

# dunetpc - Bug #19938

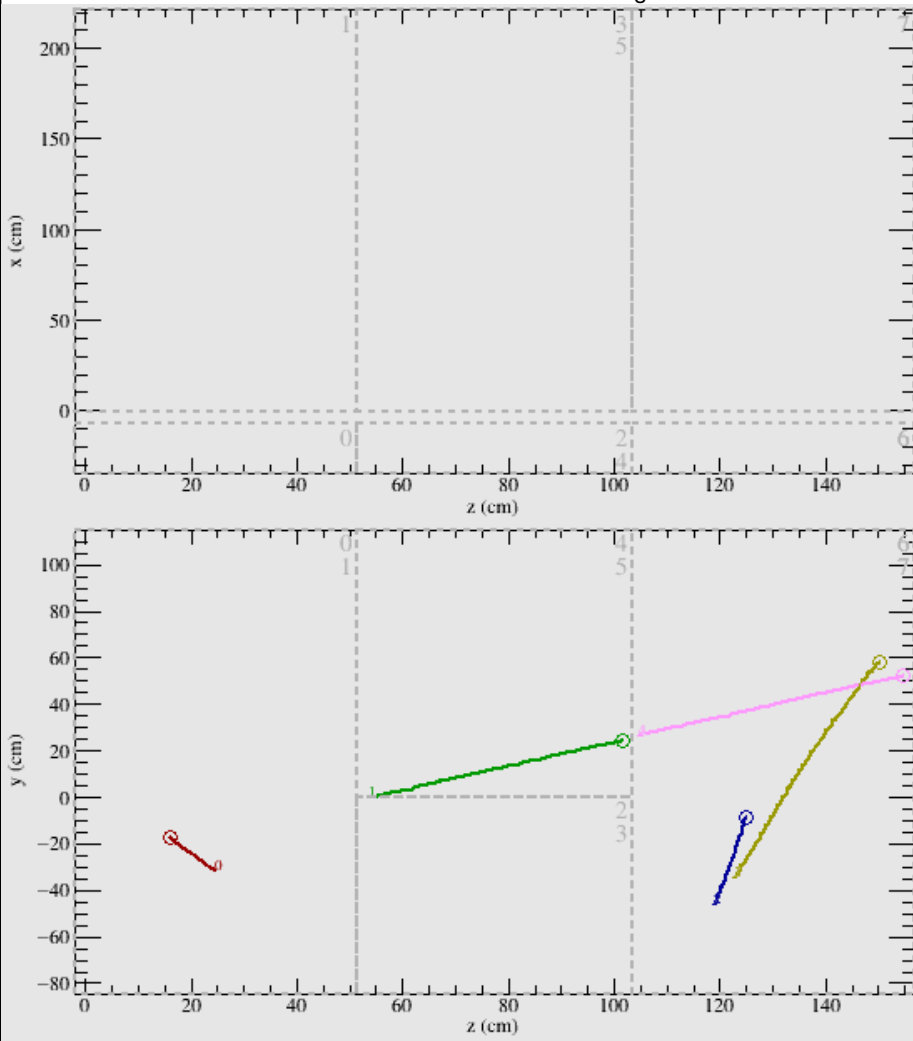
## Track stitching in PMA

05/13/2018 11:32 PM - Tingjun Yang

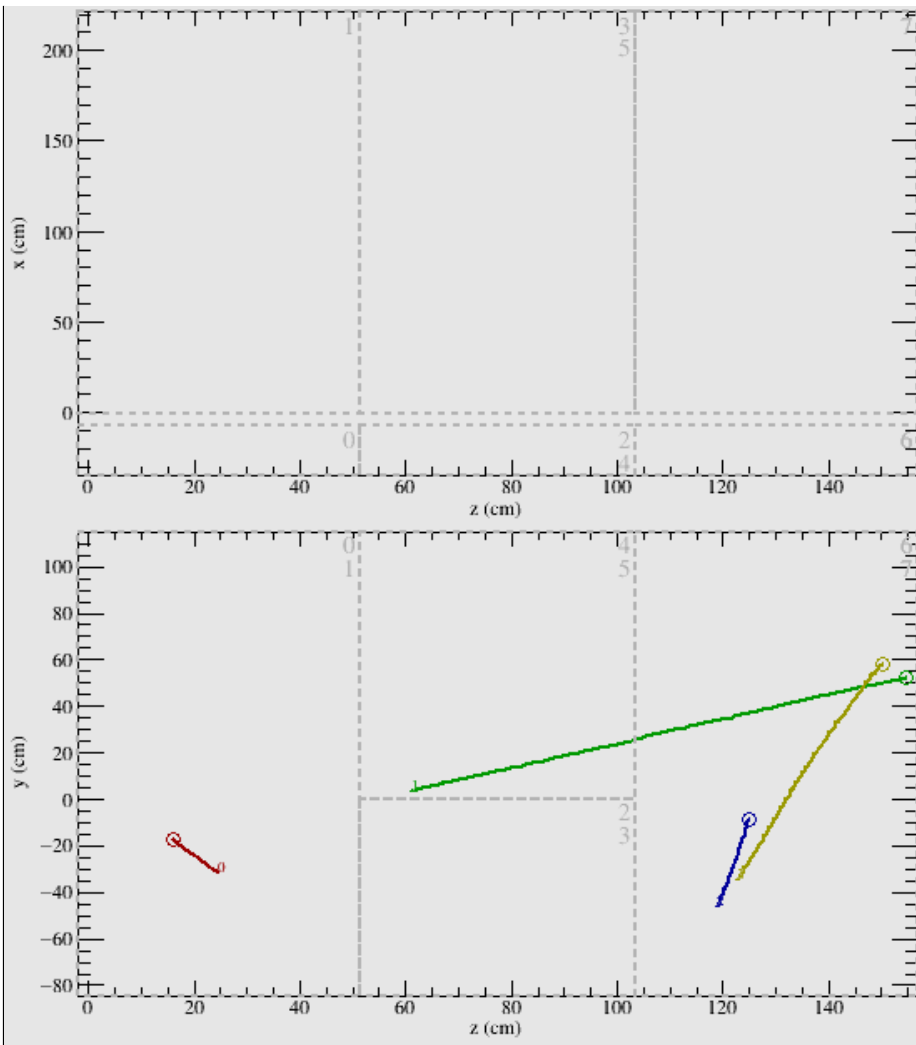
<b>Status:</b>	New	<b>Start date:</b>	05/13/2018
<b>Priority:</b>	Normal	<b>Due date:</b>	
<b>Assignee:</b>		<b>% Done:</b>	0%
<b>Category:</b>		<b>Estimated time:</b>	0.00 hour
<b>Target version:</b>			

