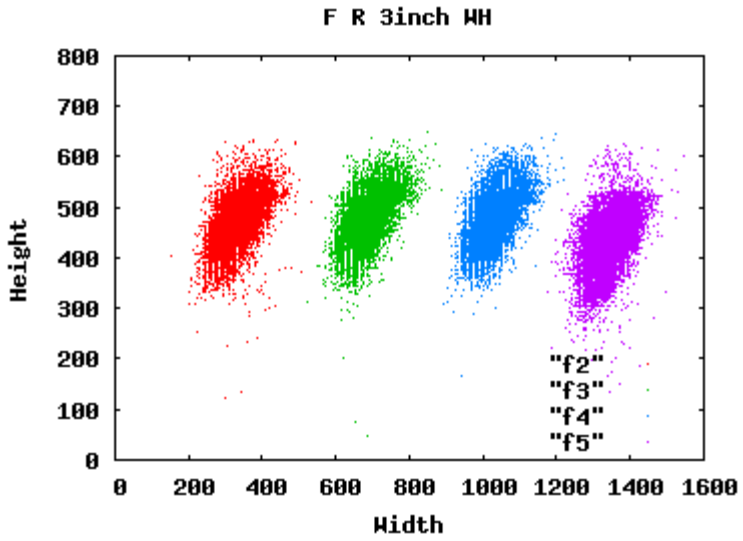
"f6"
Center Y
Center X
0
200
400
600
800
1000
1200
1400
1600
f1
f6

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.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Height
Width
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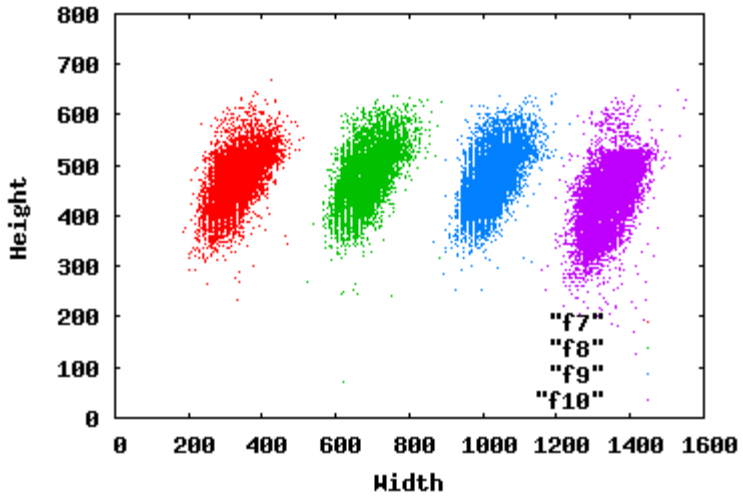
