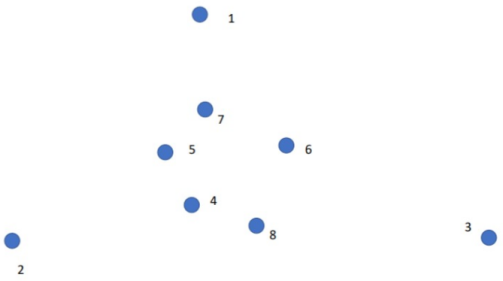
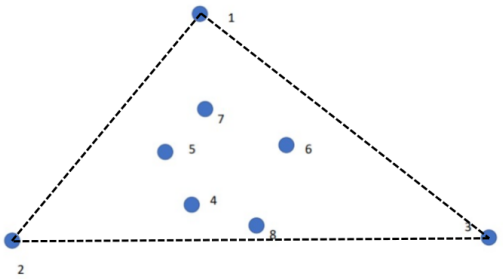
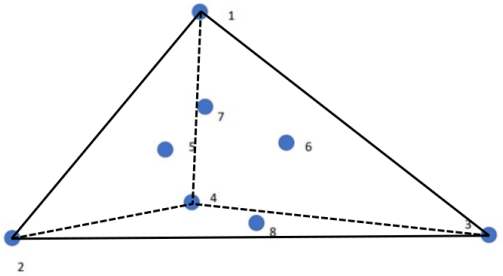
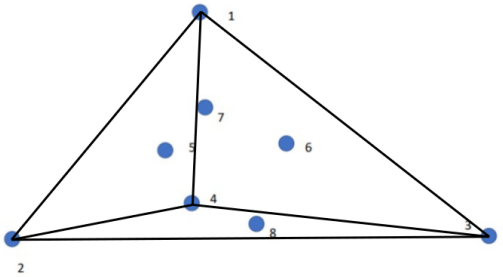
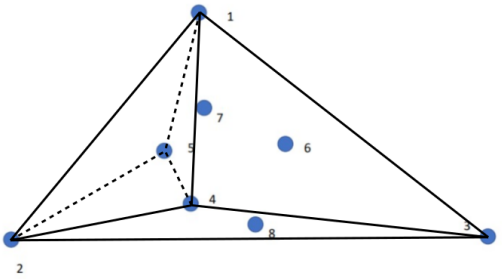
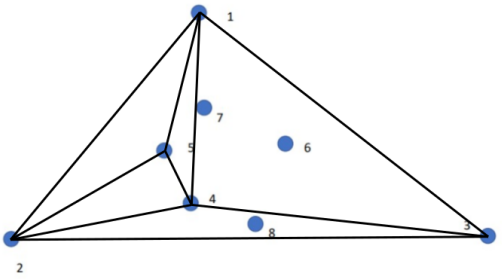
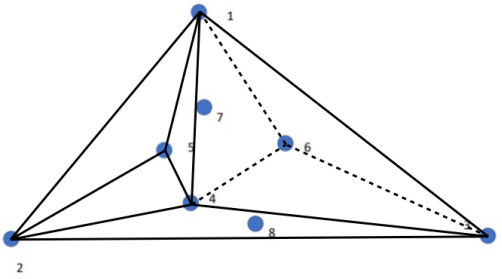
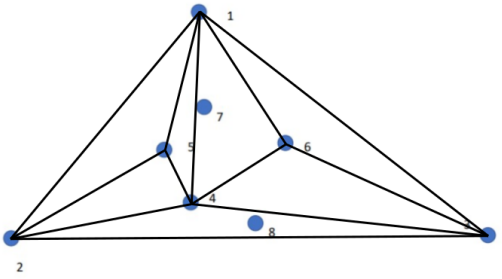
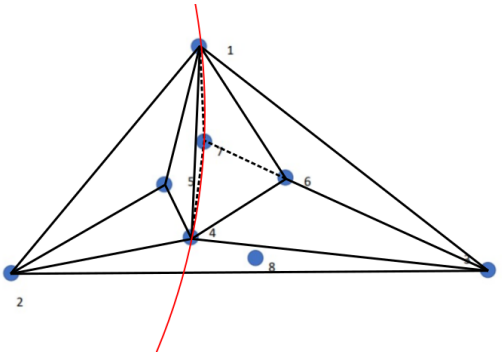
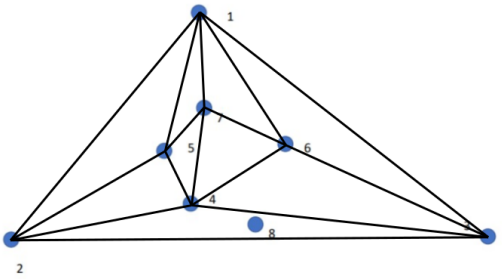
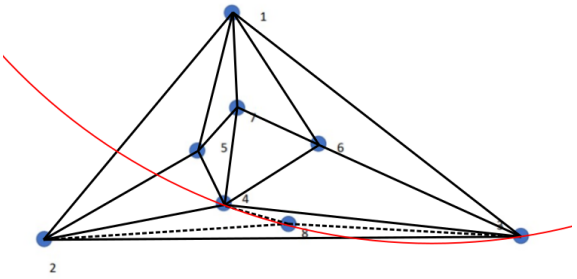
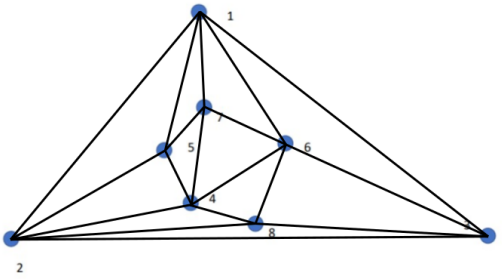
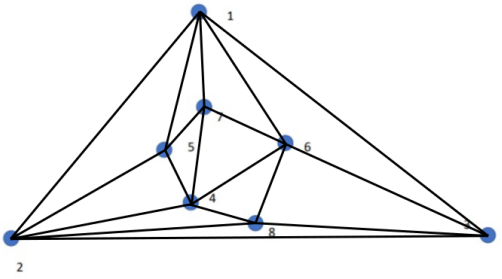
1.