### Description

While studying some 35t events, I noticed something strange in the stitching algorithm in PMA. Here is a reconstructed 35t data event if we turn off stitching between TPCs:



This is the same event after we turn on stitching between TPCs:



For the stitched track (id=1), I printed out the trajectory point index, x, y, z, dirx, diry, dirz. Near the track end:

idx	x	y	z	dirx	diry	dirz
207	278.684	5.14975	64.0385	0.131731	-0.458616	-0.878816
208	278.755	4.90352	63.5667	0.131731	-0.458616	-0.878816
209	278.821	4.67555	63.1298	0.131731	-0.458616	-0.878816
210	278.89	4.43304	62.6651	0.131731	-0.458616	-0.878816
211	278.922	4.32126	62.4509	0.131731	-0.458616	-0.878816
212	278.959	4.1947	62.2084	0.131731	-0.458616	-0.878816
213	279.042	3.90549	61.6542	0.131731	-0.458616	-0.878816
214	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
215	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
216	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
217	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
218	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
219	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
220	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
221	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
222	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
223	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
224	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
225	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829
226	279.101	3.69823	61.2571	-0.998855	-0.0132353	-0.0459829

The last few points are identical and the directions are also wrong.

The unstitched track does not have this problem:

idx	x	y	z	dirx	diry	dirz
-----	---	---	---	------	------	------

```
117 279.743 1.57914 57.1783 0.138155 -0.456614 -0.878873
118 279.843 1.24839 56.5417 0.138155 -0.456614 -0.878873
119 280.026 0.643324 55.3771 0.138155 -0.456614 -0.878873
120 280.079 0.466347 55.0365 0.138155 -0.456614 -0.878873
121 280.169 0.168602 54.4634 0.138155 -0.456614 -0.878873
122 280.24 -0.0649955 54.0137 0.138155 -0.456614 -0.878873
123 280.311 -0.300044 53.5613 0.138155 -0.456614 -0.878873
124 280.321 -0.332896 53.4981 0.138155 -0.456614 -0.878873
```

Also in the function

```
void pma::ProjectionMatchingAlg::mergeTracks(pma::Track3D& dst, pma::Track3D& src, bool reopt) const
```

if I turn off optimization (reopt=false), the problem seems to go away. So the problem seems to be related to the optimization of merged track.

Leigh, since you worked on the cathode crossing stitcher, do you have any comments? Thanks.

## History

### #1 - 05/14/2018 03:20 AM - Leigh Whitehead

Just to confirm, is this just stitching between TPCs with the same drift direction or across the APA? It should probably happen in both cases since the underlying functions called by PMA to stitch the tracks are the same.

I believe that Christoph Alt has seen something similar in the dual phase (which doesn't need CPA / APA stitching), so I hope he can chip in with a description of what he saw and what he has managed to discover about it so far. I imagine this could therefore be an issue with the code in pma::Track3D::optimize or the deeper versions that update pma::Node3D or pma::Hit3D objects.

### #2 - 05/14/2018 06:14 AM - Leigh Whitehead

Do you have the full log of trajectory points for the two unstitched tracks? It'd be good to make sure that the number of trajectory points in the stitched track is consistent with the number from the two unstitched tracks.

### #3 - 06/02/2018 05:02 PM - Tingjun Yang

Stitched track, track id 1

idx	x	y	z	dirx	diry	dirz
0	264.133	52.5319	154.561	0.149783	-0.450637	-0.880052
1	264.343	51.9023	153.331	0.149783	-0.450637	-0.880052
2	264.589	51.1608	151.883	0.149783	-0.450637	-0.880052
3	265.087	49.6642	148.961	0.149783	-0.450637	-0.880052
4	265.337	48.9096	147.487	0.149783	-0.450637	-0.880052
5	265.345	48.8879	147.445	0.149783	-0.450637	-0.880052
6	265.423	48.6514	146.983	0.149783	-0.450637	-0.880052
7	265.597	48.128	145.96	0.149783	-0.450637	-0.880052
8	265.664	47.9276	145.569	0.149783	-0.450637	-0.880052
9	265.906	47.1988	144.146	0.149783	-0.450637	-0.880052
10	265.98	46.9764	143.712	0.149783	-0.450637	-0.880052
11	265.988	46.9523	143.665	0.149783	-0.450637	-0.880052
12	266.066	46.7188	143.209	0.149783	-0.450637	-0.880052
13	266.08	46.6746	143.122	0.149783	-0.450637	-0.880052
14	266.143	46.4866	142.755	0.149783	-0.450637	-0.880052
15	266.3	46.0149	141.834	0.149783	-0.450637	-0.880052
16	266.337	45.9032	141.616	0.149783	-0.450637	-0.880052
17	266.372	45.7981	141.411	0.149783	-0.450637	-0.880052
18	266.447	45.5709	140.967	0.149783	-0.450637	-0.880052
19	266.521	45.3486	140.533	0.149783	-0.450637	-0.880052
20	266.587	45.1374	140.13	0.142931	-0.460791	-0.875924
21	266.593	45.1182	140.093	0.142931	-0.460791	-0.875924
22	266.814	44.407	138.741	0.142931	-0.460791	-0.875924
23	266.843	44.3124	138.561	0.142931	-0.460791	-0.875924
24	266.888	44.167	138.285	0.142931	-0.460791	-0.875924
25	267.036	43.6903	137.379	0.142931	-0.460791	-0.875924
26	267.094	43.5037	137.024	0.142931	-0.460791	-0.875924
27	267.109	43.4558	136.933	0.142931	-0.460791	-0.875924
28	267.184	43.214	136.474	0.142931	-0.460791	-0.875924
29	267.255	42.9835	136.035	0.142931	-0.460791	-0.875924
30	267.328	42.7473	135.586	0.142931	-0.460791	-0.875924

