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.

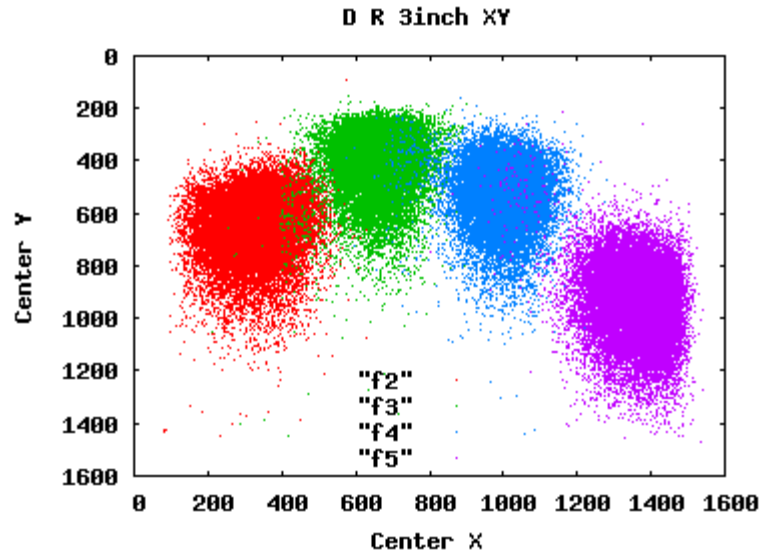
D

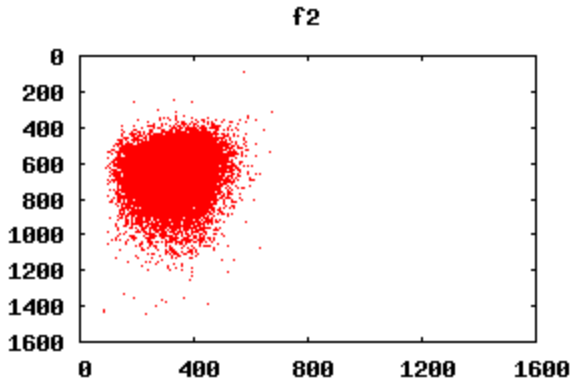
	R. Thumb				R. Index				R Middle				R. Ring				R. Little			
No Finger Found	54				225				18				10				338			
	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B
MN <= d < 0	-10.86	-11.01	-12.47	-22.89	-9.54	-6.10	-15.37	-7.97	-10.55	-6.94	-16.12	-8.73	-7.90	-8.26	-15.81	-8.85	-9.19	-7.01	-14.90	-7.86
#	19487	17757	17661	10815	20731	11835	20445	7373	20924	15032	20228	7437	19328	15741	20167	6366	20942	10845	19001	4655
0 <= d <= MX	5.09	8.08	5.94	18.42	5.10	5.79	7.15	15.34	5.24	5.33	7.06	19.21	4.50	6.23	7.01	20.22	4.05	6.83	6.88	17.40
#	4234	5984	6015	10793	3879	12834	4214	16830	3744	9608	4514	16476	5401	8766	4516	17516	3471	13472	5410	19416
MN-32 <= d < MN	-38.94	-41.34	-78.32	-77.24	-39.24	-40.26	-76.63	-78.70	-36.83	-38.72	-76.88	-76.55	-37.96	-39.35	-73.80	-77.35	-38.68	-38.34	-72.66	-76.65
#	225	475	120	1482	84	34	15	20	62	60	20	63	25	265	20	86	77	166	45	17
MX < d <= MX+32	76.19	76.29	72.90	142.52	81.36	80.00	80.48	143.64	79.91	83.31	76.41	142.57	80.17	80.25	78.58	143.01	82.63	74.88	83.11	143.22
#	26	33	5	112	28	13	25	277	16	26	11	477	12	22	57	516	4	20	22	134
d < MN-32	-197.91	-413.62	-349.33	-204.39	-214.11	-541.14	-632.00	-798.28	-330.43	-334.91	-248.22	-337.10	-453.23	-340.72	-329.17	-182.13	-407.18	-1170.65	-415.78	-963.39
#	399	122	551	1037	9	226	20	239	14	192	185	35	15	147	35	154	17	443	25	451
d > MX+32	527.32	314.16	714.88	260.27	273.40	243.96	389.23	236.25	299.45	227.40	200.30	220.46	298.41	391.07	173.09	209.92	955.37	414.77	688.97	229.42
#	51	51	70	183	237	26	249	229	208	50	10	480	187	27	173	330	457	22	465	295
Total #	24422	24422	24422	24422	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968	24968
Average	-10.19	-8.13	-13.76	-12.75	-4.65	-4.57	-7.97	4.05	-5.79	-4.25	-13.57	16.37	-3.18	-4.95	-10.65	16.27	9.95	-19.96	2.51	-1.91
Std Dev	39.38	47.47	71.37	81.85	29.81	53.68	48.42	89.98	31.45	35.65	26.89	46.99	32.29	36.70	24.70	44.67	141.62	170.71	100.86	144.07

