

I'm not robot!



AN EFFICIENT ALGORITHM FOR LINE CLIPPING IN COMPUTER GRAPHICS PROGRAMMING

S. R. Kedituwakku¹, K. R. Wijewera¹, M. A. P. Chamikara²

¹Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya
²Post Graduate Institute of Science, Faculty of Science, University of Peradeniya

Abstract: Most of the line clipping algorithms are based on Cohen-Sutherland and Liang-Barsky algorithms. These algorithms involve a lot of calculations. This paper proposes a new line clipping algorithm for 2D space which is more efficient than the existing algorithms. The possible extended algorithm for 3D space is also presented. The algorithm proposed for the 2D space is compared against traditional line clipping algorithms. The proposed algorithm was tested for a large number of random line segments and the results showed that it performs better than the Cohen-Sutherland and Liang-Barsky algorithms.

Keywords: Computer Graphics Programming, Line Clipping, 2D geometry, 3D geometry

1. INTRODUCTION

Line clipping is a basic and an important operation in computer graphics. There are many applications of line clipping. For example, line clipping is needed to extract a part of a given scene for viewing. Generally lines are clipped by using a region that includes the part of the given scene. It is known as the clipping window and it is a rectangle or a general polygon [2].

The traditional line clipping algorithms include Cohen-Sutherland line clipping algorithm [1], Liang-Barsky line clipping algorithm [2], Cyrus-Beck line clipping algorithm [3] and Nicholl-Lee-Nicholl line clipping algorithm [4]. The Cohen-Sutherland and the Liang-Barsky algorithms can be extended to three-dimensional clipping [1]. The Nicholl-Lee-Nicholl algorithm performs fewer comparisons and divisions. Therefore, it is faster than others [1]. The major disadvantage of this algorithm is that it can only be applied to two-dimensional clipping [1]. On the other hand, the Liang-Barsky and the Cohen-Sutherland methods are easily extended to three-dimensional scenes [1].

The Cohen-Sutherland line clipping algorithm is one of the earliest and most widely used line clipping methods [2]. In this algorithm, a rectangular clipping window along with a coding scheme is used to divide the space into regions. Then, each end point of the line segment is assigned a region code according to the region which has been occupied by that point. Then the "AND" and "OR" operations are performed over the region codes of the end points to decide whether the line segment is inside the clipping window or outside the clipping window. This algorithm is very faster for simple situations such as line segment is completely inside or outside of the clipping window. When the line segment cannot be classified as completely inside or outside, the algorithm needs to be repeated several times to convert it into a simple situation. So, if the line segment is intersecting more than two boundaries of the clipping window, lots of unnecessary computations are involved [1].