31 267.357 42.6557 135.412 0.142931 -0.460791 -0.875924  
32 267.401 42.5137 135.142 0.142931 -0.460791 -0.875924  
33 267.437 42.3967 134.92 0.142931 -0.460791 -0.875924  
34 267.514 42.1506 134.452 0.142931 -0.460791 -0.875924  
35 267.591 41.8997 133.975 0.142931 -0.460791 -0.875924  
36 267.62 41.8069 133.799 0.142931 -0.460791 -0.875924  
37 267.746 41.402 133.029 0.142931 -0.460791 -0.875924  
38 267.767 41.3349 132.902 0.142931 -0.460791 -0.875924  
39 267.82 41.1622 132.573 0.142931 -0.460791 -0.875924  
40 267.841 41.0934 132.443 0.142931 -0.460791 -0.875924  
41 267.848 41.0736 132.405 0.142931 -0.460791 -0.875924  
42 267.991 40.6112 131.526 0.142931 -0.460791 -0.875924  
43 268.064 40.3758 131.078 0.142931 -0.460791 -0.875924  
44 268.101 40.2581 130.855 0.142931 -0.460791 -0.875924  
45 268.116 40.2078 130.759 0.142931 -0.460791 -0.875924  
46 268.193 39.9615 130.291 0.142931 -0.460791 -0.875924  
47 268.209 39.9079 130.189 0.142931 -0.460791 -0.875924  
48 268.267 39.7227 129.837 0.142931 -0.460791 -0.875924  
49 268.342 39.4809 129.377 0.142931 -0.460791 -0.875924  
50 268.5 38.9713 128.408 0.142931 -0.460791 -0.875924  
51 268.574 38.7335 127.956 0.142931 -0.460791 -0.875924  
52 268.575 38.73 127.95 0.142931 -0.460791 -0.875924  
53 268.648 38.4938 127.501 0.142931 -0.460791 -0.875924  
54 268.721 38.2594 127.055 0.142931 -0.460791 -0.875924  
55 268.722 38.2547 127.046 0.138242 -0.457774 -0.878255  
56 268.792 38.023 126.602 0.138242 -0.457774 -0.878255  
57 268.798 38.0026 126.563 0.138242 -0.457774 -0.878255  
58 269.004 37.3198 125.253 0.138242 -0.457774 -0.878255  
59 269.06 37.1363 124.901 0.138242 -0.457774 -0.878255  
60 269.077 37.0801 124.793 0.138242 -0.457774 -0.878255  
61 269.217 36.6169 123.904 0.138242 -0.457774 -0.878255  
62 269.287 36.3829 123.455 0.138242 -0.457774 -0.878255  
63 269.289 36.3784 123.446 0.138242 -0.457774 -0.878255  
64 269.354 36.1605 123.028 0.138242 -0.457774 -0.878255  
65 269.376 36.0881 122.89 0.138242 -0.457774 -0.878255  
66 269.447 35.8547 122.442 0.138242 -0.457774 -0.878255  
67 269.498 35.6847 122.116 0.138242 -0.457774 -0.878255  
68 269.52 35.6134 121.979 0.138242 -0.457774 -0.878255  
69 269.52 35.6129 121.978 0.138242 -0.457774 -0.878255  
70 269.57 35.4457 121.657 0.138242 -0.457774 -0.878255  
71 269.775 34.768 120.357 0.138242 -0.457774 -0.878255  
72 269.887 34.3963 119.644 0.138242 -0.457774 -0.878255  
73 270.014 33.975 118.836 0.138242 -0.457774 -0.878255  
74 270.137 33.5681 118.055 0.138242 -0.457774 -0.878255  
75 270.395 32.7149 116.418 0.138242 -0.457774 -0.878255  
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78 270.545 32.2188 115.466 0.138242 -0.457774 -0.878255  
79 270.621 31.9752 114.994 0.141775 -0.453729 -0.879789  
80 270.695 31.7382 114.535 0.141775 -0.453729 -0.879789  
81 270.705 31.7063 114.473 0.141775 -0.453729 -0.879789  
82 270.765 31.5119 114.096 0.141775 -0.453729 -0.879789  
83 270.84 31.2743 113.635 0.141775 -0.453729 -0.879789  
84 270.939 30.9555 113.017 0.141775 -0.453729 -0.879789  
85 271.18 30.184 111.521 0.141775 -0.453729 -0.879789  
86 271.22 30.0583 111.278 0.141775 -0.453729 -0.879789  
87 271.295 29.8183 110.812 0.141775 -0.453729 -0.879789  
88 271.37 29.5767 110.344 0.141775 -0.453729 -0.879789  
89 271.428 29.3929 109.987 0.141775 -0.453729 -0.879789  
90 271.428 29.3905 109.983 0.141775 -0.453729 -0.879789  
91 271.513 29.1195 109.457 0.141775 -0.453729 -0.879789  
92 271.572 28.9308 109.091 0.141775 -0.453729 -0.879789  
93 271.588 28.8789 108.991 0.141775 -0.453729 -0.879789  
94 271.663 28.6383 108.524 0.141775 -0.453729 -0.879789  
95 271.669 28.619 108.487 0.141775 -0.453729 -0.879789  
96 271.717 28.4678 108.194 0.141775 -0.453729 -0.879789  
97 271.968 27.664 106.635 0.141775 -0.453729 -0.879789  
98 272.043 27.4232 106.168 0.141775 -0.453729 -0.879789  
99 272.114 27.1946 105.725 0.141775 -0.453729 -0.879789  
100 272.19 26.9532 105.257 0.141775 -0.453729 -0.879789  
101 272.266 26.7089 104.783 0.0625938 -0.61263 -0.787887  
102 272.517 24.2575 101.63 0.158713 -0.405105 -0.900389  
103 272.536 24.2075 101.519 0.158713 -0.405105 -0.900389  
104 272.562 24.141 101.371 0.158713 -0.405105 -0.900389  
105 272.595 24.0576 101.186 0.158713 -0.405105 -0.900389