"f4"
"f5"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Height
Width
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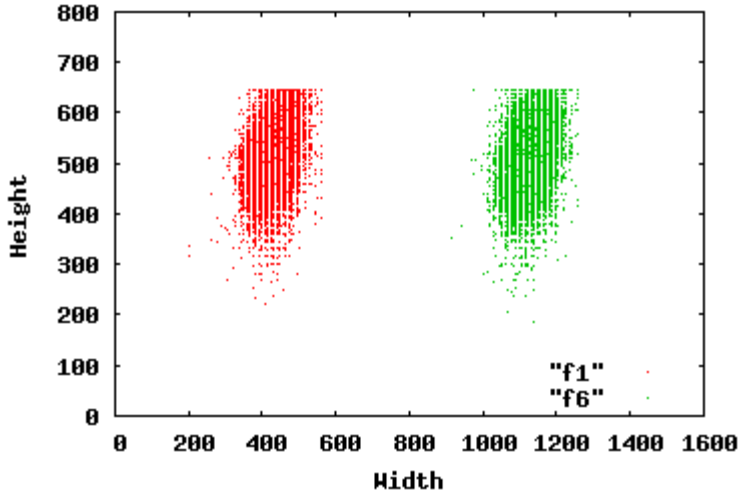
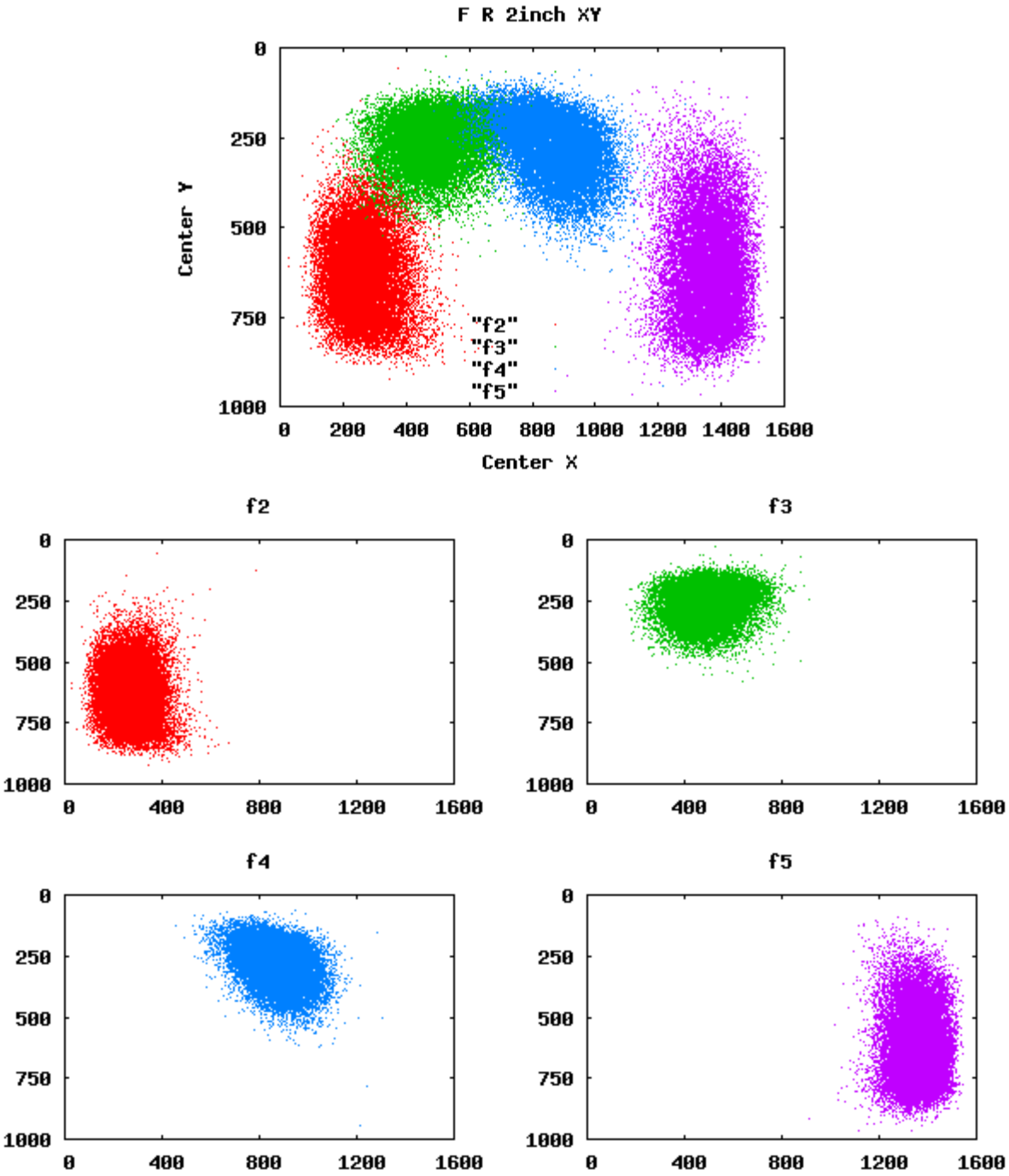
"f9"
"f10"


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

