

# Computational Geometry Project Proposal

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## Problem Statement:

Suppose we have an object moving through space. Suppose further that we have a robot that can detect the boundaries of objects. If this robot were to observe a moving object, it would be useful in fields such as Robotics, Motion Planning and Computer Vision to reconstruct the trajectory of the object.

We are given a cloud of  $N$  points located at positions  $\mathbf{x}_i \in \mathbb{R}^3, i \in [1..N]$ . The Moving Least Squares method [1] has been used to reconstruct a 3D surface from such data. It has not, however, been used to calculate a trajectory. It might be possible to modify this existing technique for our purpose.

There are several implementations of Moving Least Squares applied to surface reconstruction [?], [?]. One of the difficulties that will be encountered when applying it to curve reconstruction from 3D points must be noted - deciding how to fit the curve to the points. It might be useful to fit the curve to the center of gravity of the points, though there are some cases where this would not be as instructive. Another option would be to fit the curve to the zero set of the points.

## References

[1]