

Directional-iDBSCAN

a proposal to CYGNO

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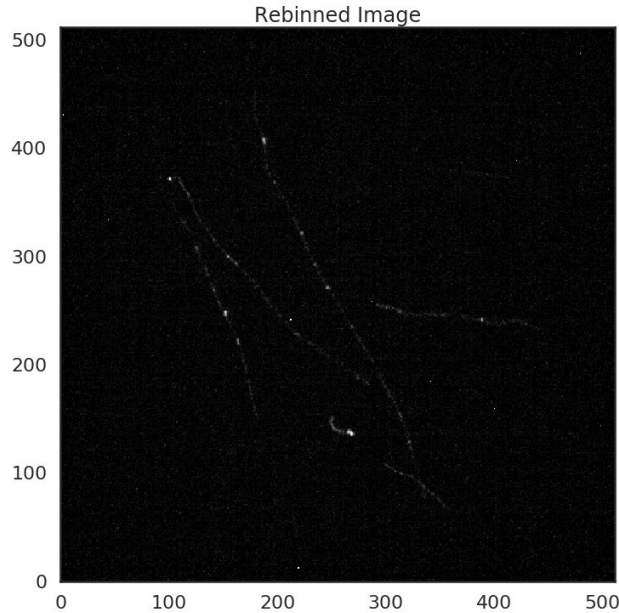
Tasks from last meeting

- Agreed tasks from the last meeting:
 - Analyze some more images to have a visual feeling about the iDDBSCAN behavior in some particular cases, as overlapped tracks. ✓
 - Analyzed runs: 2097 and 2098 (“Dollar Trillogy” - 60/40 mixture); 2317, 2318 and 2320 (70/30 mixture).
 - See if we can use the directional-DBSCAN as a long track background removing. ✗
 - Analyse the energy distributions using iDDBSCAN, iDBSCAN and Super-iDBSCAN for No-source (NRAD), ER(Fe55) and NR(AmBe). ✗

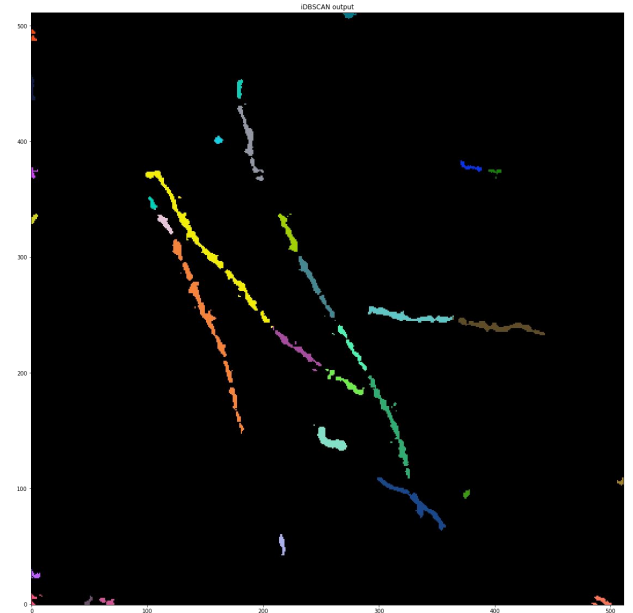
Analyzed runs

- The “Dollar Trilogy” runs had the same behavior as the run 2065 with the iDDBSCAN.
 - Long straight/curved tracks recognized as one.
 - Overlapped tracks - one long track recognized or multiple tracks classified as one.
- The 2300s runs had a slightly different behavior.
 - Long straight/curved tracks here are fainter.
 - Overlapped tracks occurs more often.

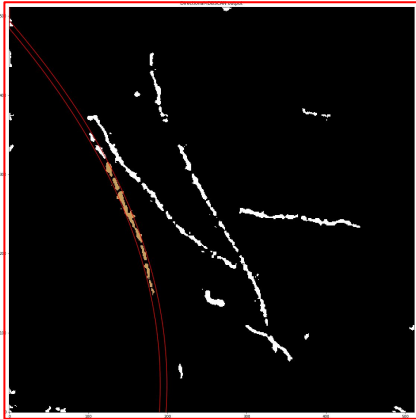
Run 2317 - Event 05



In this example the tracks aren't so faint, so even being unable to find the entire tracks, the iDBSCAN output works well as the iDDBSCAN first step.