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.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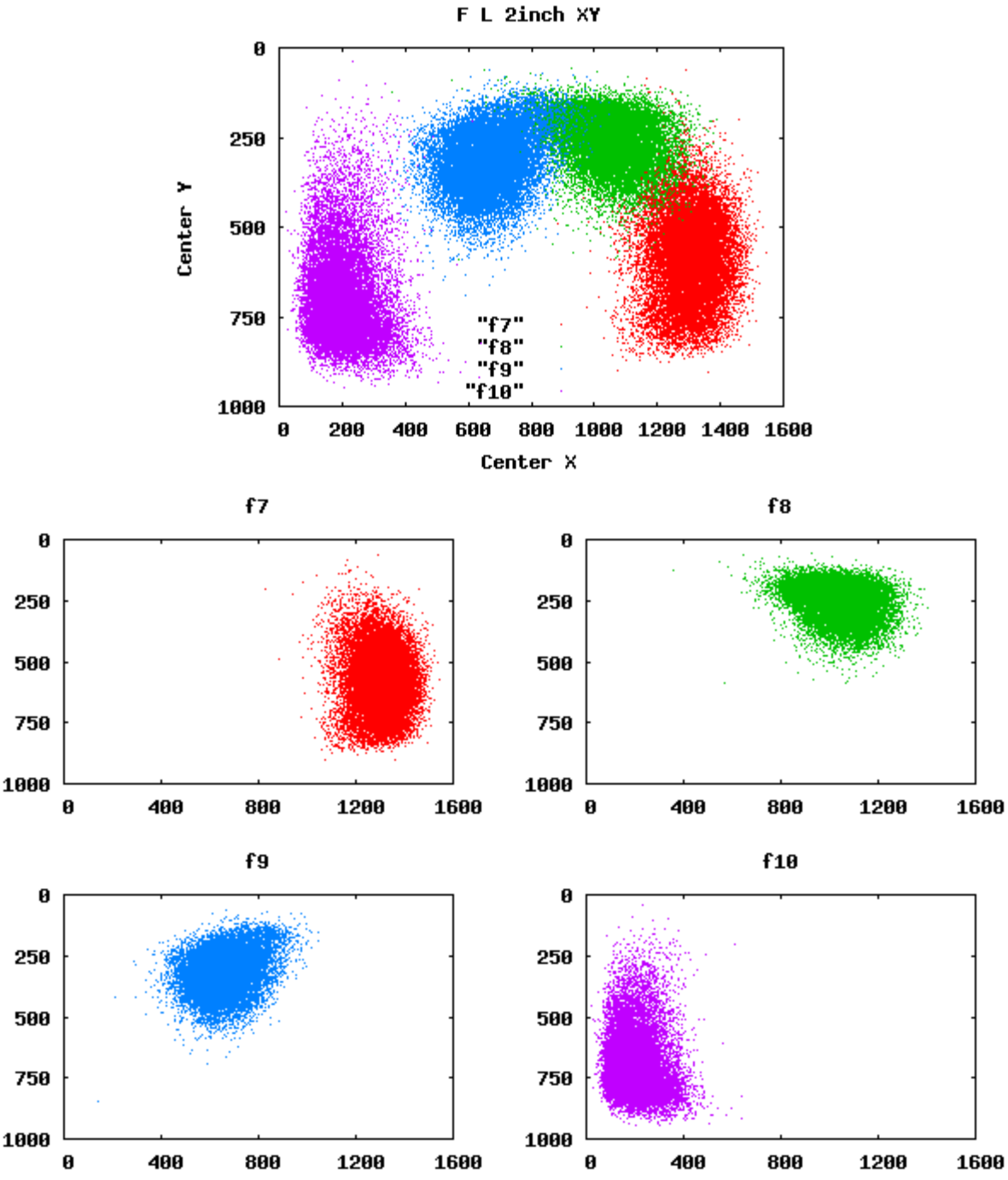
600
800
1000
1200
1400
1600
"f2"
"f3"
"f4"
"f5"
f2
f3
f4
f5
0
400
800
1200
1600


F L 2inch XY
Center Y
Center X
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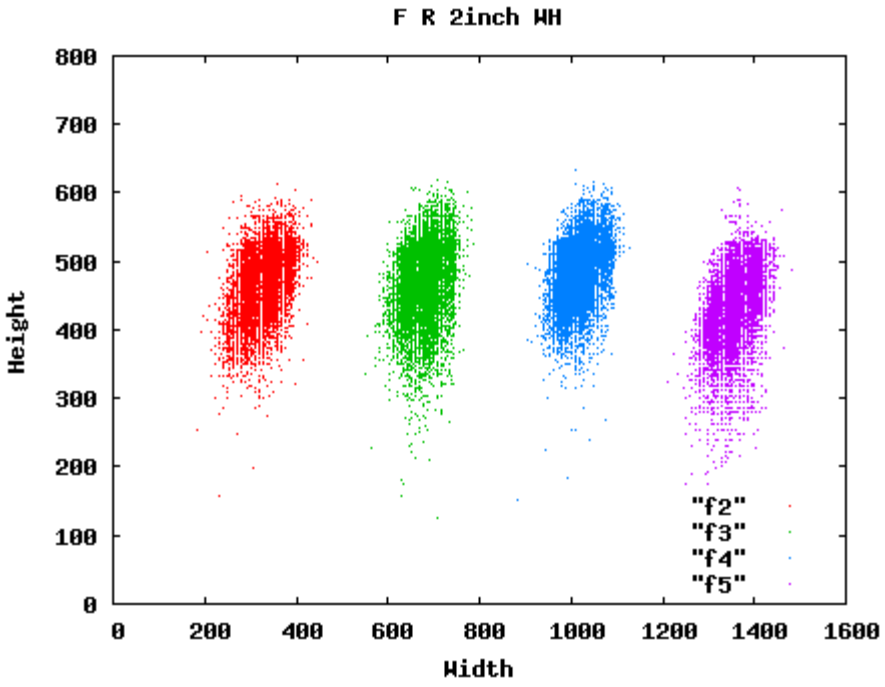
500