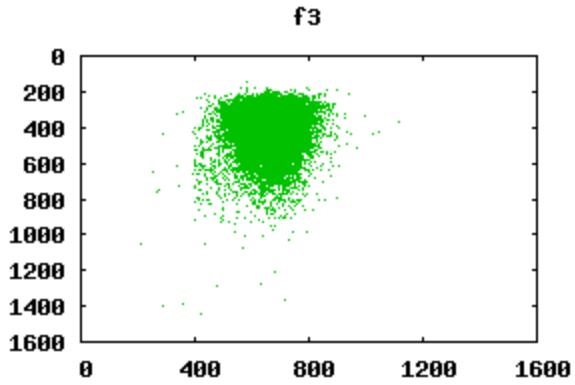
	L. Thumb				L. Index				L. Middle				L. Ring				L. Little			
No Finger Found	35				106				19				43				435			
	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B	L	R	T	B
MN <= d < 0	-12.54	-9.53	-13.94	-22.51	-9.53	-7.74	-15.59	-8.65	-10.71	-7.41	-16.10	-9.99	-11.08	-6.53	-15.82	-9.64	-9.54	-6.74	-15.19	-8.21
#	19570	16968	19165	11764	19697	11707	20004	7106	20337	12767	19814	7497	20102	9317	18620	7945	17591	8387	17189	5652
0 <= d <= MX	8.64	5.80	7.25	18.78	4.44	6.12	6.15	14.66	4.38	5.66	5.68	18.97	5.75	6.29	6.31	18.63	6.21	6.49	6.38	15.28
#	3589	6505	4697	10033	5075	12768	4743	17286	4418	11903	4998	16472	4666	15400	6099	16021	6896	15981	7200	18342
MN-32 <= d < MN	-40.70	-39.80	-77.82	-77.10	-40.56	-40.07	-75.65	-75.82	-39.36	-38.13	-76.00	-76.53	-38.73	-38.34	-78.63	-78.28	-40.32	-39.45	-72.33	-75.32
#	540	165	104	1441	32	315	17	19	36	125	25	70	66	88	8	91	74	109	56	11
MX < d <= MX+32	75.61	77.90	78.22	142.58	79.33	78.87	78.88	142.40	79.32	79.70	73.83	142.29	80.90	82.74	77.46	142.56	77.56	82.44	82.65	143.99
#	33	30	43	128	12	30	29	206	22	23	15	466	20	21	45	488	82	9	17	145
d < MN-32	-548.76	-276.42	-318.98	-190.05	-523.58	-1164.50	-399.56	-713.25	-318.44	-577.07	-288.91	-320.52	-322.53	-590.30	-369.87	-337.25	-316.48	-377.37	-334.62	-1133.87
#	651	171	337	920	13	116	39	128	81	46	94	54	30	64	41	125	21	437	26	465
d > MX+32	461.78	597.55	511.84	259.98	826.33	367.57	374.32	242.15	366.52	324.62	209.64	219.56	378.18	279.49	206.07	216.29	185.32	255.67	770.19	218.38
#	39	583	76	136	135	28	132	219	70	100	18	405	80	74	151	294	300	41	476	349
Total #	24422	24422	24422	24422	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964	24964
Average	-23.47	7.08	-12.55	-12.64	-2.43	-5.91	-9.93	7.27	-7.94	-0.97	-12.61	14.83	-7.06	0.69	-9.50	12.25	-2.91	-4.44	5.61	-7.90
Std Dev	98.14	103.26	56.14	71.67	69.97	86.41	37.54	65.68	32.51	40.01	23.94	48.05	28.27	38.11	28.34	52.49	26.32	53.32	112.40	163.59

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.


