CS Masters' Thesis Defense

Title: *Path Planning in Planar Environments using Triangulations*
Speaker: Chaitanya Deosthale
Date: Tuesday, April 24, 2012
Time: 1:00 p.m.
Location: GMCS 405
Thesis advisor: Dr Joseph Lewis

Abstract:
Computing a collision-free path from a point to another in a planar environment is a very popular and common problem having applications in various fields. A unique approach to compute a collision-free path among two points by triangulating a planar environment was proposed by Marcelo Kallmann which made use of a Constrained Delaunay Triangulation, A* search and a funnel algorithm proposed by Bernard Chazelle to obtain the optimal path. The goal of this thesis is to provide a detailed and precise implementation of how an optimal path might be obtained by making use of just the Constrained Delaunay Triangulation and A* search approach.

The obstacle containing planar environment is represented by a Constrained Delaunay Triangulation. By triangulating the free space as well as the obstacles, a polygonal domain is obtained for performing an A* search across the different visibility graphs present in between two points. The A* search will retrieve a free path between the two points; if there exists one and which may be the shortest path in some instances. The approach in this thesis uses a face-vertex data structure to maintain adjacency relationships among the various elements in an environment; while constructing a Constrained Delaunay Triangulation. The effective use of the data structure used to represent triangulation in finding a path using A* search is demonstrated. A performance analysis on how quickly the collision-free path is computed is performed and a decision on the applicability of the approach in a time-critical application is made.