106 272.641 23.9397 100.924 0.158713 -0.405105 -0.900389  
107 272.675 23.8532 100.732 0.158713 -0.405105 -0.900389  
108 272.691 23.813 100.642 0.158713 -0.405105 -0.900389  
109 272.814 23.4995 99.9456 0.158713 -0.405105 -0.900389  
110 272.894 23.2941 99.489 0.158713 -0.405105 -0.900389  
111 272.91 23.2539 99.3996 0.158713 -0.405105 -0.900389  
112 272.916 23.2375 99.3633 0.158713 -0.405105 -0.900389  
113 273.064 22.86 98.5241 0.158713 -0.405105 -0.900389  
114 273.231 22.4341 97.5776 0.158713 -0.405105 -0.900389  
115 273.248 22.3914 97.4827 0.158713 -0.405105 -0.900389  
116 273.31 22.2317 97.1277 0.158713 -0.405105 -0.900389  
117 273.331 22.1781 97.0085 0.158713 -0.405105 -0.900389  
118 273.382 22.0499 96.7236 0.158713 -0.405105 -0.900389  
119 273.412 21.9732 96.5531 0.158713 -0.405105 -0.900389  
120 273.469 21.8261 96.2262 0.158713 -0.405105 -0.900389  
121 273.497 21.7544 96.0669 0.158713 -0.405105 -0.900389  
122 273.546 21.6264 95.7918 0.161412 -0.446547 -0.880081  
123 273.583 21.5264 95.5946 0.161412 -0.446547 -0.880081  
124 273.634 21.3835 95.3131 0.161412 -0.446547 -0.880081  
125 273.669 21.2883 95.1254 0.161412 -0.446547 -0.880081  
126 273.709 21.1757 94.9035 0.161412 -0.446547 -0.880081  
127 273.792 20.9469 94.4527 0.161412 -0.446547 -0.880081  
128 273.874 20.7204 94.0063 0.161412 -0.446547 -0.880081  
129 273.904 20.638 93.8438 0.161412 -0.446547 -0.880081  
130 273.934 20.555 93.6801 0.161412 -0.446547 -0.880081  
131 274.017 20.3255 93.228 0.161412 -0.446547 -0.880081  
132 274.04 20.261 93.1008 0.161412 -0.446547 -0.880081  
133 274.102 20.0899 92.7637 0.161412 -0.446547 -0.880081  
134 274.124 20.0295 92.6446 0.161412 -0.446547 -0.880081  
135 274.287 19.5761 91.751 0.161412 -0.446547 -0.880081  
136 274.428 19.1866 90.9833 0.161412 -0.446547 -0.880081  
137 274.536 18.8897 90.3982 0.161412 -0.446547 -0.880081  
138 274.616 18.6677 89.9605 0.161412 -0.446547 -0.880081  
139 274.703 18.4267 89.4856 0.161412 -0.446547 -0.880081  
140 274.945 17.6373 87.9652 0.135355 -0.458184 -0.878491  
141 275.397 16.1049 85.027 0.135355 -0.458184 -0.878491  
142 275.421 16.0238 84.8717 0.135355 -0.458184 -0.878491  
143 275.493 15.7826 84.4092 0.135355 -0.458184 -0.878491  
144 275.561 15.5526 83.9681 0.135355 -0.458184 -0.878491  
145 275.626 15.3323 83.5457 0.135355 -0.458184 -0.878491  
146 275.676 15.1629 83.221 0.135355 -0.458184 -0.878491  
147 275.703 15.0708 83.0444 0.135355 -0.458184 -0.878491  
148 275.745 14.9275 82.7696 0.135355 -0.458184 -0.878491  
149 275.814 14.6926 82.3201 0.130961 -0.461219 -0.877568  
150 275.85 14.5656 82.0784 0.130961 -0.461219 -0.877568  
151 275.881 14.4558 81.8695 0.130961 -0.461219 -0.877568  
152 276.056 13.8395 80.6968 0.130961 -0.461219 -0.877568  
153 276.084 13.7405 80.5084 0.130961 -0.461219 -0.877568  
154 276.093 13.7088 80.4481 0.130961 -0.461219 -0.877568  
155 276.125 13.5978 80.237 0.130961 -0.461219 -0.877568  
156 276.19 13.3695 79.8027 0.130961 -0.461219 -0.877568  
157 276.219 13.2672 79.6079 0.130961 -0.461219 -0.877568  
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159 276.286 13.0292 79.1551 0.130961 -0.461219 -0.877568  
160 276.328 12.8809 78.8729 0.130961 -0.461219 -0.877568  
161 276.329 12.8802 78.8716 0.130961 -0.461219 -0.877568  
162 276.354 12.7913 78.7025 0.130961 -0.461219 -0.877568  
163 276.42 12.5566 78.2559 0.130961 -0.461219 -0.877568  
164 276.488 12.3191 77.8039 0.130961 -0.461219 -0.877568  
165 276.619 11.8583 76.9271 0.130961 -0.461219 -0.877568  
166 276.677 11.654 76.5384 0.130961 -0.461219 -0.877568  
167 276.744 11.4159 76.0854 0.130961 -0.461219 -0.877568  
168 276.753 11.3847 76.0261 0.130961 -0.461219 -0.877568  
169 276.809 11.1877 75.6513 0.130961 -0.461219 -0.877568  
170 276.816 11.1649 75.6078 0.130961 -0.461219 -0.877568  
171 276.885 10.9463 75.1878 0.148471 -0.455276 -0.877884  
172 276.886 10.943 75.1814 0.148471 -0.455276 -0.877884  
173 277.02 10.5311 74.3872 0.148471 -0.455276 -0.877884  
174 277.2 9.97846 73.3215 0.148471 -0.455276 -0.877884  
175 277.267 9.77349 72.9263 0.148471 -0.455276 -0.877884  
176 277.278 9.73977 72.8613 0.148471 -0.455276 -0.877884  
177 277.282 9.72721 72.8371 0.148471 -0.455276 -0.877884  
178 277.361 9.48492 72.3699 0.148471 -0.455276 -0.877884  
179 277.438 9.24756 71.9122 0.148471 -0.455276 -0.877884  
180 277.504 9.04759 71.5266 0.148471 -0.455276 -0.877884

