Project Proposal

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Problem Statement: Our aim is to perform feature-based visualization on the Vortex Street data which is a 3D time-dependent flow field.

Aim:

* Identify features objects and label them, for each time frame. Thus, each snapshot of the time-dependent data set would yield a set of feature objects.
* Implement feature tracking in two steps:
  + First, we would compute **linear continuations** from timestep ‘t’ to ‘t + 1’ by solving a weighted, bi-partite matching problem, as described in the paper. This guarantees a globally optimal 1:1 assignment of feature objects under the selected weight function.
  + The above step, however, is limited to linear assignments. It cannot describe 1: n or n :1 events, i.e., splits or merges. In a second step, we detect these events by augmenting the 1:1 assignments from the matching phase by additional edges. As mentioned in paper, we implement this task by modelling it as a maximum-weight independent set problem over the set of all potential explanations which are compatible with the initial matching.
* Build a feature evolution graph after feature tracking as illustrated below (taken from paper):

Chart

Description automatically generated with medium confidence

* Collect relevant statistical data summarising key aspects of the time-dependent flow data, and presenting our observations/ analysis.

# Reference Paper: Feature Tracking by Two-Step Optimization <https://ieeexplore.ieee.org/document/8546802>