Winter School 2010

The Chinese University of Hong Kong

January 24-30, 2010

Room 1009, 10/F., William M.W. Mong Engineering Bldg., CUHK

Approximate Path Problems in Anisotropic Regions

By

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Abstract:

A classical path problem in a planar geometric environment is to find the path with the minimum Euclidean length. The Euclidean path length is not an appropriate measure if other factors like friction, wind, steepness, or other mechanical constraints need to be taken into consideration, such as when planning a path through cities, swamps, and forests. In other words, different metrics should be used in different regions of the subdivision and the metric should be sensitive to the navigation direction. Direction-dependence may have external origins. For example, the speed of an object traveling in a fluid may be influenced by its flow (e.g. current and wind). Direction-dependence may also be inherent. For example, if we project a terrain vertically to a planar subdivision, the relative difficulties of travelling uphill versus downhill translate to a direction-varying speed in the projected planar subdivision. Our recent work produced the first provably good approximate shortest path results in a general setting where the travel cost in different regions are defined by different convex distance functions. In general, a convex distance function can be asymmetric and direction-dependent. Thus, it is a good model of direction-dependent factors. We sketch in this talk our recent results in this model.

Biography:

Siu-Wing Cheng received his BSc in Computer Studies from the University of Hong Kong in 1987 and his PhD in Computer Science from the University of Minnesota in 1992. Since then, he has been affiliated with the Department of Computer Science and Engineering of the Hong Kong University of Science and Technology. Prof. Cheng's major research areas include computational geometry, algorithms, and data structures. He recently spends most of his time on problems in mesh generation, manifold reconstruction, and approximate path problems.