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181 277.513 9.01893 71.4713 0.148471 -0.455276 -0.877884
182 277.517 9.00759 71.4495 0.148471 -0.455276 -0.877884
183 277.58 8.8133 71.0748 0.148471 -0.455276 -0.877884
184 277.591 8.77943 71.0095 0.148471 -0.455276 -0.877884
185 277.653 8.58957 70.6434 0.148471 -0.455276 -0.877884
186 277.668 8.54422 70.556 0.148471 -0.455276 -0.877884
187 277.729 8.35749 70.1959 0.148471 -0.455276 -0.877884
188 277.751 8.28996 70.0657 0.148471 -0.455276 -0.877884
189 277.805 8.12374 69.7452 0.148471 -0.455276 -0.877884
190 277.88 7.89326 69.3007 0.148471 -0.455276 -0.877884
191 277.989 7.55907 68.6563 0.148471 -0.455276 -0.877884
192 278.004 7.51201 68.5656 0.148471 -0.455276 -0.877884
193 278.031 7.42562 68.3996 0.131731 -0.458616 -0.878816
194 278.061 7.32075 68.1986 0.131731 -0.458616 -0.878816
195 278.099 7.18759 67.9435 0.131731 -0.458616 -0.878816
196 278.13 7.08121 67.7396 0.131731 -0.458616 -0.878816
197 278.195 6.85351 67.3033 0.131731 -0.458616 -0.878816
198 278.234 6.71918 67.0459 0.131731 -0.458616 -0.878816
199 278.245 6.6784 66.9678 0.131731 -0.458616 -0.878816
200 278.333 6.37205 66.3807 0.131731 -0.458616 -0.878816
201 278.369 6.24718 66.1414 0.131731 -0.458616 -0.878816
202 278.438 6.00945 65.6859 0.131731 -0.458616 -0.878816
203 278.477 5.87072 65.42 0.131731 -0.458616 -0.878816
204 278.572 5.54215 64.7904 0.131731 -0.458616 -0.878816
205 278.615 5.39336 64.5053 0.131731 -0.458616 -0.878816
206 278.636 5.31688 64.3588 0.131731 -0.458616 -0.878816
207 278.684 5.14975 64.0385 0.131731 -0.458616 -0.878816
208 278.755 4.90352 63.5667 0.131731 -0.458616 -0.878816
209 278.821 4.67555 63.1298 0.131731 -0.458616 -0.878816
210 278.89 4.43304 62.6651 0.131731 -0.458616 -0.878816
211 278.922 4.32126 62.4509 0.131731 -0.458616 -0.878816
212 278.959 4.1947 62.2084 0.131731 -0.458616 -0.878816
213 279.042 3.90549 61.6542 0.131731 -0.458616 -0.878816
214 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
215 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
216 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
217 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
218 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
219 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
220 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
221 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
222 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
223 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
224 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
225 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829
226 279.101 3.69823 61.2571 -0.998855 -0.0132353 -0.0459829

```

The unstitched tracks:

Track id 4:

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idx    x      y      z      dirx    diry    dirz
0 264.133 52.5319 154.561 0.149783 -0.450637 -0.880052
1 264.343 51.9023 153.331 0.149783 -0.450637 -0.880052
2 264.589 51.1608 151.883 0.149783 -0.450637 -0.880052
3 265.087 49.6642 148.961 0.149783 -0.450637 -0.880052
4 265.337 48.9096 147.487 0.149783 -0.450637 -0.880052
5 265.345 48.8879 147.445 0.149783 -0.450637 -0.880052
6 265.423 48.6514 146.983 0.149783 -0.450637 -0.880052
7 265.597 48.128 145.96 0.149783 -0.450637 -0.880052
8 265.664 47.9276 145.569 0.149783 -0.450637 -0.880052
9 265.906 47.1988 144.146 0.149783 -0.450637 -0.880052
10 265.98 46.9764 143.712 0.149783 -0.450637 -0.880052
11 265.988 46.9523 143.665 0.149783 -0.450637 -0.880052
12 266.066 46.7188 143.209 0.149783 -0.450637 -0.880052
13 266.08 46.6746 143.122 0.149783 -0.450637 -0.880052
14 266.143 46.4866 142.755 0.149783 -0.450637 -0.880052
15 266.3 46.0149 141.834 0.149783 -0.450637 -0.880052
16 266.337 45.9032 141.616 0.149783 -0.450637 -0.880052
17 266.372 45.7981 141.411 0.149783 -0.450637 -0.880052
18 266.447 45.5709 140.967 0.149783 -0.450637 -0.880052
19 266.521 45.3486 140.533 0.149783 -0.450637 -0.880052
20 266.587 45.1374 140.13 0.142931 -0.460791 -0.875924
21 266.593 45.1182 140.093 0.142931 -0.460791 -0.875924
22 266.814 44.407 138.741 0.142931 -0.460791 -0.875924