D R 3inch XY
Center Y
Center X
"f2"
"f3"
"f4"
"f5"


f2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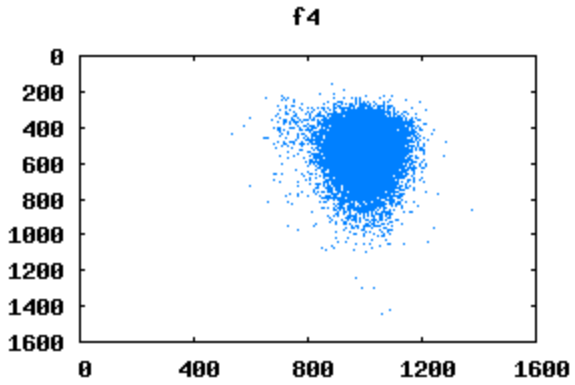
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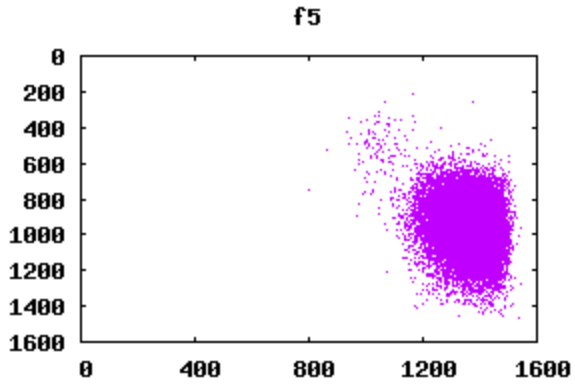