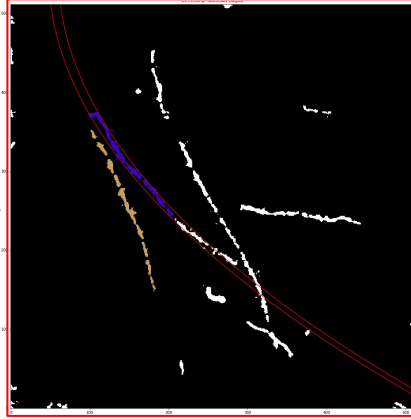
Run 2317 - Event 05



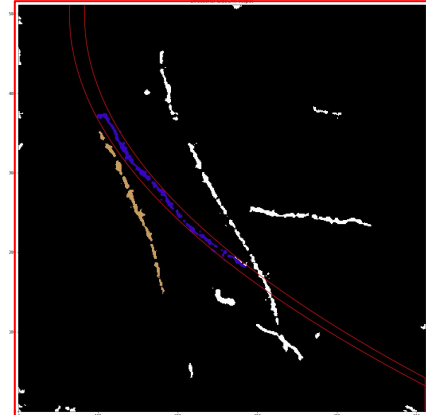
Starting from a cluster with a good fit model



Only one directional search was enough



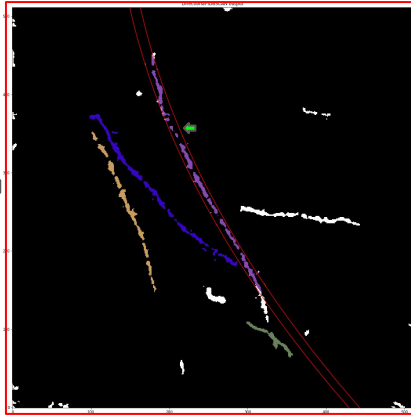
The next one needed more steps to finish



Here the directional search ends



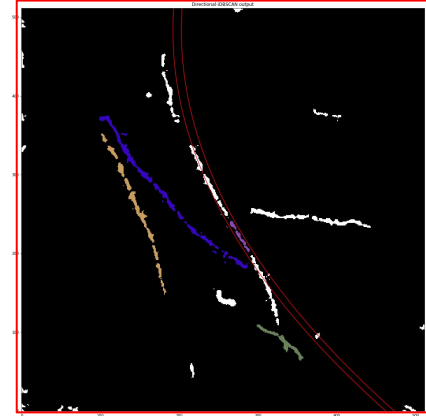
The other clusters will be found without directional search



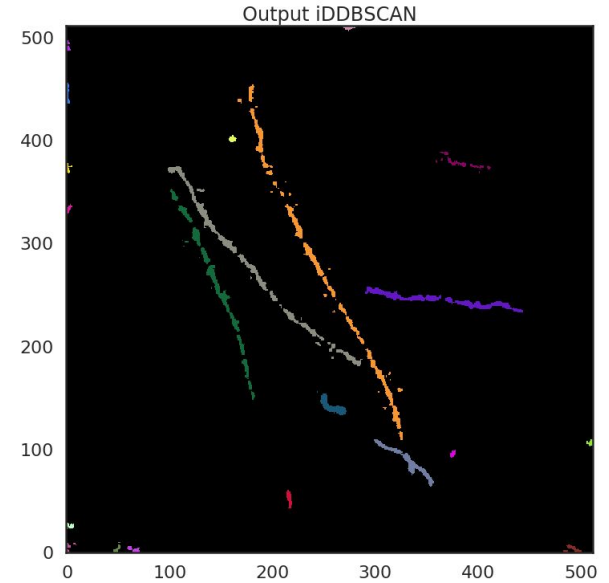
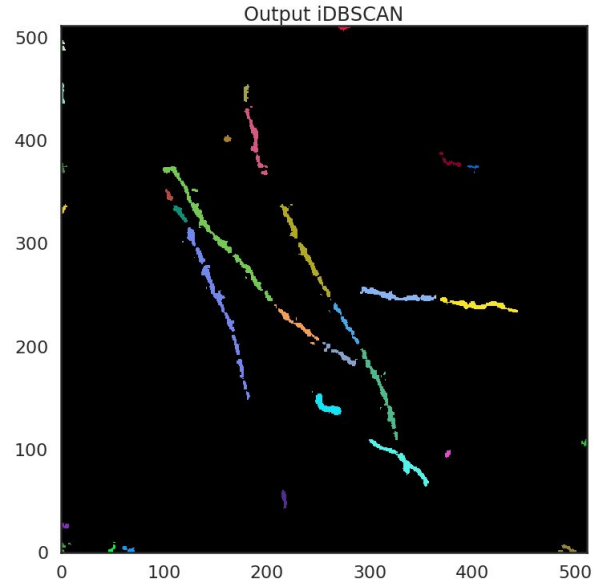
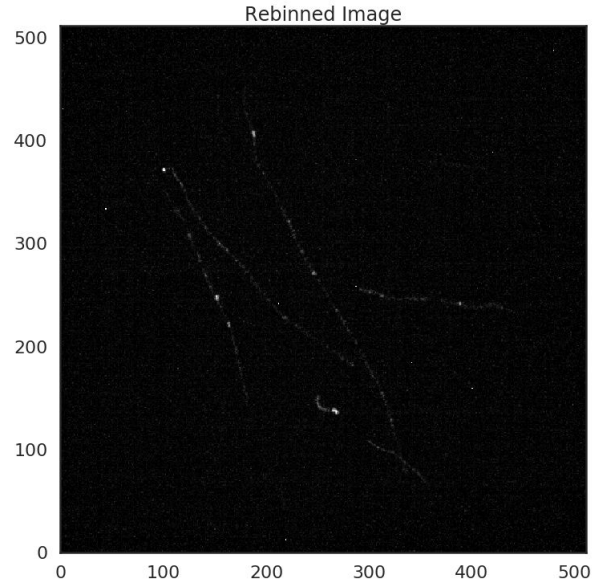
The last long track started from a small cluster



