

## A Genetic Based Algorithm to Generate Random Simple Polygons Using a New Polygon Merge Algorithm

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**Abstract :** In this paper a new algorithm to generate random simple polygons from a given set of points in a two dimensional plane is designed. The proposed algorithm uses a genetic algorithm to generate polygons with few vertices. A new merge algorithm is presented which converts any two polygons into a simple polygon. This algorithm at first changes two polygons into a polygonal chain and then the polygonal chain is converted into a simple polygon. The process of converting a polygonal chain into a simple polygon is based on the removal of intersecting edges. The merge algorithm has the time complexity of  $O((r+s) * l)$  where  $r$  and  $s$  are the size of merging polygons and  $l$  shows the number of intersecting edges removed from the polygonal chain. It will be shown that  $1 < l < r+s$ . The experiments results show that the proposed algorithm has the ability to generate a great number of different simple polygons and has better performance in comparison to celebrated algorithms such as space partitioning and steady growth.

**Keywords :** Divide and conquer, genetic algorithm, merge polygons, Random simple polygon generation.

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