The illustrations are listed below.

Step	Operation	Effect
0	-	
1	Compute the outer triangle	
2	Add point 4	
3	Incircle test pass	

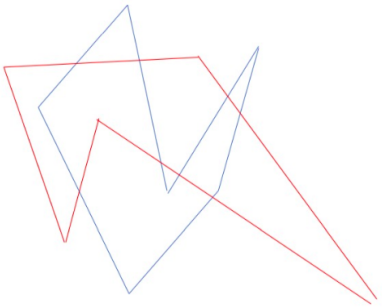
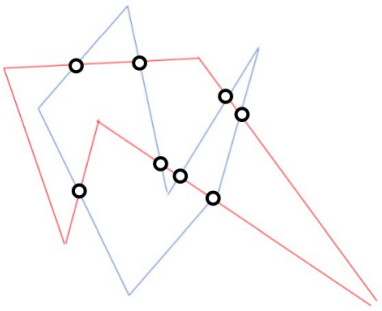
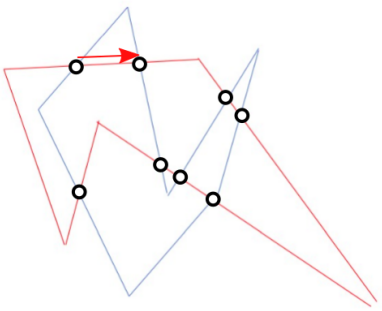
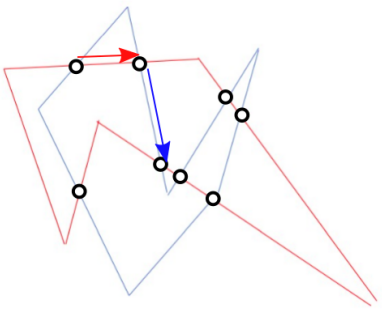
Step	Operation	Effect
4	Add point 5	
5	Incircle test pass	
6	Add point 6	
7	Incircle test pass	
8	Add point 7, incircle test failed	