It found points previously marked as noise that belonged to this track¹

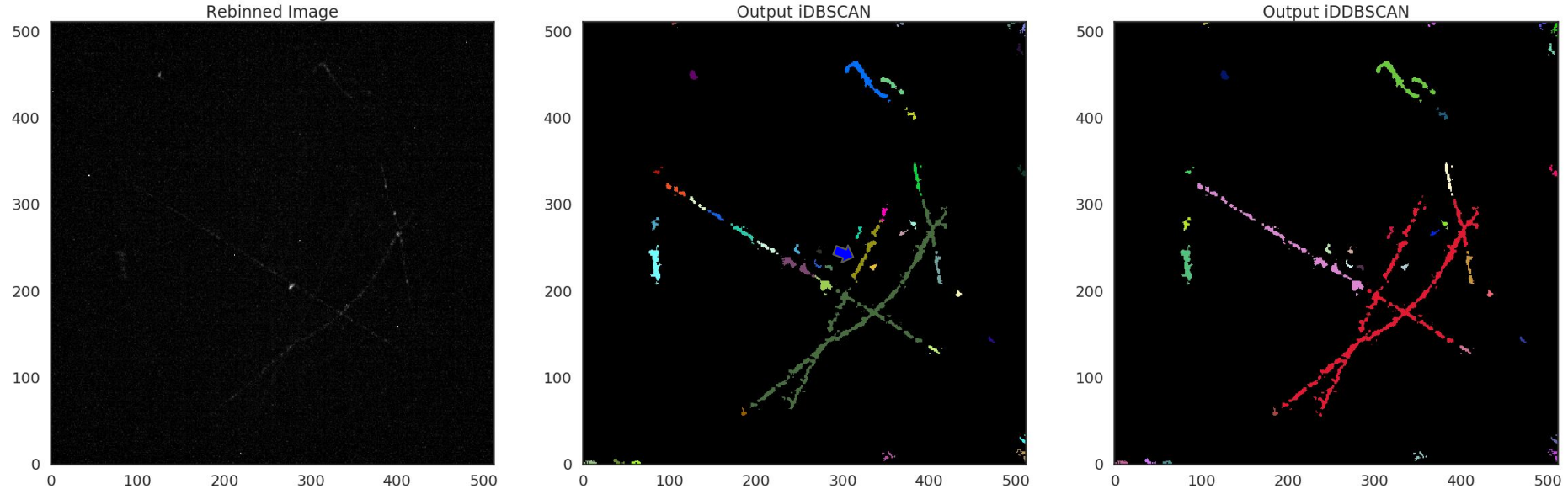


Run 2317 - Event 05



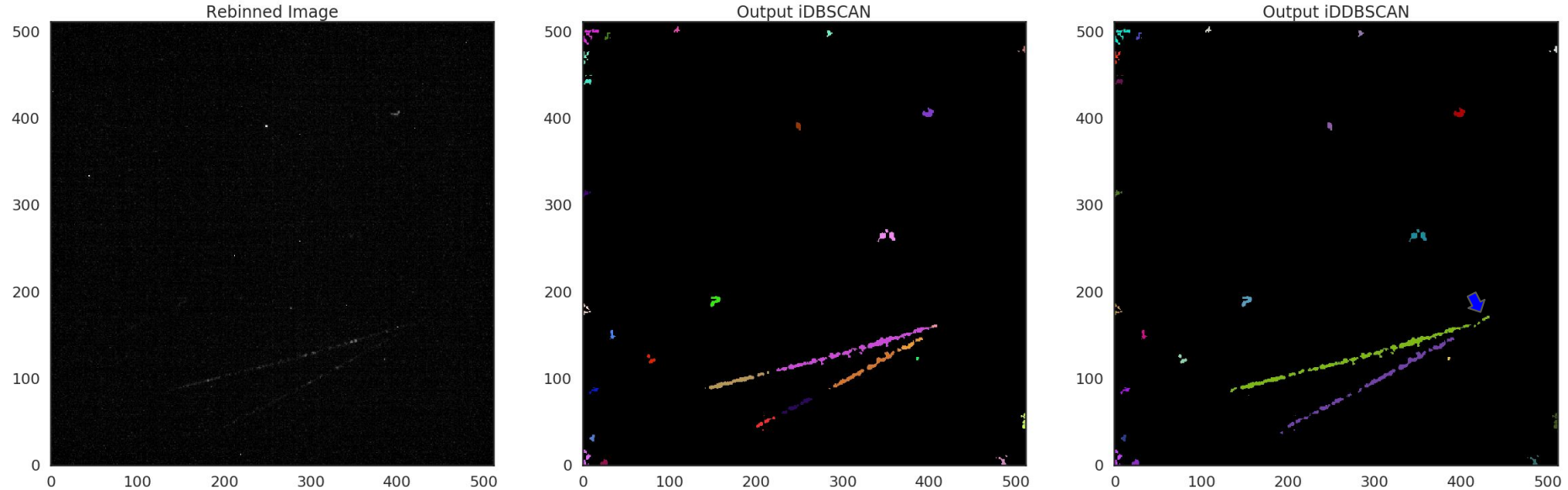
The final output shows that some small tracks aren't being recognized.

Run 2320 - Event 24



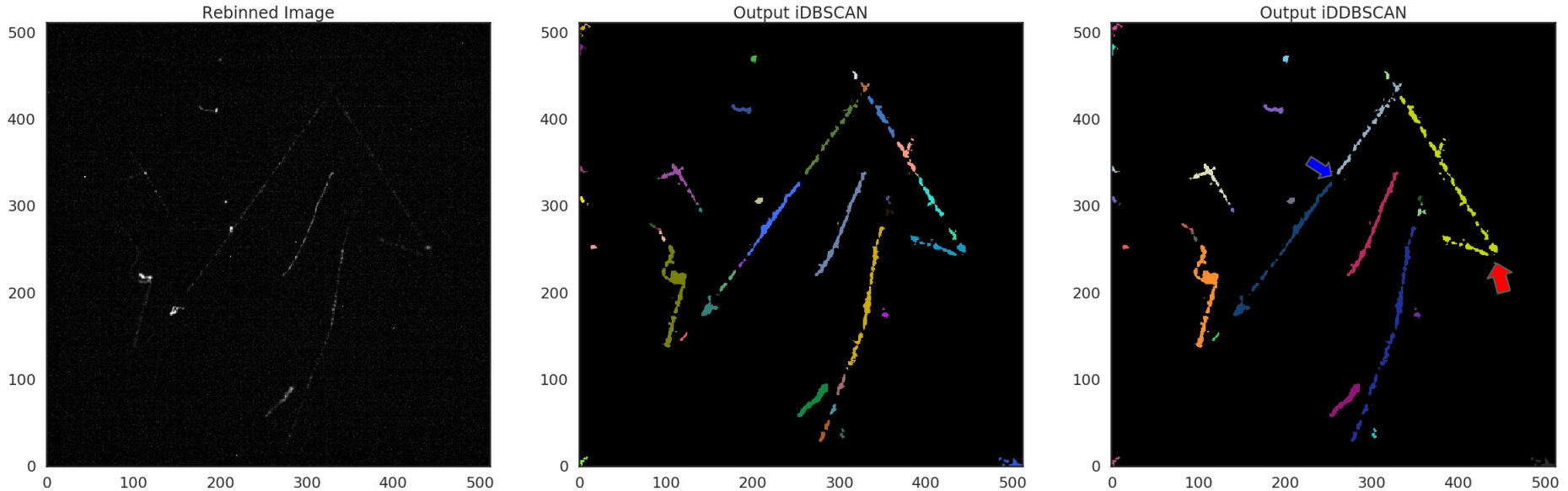
Here is an example of the overlapped tracks in the 2300s runs - As expected, the iDDBSCAN is pretty sensitive to the primary clusterization of the iDBSCAN.

Run 2097 - Event 18



In the “Dollar Trilogy” events, it was easier for the iDBSCAN to find the long tracks because they have a good intensity and the overlapped cases are not so usual as in the previous runs.

Run 2098 - Event 24



This event illustrates well some of the problems found on the events: Misclassification¹ and maybe the need to increase the radius on the directional search²

Conclusions

- There are some improvements to be done in the algorithm in order to find the long tracks, such as recognize more small tracks eligible to the directional search step.
- Events with overlapped tracks, in the best scenario, will only have part of the tracks recognized.
- The choice of input parameters will depend on the purpose given to the algorithm.