```

23 266.843 44.3124 138.561 0.142931 -0.460791 -0.875924  
24 266.888 44.167 138.285 0.142931 -0.460791 -0.875924  
25 267.036 43.6903 137.379 0.142931 -0.460791 -0.875924  
26 267.094 43.5037 137.024 0.142931 -0.460791 -0.875924  
27 267.109 43.4558 136.933 0.142931 -0.460791 -0.875924  
28 267.184 43.214 136.474 0.142931 -0.460791 -0.875924  
29 267.255 42.9835 136.035 0.142931 -0.460791 -0.875924  
30 267.328 42.7473 135.586 0.142931 -0.460791 -0.875924  
31 267.357 42.6557 135.412 0.142931 -0.460791 -0.875924  
32 267.401 42.5137 135.142 0.142931 -0.460791 -0.875924  
33 267.437 42.3967 134.92 0.142931 -0.460791 -0.875924  
34 267.514 42.1506 134.452 0.142931 -0.460791 -0.875924  
35 267.591 41.8997 133.975 0.142931 -0.460791 -0.875924  
36 267.62 41.8069 133.799 0.142931 -0.460791 -0.875924  
37 267.746 41.402 133.029 0.142931 -0.460791 -0.875924  
38 267.767 41.3349 132.902 0.142931 -0.460791 -0.875924  
39 267.82 41.1622 132.573 0.142931 -0.460791 -0.875924  
40 267.841 41.0934 132.443 0.142931 -0.460791 -0.875924  
41 267.848 41.0736 132.405 0.142931 -0.460791 -0.875924  
42 267.991 40.6112 131.526 0.142931 -0.460791 -0.875924  
43 268.064 40.3758 131.078 0.142931 -0.460791 -0.875924  
44 268.101 40.2581 130.855 0.142931 -0.460791 -0.875924  
45 268.116 40.2078 130.759 0.142931 -0.460791 -0.875924  
46 268.193 39.9615 130.291 0.142931 -0.460791 -0.875924  
47 268.209 39.9079 130.189 0.142931 -0.460791 -0.875924  
48 268.267 39.7227 129.837 0.142931 -0.460791 -0.875924  
49 268.342 39.4809 129.377 0.142931 -0.460791 -0.875924  
50 268.5 38.9713 128.408 0.142931 -0.460791 -0.875924  
51 268.574 38.7335 127.956 0.142931 -0.460791 -0.875924  
52 268.575 38.73 127.95 0.142931 -0.460791 -0.875924  
53 268.648 38.4938 127.501 0.142931 -0.460791 -0.875924  
54 268.721 38.2594 127.055 0.142931 -0.460791 -0.875924  
55 268.722 38.2547 127.046 0.138242 -0.457774 -0.878255  
56 268.792 38.023 126.602 0.138242 -0.457774 -0.878255  
57 268.798 38.0026 126.563 0.138242 -0.457774 -0.878255  
58 269.004 37.3198 125.253 0.138242 -0.457774 -0.878255  
59 269.06 37.1363 124.901 0.138242 -0.457774 -0.878255  
60 269.077 37.0801 124.793 0.138242 -0.457774 -0.878255  
61 269.217 36.6169 123.904 0.138242 -0.457774 -0.878255  
62 269.287 36.3829 123.455 0.138242 -0.457774 -0.878255  
63 269.289 36.3784 123.446 0.138242 -0.457774 -0.878255  
64 269.354 36.1605 123.028 0.138242 -0.457774 -0.878255  
65 269.376 36.0881 122.89 0.138242 -0.457774 -0.878255  
66 269.447 35.8547 122.442 0.138242 -0.457774 -0.878255  
67 269.498 35.6847 122.116 0.138242 -0.457774 -0.878255  
68 269.52 35.6134 121.979 0.138242 -0.457774 -0.878255  
69 269.52 35.6129 121.978 0.138242 -0.457774 -0.878255  
70 269.57 35.4457 121.657 0.138242 -0.457774 -0.878255  
71 269.775 34.768 120.357 0.138242 -0.457774 -0.878255  
72 269.887 34.3963 119.644 0.138242 -0.457774 -0.878255  
73 270.014 33.975 118.836 0.138242 -0.457774 -0.878255  
74 270.137 33.5681 118.055 0.138242 -0.457774 -0.878255  
75 270.395 32.7149 116.418 0.138242 -0.457774 -0.878255  
76 270.466 32.4796 115.967 0.138242 -0.457774 -0.878255  
77 270.469 32.4689 115.946 0.138242 -0.457774 -0.878255  
78 270.545 32.2188 115.466 0.138242 -0.457774 -0.878255  
79 270.621 31.9752 114.994 0.141775 -0.453729 -0.879789  
80 270.695 31.7382 114.535 0.141775 -0.453729 -0.879789  
81 270.705 31.7063 114.473 0.141775 -0.453729 -0.879789  
82 270.765 31.5119 114.096 0.141775 -0.453729 -0.879789  
83 270.84 31.2743 113.635 0.141775 -0.453729 -0.879789  
84 270.939 30.9555 113.017 0.141775 -0.453729 -0.879789  
85 271.18 30.184 111.521 0.141775 -0.453729 -0.879789  
86 271.22 30.0583 111.278 0.141775 -0.453729 -0.879789  
87 271.295 29.8183 110.812 0.141775 -0.453729 -0.879789  
88 271.37 29.5767 110.344 0.141775 -0.453729 -0.879789  
89 271.428 29.3929 109.987 0.141775 -0.453729 -0.879789  
90 271.428 29.3905 109.983 0.141775 -0.453729 -0.879789  
91 271.513 29.1195 109.457 0.141775 -0.453729 -0.879789  
92 271.572 28.9308 109.091 0.141775 -0.453729 -0.879789  
93 271.588 28.8789 108.991 0.141775 -0.453729 -0.879789  
94 271.663 28.6383 108.524 0.141775 -0.453729 -0.879789  
95 271.669 28.619 108.487 0.141775 -0.453729 -0.879789  
96 271.717 28.4678 108.194 0.141775 -0.453729 -0.879789  
97 271.968 27.664 106.635 0.141775 -0.453729 -0.879789