750
1000
0
200
400
600
800
1000
1200
1400
1600
"f7"
"f8"
"f9"
"f10"
f7
f8
f9
f10

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.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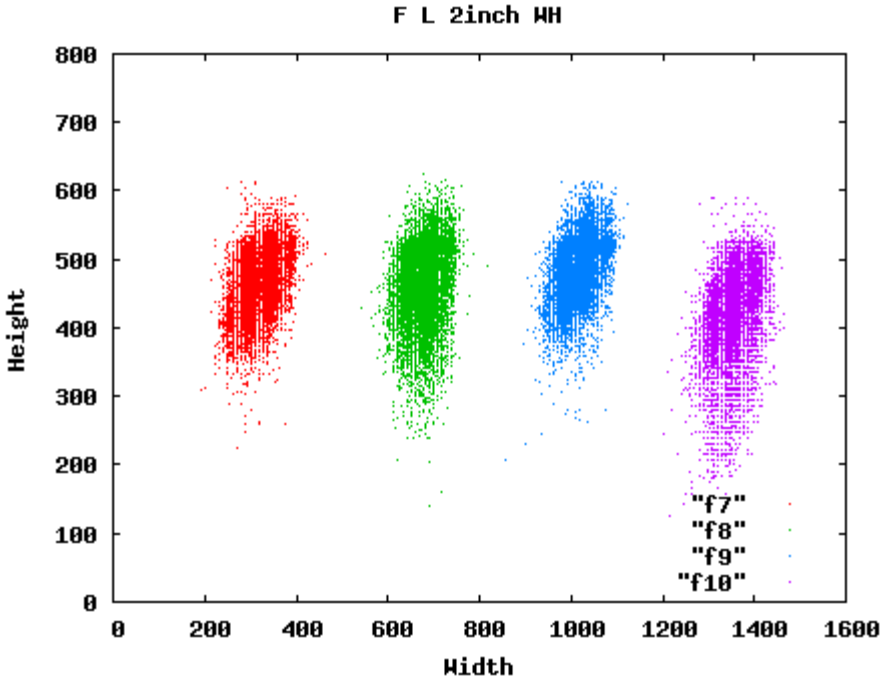
Height
Width
"f2"
"f3"
"f4"
"f5"


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