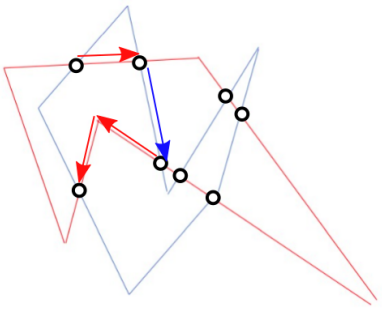
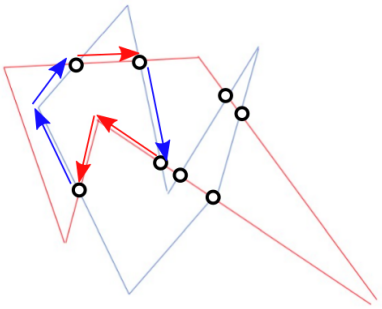
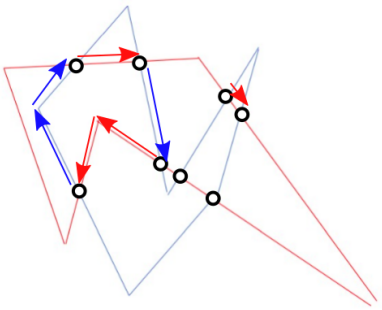
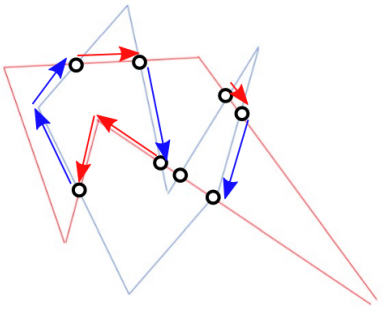
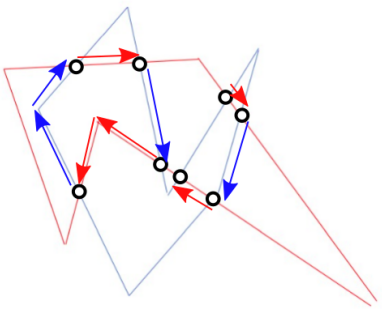
Step	Operation	Effect
9	Swap the edge	
10	Add point 8, incircle test failed	
11	Swap the edge	
12	The end	

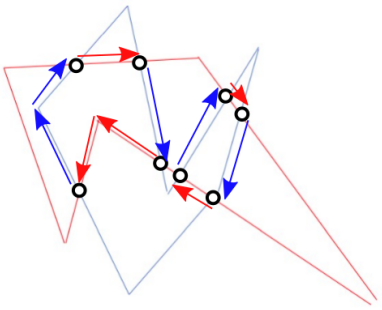
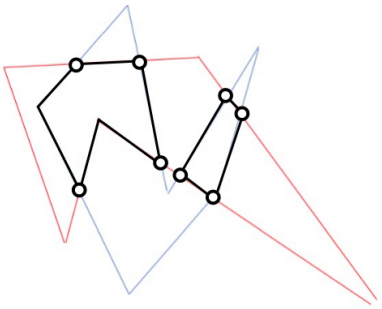
2.

All the data structures used are event queue, plane sweep status queue and doubly connected edge list.

The illustrations are listed below.

Step	Operation	Effect
0	-	
1	Compute intersection points	
2	Find the next edge of overlay from an intersection point	
3	Find the next edge of overlay	

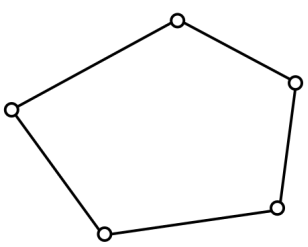
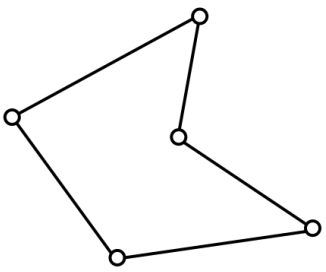
Step	Operation	Effect
4	Find the next edge of overlay	
5	Find the next edge of overlay, complete	
6	Find the next edge of overlay from an intersection point	
7	Find the next edge of overlay	
8	Find the next edge of overlay, incircle test failed	

Step	Operation	Effect
9	Find the next edge of overlay	
10	The end	

3.

3.1

Clearly, a polygon satisfies this property when and only when it is a convex polygon. Here are two examples of polygons that satisfy and do not satisfy such properties, respectively.

A polygon that satisfies this structural property	A polygon that does not satisfy this structural property
	

3.2

The region formed by the set of rays intersecting P emitted from q is equivalent to the union set of triangles constructed by q and the edges of P sequentially.

This proof is trivial and can be proved using recursion.

3.3

This gives us an algorithm for constructing polygons from point sets. Start with a triangle and add a new point in turn. The new points and the existing polygon form a new polygon. To form a new polygon, we need this point and each side of the existing polygon to form a triangle, and take the union of these triangles and polygons, then we get the outermost side of this union to be the new polygon region.

It is not difficult to prove that the time complexity of this algorithm is $O(n^2)$.