

I. METHODS

This section explains two alternative methodologies to find moving flock patterns in large spatio-temporal datasets using modern distributed frameworks to divide and parallize the work load.

The first alternative follows closely the steps explained at [1]. At this work, the authors proposed the Basic Flock Evaluation (BFE) algorithm to find flock pattern on trajectories databases. The details of the algorithm can be accessed at the source but figure 1 explains schematically the work flow where we can identify 4 general steps.

- 1) Pair finding: Using the ε parameter, the algorithm query the set of points to get the set of pairs which laid at a maximum distance of ε units. Usually, it is a distance self-join operation over the set of points using ε as the distance parameter. The query also pays attention to do not return pair duplicates. Pair between point p_1 and p_2 is the same that pair between p_2 and p_1 and just one of them should be reported (the id of each point is used to filter duplicates).
- 2) Center computation: From the set of pairs of points available, each tuple is the input of a simple computation to locate the centers of the two circles of radius $\frac{\varepsilon}{2}$ which circumference lied on the input points. The pseudocode of the precEDURE can be seen in appendix A.

APPENDIX A CENTER COMPUTATION.

Appendix one explains center computation.

Algorithm 1 A small pseudocode

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1:  $s \leftarrow 0$ 
2:  $p \leftarrow 0$ 
3: for  $i \leftarrow 1, 10$  do
4:    $s \leftarrow s + i$ 
5:    $p \leftarrow p + s$ 
6: end for

```

APPENDIX B DISK PRUNNING.

Appendix two explains disk pruning.

REFERENCES

- [1] M. R. Vieira, P. Bakalov, and V. J. Tsotras, "On-line Discovery of Flock Patterns in Spatio-temporal Data," in *Proceedings of the 17th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*. ACM, 2009, pp. 286–295.

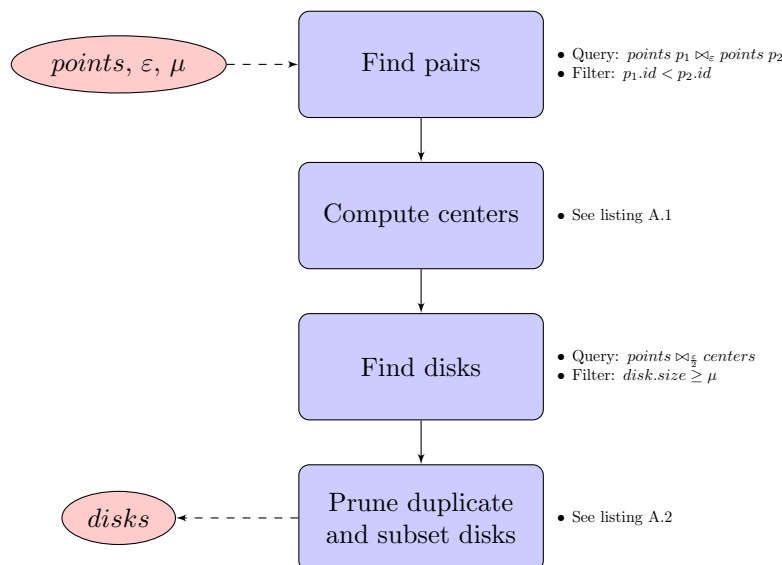


Fig. 1. General steps in BFE algorithm.