Computational Geometry Project Proposal

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Questions we shall consider

- Broadly we shall try to prove the four colourability of alpha shapes of Delauney triangulations of a planar point set; we hope to exploit the geometric conditions imposed by the fact that is an alpha shape of this particular geometric structure (a Delauney triangulation) to give elementary proofs for results and avoid the four colour theorem.
- Also we shall attempt to find efficient algorithms for finding the chromatic number of such an alpha shape and give a colouring on the same or try to prove complexity bounds for such algorithms. In particular an algorithm for deciding if a Delauney triangulation is three colourable is known. A three colouring can also be given in this case. We shall attempt to find an algorithm for finding a four colouring if a three colouring is not possible.

Methods

A few initial ideas on how to proceed.

- As suggested by Prof. Govindarajan we shall try to classify forbidden structures in alpha shapes of Delauney Triangulations. We shall try to argue that four colourability cannot be violated without such forbidden structures appearing.
- Note that addressing the second question by giving a provably correct algorithm for the same automatically proves four colourability for Delauney triangulations.