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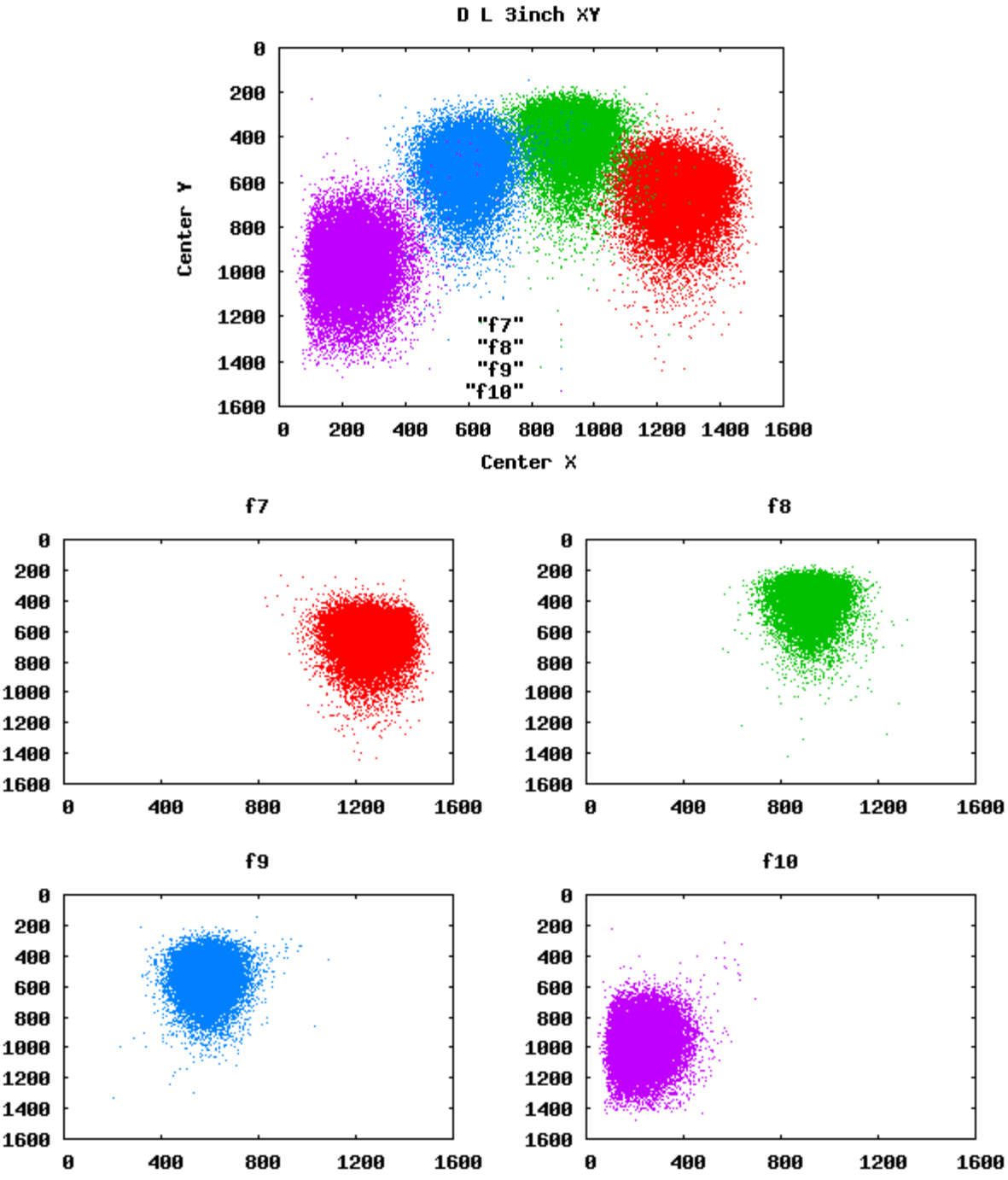
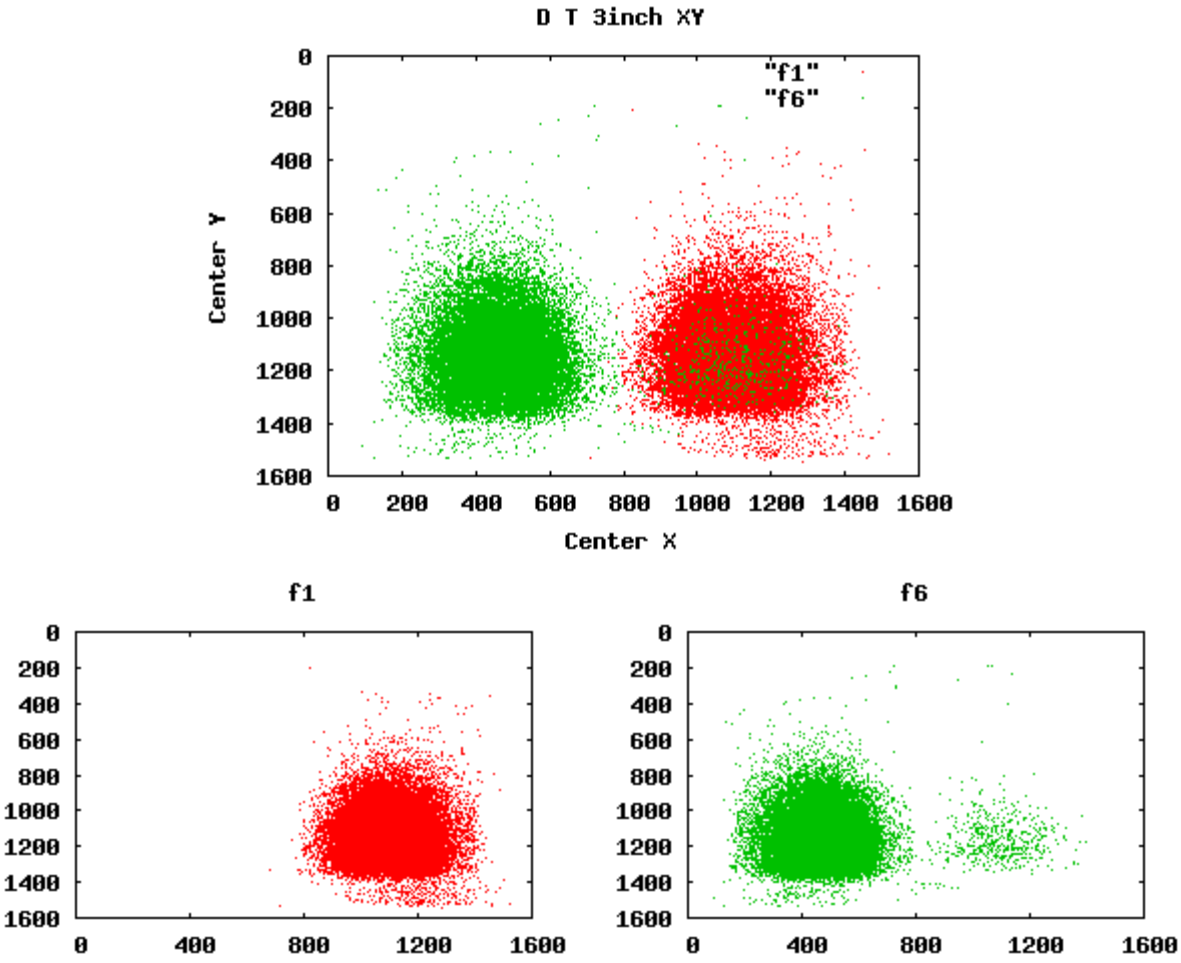
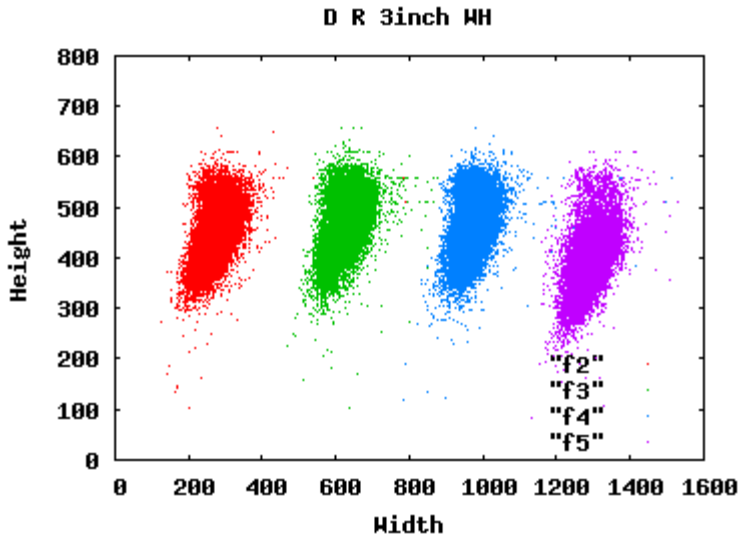
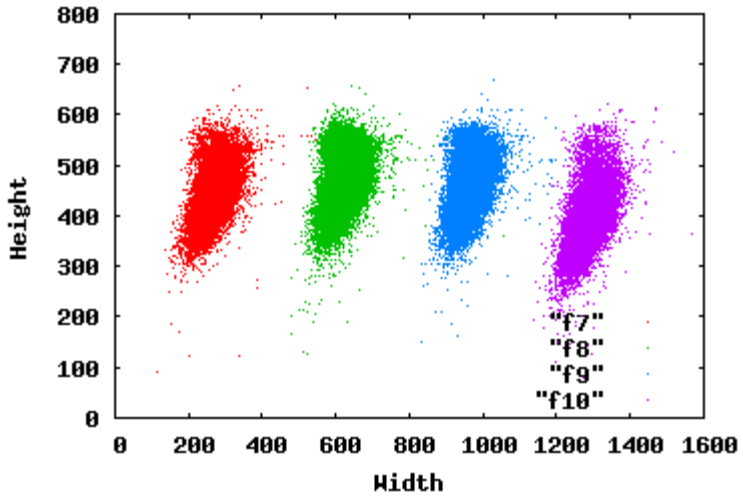