98 272.043 27.4232 106.168 0.141775 -0.453729 -0.879789  
99 272.114 27.1946 105.725 0.141775 -0.453729 -0.879789  
100 272.19 26.9532 105.257 0.141775 -0.453729 -0.879789  
101 272.266 26.7089 104.783 0.141775 -0.453729 -0.879789

Track id 1:

idx	x	y	z	dirx	diry	dirz
0	272.517	24.2575	101.63	0.158713	-0.405105	-0.900389
1	272.536	24.2075	101.519	0.158713	-0.405105	-0.900389
2	272.562	24.141	101.371	0.158713	-0.405105	-0.900389
3	272.595	24.0576	101.186	0.158713	-0.405105	-0.900389
4	272.641	23.9397	100.924	0.158713	-0.405105	-0.900389
5	272.675	23.8532	100.732	0.158713	-0.405105	-0.900389
6	272.691	23.813	100.642	0.158713	-0.405105	-0.900389
7	272.814	23.4995	99.9456	0.158713	-0.405105	-0.900389
8	272.894	23.2941	99.489	0.158713	-0.405105	-0.900389
9	272.91	23.2539	99.3996	0.158713	-0.405105	-0.900389
10	272.916	23.2375	99.3633	0.158713	-0.405105	-0.900389
11	273.064	22.86	98.5241	0.158713	-0.405105	-0.900389
12	273.231	22.4341	97.5776	0.158713	-0.405105	-0.900389
13	273.248	22.3914	97.4827	0.158713	-0.405105	-0.900389
14	273.31	22.2317	97.1277	0.158713	-0.405105	-0.900389
15	273.331	22.1781	97.0085	0.158713	-0.405105	-0.900389
16	273.382	22.0499	96.7236	0.158713	-0.405105	-0.900389
17	273.412	21.9732	96.5531	0.158713	-0.405105	-0.900389
18	273.469	21.8261	96.2262	0.158713	-0.405105	-0.900389
19	273.497	21.7544	96.0669	0.158713	-0.405105	-0.900389
20	273.546	21.6264	95.7918	0.161412	-0.446547	-0.880081
21	273.583	21.5264	95.5946	0.161412	-0.446547	-0.880081
22	273.634	21.3835	95.3131	0.161412	-0.446547	-0.880081
23	273.669	21.2883	95.1254	0.161412	-0.446547	-0.880081
24	273.709	21.1757	94.9035	0.161412	-0.446547	-0.880081
25	273.792	20.9469	94.4527	0.161412	-0.446547	-0.880081
26	273.874	20.7204	94.0063	0.161412	-0.446547	-0.880081
27	273.904	20.638	93.8438	0.161412	-0.446547	-0.880081
28	273.934	20.555	93.6801	0.161412	-0.446547	-0.880081
29	274.017	20.3255	93.228	0.161412	-0.446547	-0.880081
30	274.04	20.261	93.1008	0.161412	-0.446547	-0.880081
31	274.102	20.0899	92.7637	0.161412	-0.446547	-0.880081
32	274.124	20.0295	92.6446	0.161412	-0.446547	-0.880081
33	274.287	19.5761	91.751	0.161412	-0.446547	-0.880081
34	274.428	19.1866	90.9833	0.161412	-0.446547	-0.880081
35	274.536	18.8897	90.3982	0.161412	-0.446547	-0.880081
36	274.616	18.6677	89.9605	0.161412	-0.446547	-0.880081
37	274.703	18.4267	89.4856	0.161412	-0.446547	-0.880081
38	274.945	17.6373	87.9652	0.135355	-0.458184	-0.878491
39	275.397	16.1049	85.027	0.135355	-0.458184	-0.878491
40	275.421	16.0238	84.8717	0.135355	-0.458184	-0.878491
41	275.493	15.7826	84.4092	0.135355	-0.458184	-0.878491
42	275.561	15.5526	83.9681	0.135355	-0.458184	-0.878491
43	275.626	15.3323	83.5457	0.135355	-0.458184	-0.878491
44	275.676	15.1629	83.221	0.135355	-0.458184	-0.878491
45	275.703	15.0708	83.0444	0.135355	-0.458184	-0.878491
46	275.745	14.9275	82.7696	0.135355	-0.458184	-0.878491
47	275.814	14.6926	82.3201	0.130961	-0.461219	-0.877568
48	275.85	14.5656	82.0784	0.130961	-0.461219	-0.877568
49	275.881	14.4558	81.8695	0.130961	-0.461219	-0.877568
50	276.056	13.8395	80.6968	0.130961	-0.461219	-0.877568
51	276.084	13.7405	80.5084	0.130961	-0.461219	-0.877568
52	276.093	13.7088	80.4481	0.130961	-0.461219	-0.877568
53	276.125	13.5978	80.237	0.130961	-0.461219	-0.877568
54	276.19	13.3695	79.8027	0.130961	-0.461219	-0.877568
55	276.219	13.2672	79.6079	0.130961	-0.461219	-0.877568
56	276.259	13.1264	79.34	0.130961	-0.461219	-0.877568
57	276.286	13.0292	79.1551	0.130961	-0.461219	-0.877568
58	276.328	12.8809	78.8729	0.130961	-0.461219	-0.877568
59	276.329	12.8802	78.8716	0.130961	-0.461219	-0.877568
60	276.354	12.7913	78.7025	0.130961	-0.461219	-0.877568
61	276.42	12.5566	78.2559	0.130961	-0.461219	-0.877568
62	276.488	12.3191	77.8039	0.130961	-0.461219	-0.877568
63	276.619	11.8583	76.9271	0.130961	-0.461219	-0.877568
64	276.677	11.654	76.5384	0.130961	-0.461219	-0.877568
65	276.744	11.4159	76.0854	0.130961	-0.461219	-0.877568



