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Leadership Starts Here

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An Alternative Data Structure to Line Sweep Algorithm

Abstract

Line sweep algorithm is probably the most popular algorithm in Computational Geometry. The algorithm basically tries to find intersection points among a set of lines in a Cartesian coordinate space. The algorithm has many real life usages and hence probably is more popular. In this thesis I am presenting two different implementations of the Line Sweep algorithm. The two variations of the algorithm are developed using C++ programming language. C++ is the chosen language as it provides a large amount of control over the program but the algorithm can be potentially developed in any programming language. First implementation represents the algorithm as stated in the text book and in the second implementation I am proposing a slight modification to the data structure that is used in the original algorithm in order to maximize throughput. I will then be analyzing the outputs from the two implementations to show that the modified Line Sweep algorithm is more efficient compared to the existing algorithm. Modern Design patterns like iterators have been used to develop the algorithm so that it can be easily applied to other use cases with little or no modifications.

All the data structures have been self-implemented without dependency on any third party libraries or dynamic link libraries (DLLs). The primary goal of this project besides understanding and implementing the Line sweep algorithm is to suggest some modifications in the original data structures used in this algorithm in order to make it more efficient. Also the secondary goal is to present a working algorithm so that future students/ researchers can better understand the algorithm when they see the data structures being updated as the algorithm proceeds which are very critical in understanding the overall algorithm.

Thesis Committee

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Joseph Mahaffy, Department of Mathematics and Statistics