D L 3inch XY
Center Y
Center X
"f7"
"f8"
"f9"
"f10"
f7
f8
f9
f10
0
200
400
600
800
1000
1200
1400
1600

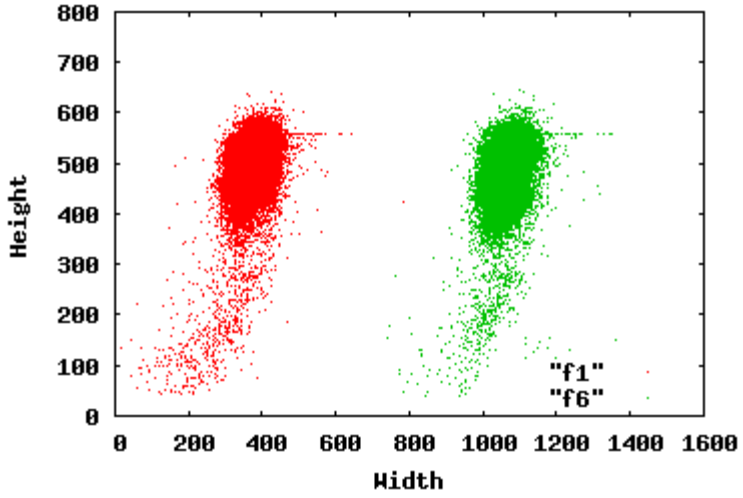

D T 3inch XY
"f1"
"f6"
Center Y
Center X
0
200
400
600
800
1000
1200
1400
1600
f1
f6

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 2^{nd}, 3^{rd}, and 4^{th} 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.


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


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


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