66 276.753 11.3847 76.0261 0.130961 -0.461219 -0.877568  
67 276.809 11.1877 75.6513 0.130961 -0.461219 -0.877568  
68 276.816 11.1649 75.6078 0.130961 -0.461219 -0.877568  
69 276.885 10.9463 75.1878 0.148471 -0.455276 -0.877884  
70 276.886 10.943 75.1814 0.148471 -0.455276 -0.877884  
71 277.02 10.5311 74.3872 0.148471 -0.455276 -0.877884  
72 277.2 9.97846 73.3215 0.148471 -0.455276 -0.877884  
73 277.267 9.77349 72.9263 0.148471 -0.455276 -0.877884  
74 277.278 9.73977 72.8613 0.148471 -0.455276 -0.877884  
75 277.282 9.72721 72.8371 0.148471 -0.455276 -0.877884  
76 277.361 9.48492 72.3699 0.148471 -0.455276 -0.877884  
77 277.438 9.24756 71.9122 0.148471 -0.455276 -0.877884  
78 277.504 9.04759 71.5266 0.148471 -0.455276 -0.877884  
79 277.513 9.01893 71.4713 0.148471 -0.455276 -0.877884  
80 277.517 9.00759 71.4495 0.148471 -0.455276 -0.877884  
81 277.58 8.8133 71.0748 0.148471 -0.455276 -0.877884  
82 277.591 8.77943 71.0095 0.148471 -0.455276 -0.877884  
83 277.653 8.58957 70.6434 0.148471 -0.455276 -0.877884  
84 277.668 8.54422 70.556 0.148471 -0.455276 -0.877884  
85 277.729 8.35749 70.1959 0.148471 -0.455276 -0.877884  
86 277.751 8.28996 70.0657 0.148471 -0.455276 -0.877884  
87 277.805 8.12374 69.7452 0.148471 -0.455276 -0.877884  
88 277.88 7.89326 69.3007 0.148471 -0.455276 -0.877884  
89 277.989 7.55907 68.6563 0.148471 -0.455276 -0.877884  
90 278.004 7.51201 68.5656 0.148471 -0.455276 -0.877884  
91 278.031 7.42562 68.3996 0.131731 -0.458616 -0.878816  
92 278.061 7.32075 68.1986 0.131731 -0.458616 -0.878816  
93 278.099 7.18759 67.9435 0.131731 -0.458616 -0.878816  
94 278.13 7.08121 67.7396 0.131731 -0.458616 -0.878816  
95 278.195 6.85351 67.3033 0.131731 -0.458616 -0.878816  
96 278.234 6.71918 67.0459 0.131731 -0.458616 -0.878816  
97 278.245 6.6784 66.9678 0.131731 -0.458616 -0.878816  
98 278.333 6.37205 66.3807 0.131731 -0.458616 -0.878816  
99 278.369 6.24718 66.1414 0.131731 -0.458616 -0.878816  
100 278.438 6.00945 65.6859 0.131731 -0.458616 -0.878816  
101 278.477 5.87072 65.42 0.131731 -0.458616 -0.878816  
102 278.572 5.54215 64.7904 0.131731 -0.458616 -0.878816  
103 278.615 5.39336 64.5053 0.131731 -0.458616 -0.878816  
104 278.636 5.31688 64.3588 0.131731 -0.458616 -0.878816  
105 278.684 5.14975 64.0385 0.131731 -0.458616 -0.878816  
106 278.755 4.90352 63.5667 0.131731 -0.458616 -0.878816  
107 278.821 4.67555 63.1298 0.131731 -0.458616 -0.878816  
108 278.89 4.43304 62.6651 0.131731 -0.458616 -0.878816  
109 278.922 4.32126 62.4509 0.131731 -0.458616 -0.878816  
110 278.959 4.1947 62.2084 0.131731 -0.458616 -0.878816  
111 279.042 3.90549 61.6542 0.131731 -0.458616 -0.878816  
112 279.323 2.96431 59.8444 0.138155 -0.456614 -0.878873  
113 279.369 2.81387 59.5549 0.138155 -0.456614 -0.878873  
114 279.534 2.26868 58.5055 0.138155 -0.456614 -0.878873  
115 279.602 2.04493 58.0748 0.138155 -0.456614 -0.878873  
116 279.672 1.81321 57.6288 0.138155 -0.456614 -0.878873  
117 279.743 1.57914 57.1783 0.138155 -0.456614 -0.878873  
118 279.843 1.24839 56.5417 0.138155 -0.456614 -0.878873  
119 280.026 0.643324 55.3771 0.138155 -0.456614 -0.878873  
120 280.079 0.466347 55.0365 0.138155 -0.456614 -0.878873  
121 280.169 0.168602 54.4634 0.138155 -0.456614 -0.878873  
122 280.24 -0.0649955 54.0137 0.138155 -0.456614 -0.878873  
123 280.311 -0.300044 53.5613 0.138155 -0.456614 -0.878873  
124 280.321 -0.332896 53.4981 0.138155 -0.456614 -0.878873

Stitched track has 227 trajectory points.  
Unstitched tracks have 102+125=227 trajectory points.

## Files

evd.larortho3d.15958.159_unstitch.png	13.1 KB	05/14/2018	Tingjun Yang
evd.larortho3d.15958.159_stitch.png	12.9 KB	05/14/2018	Tingjun Yang