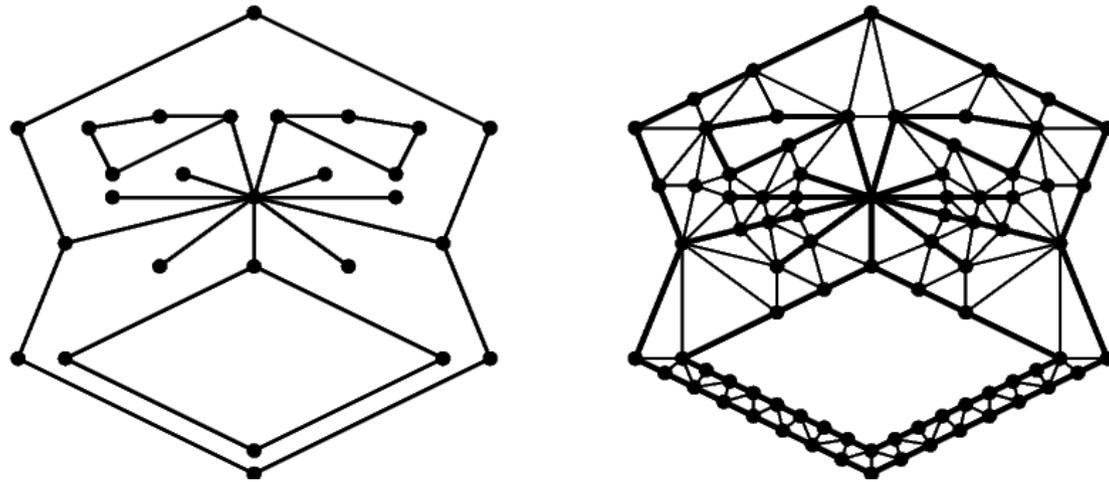
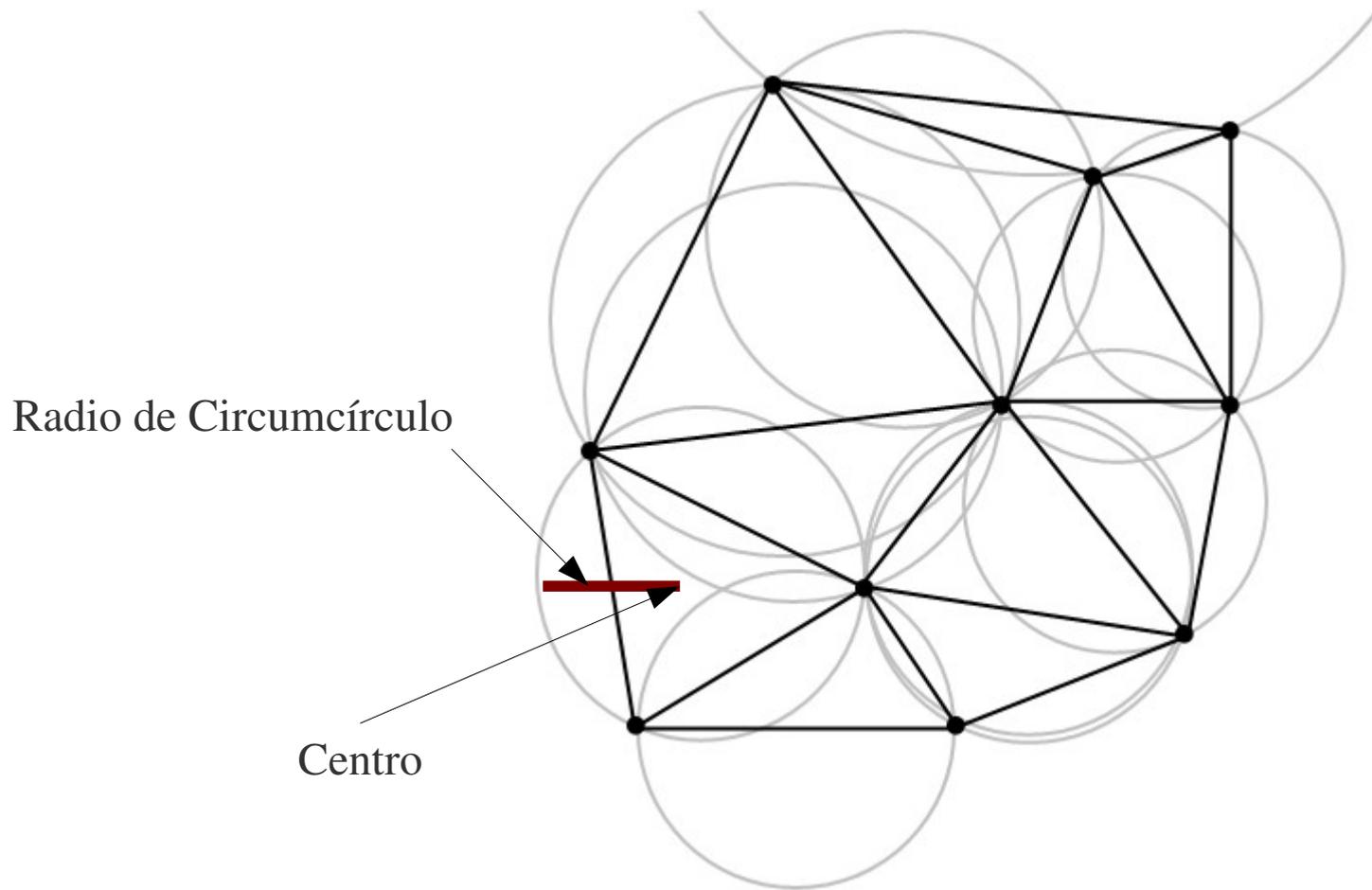


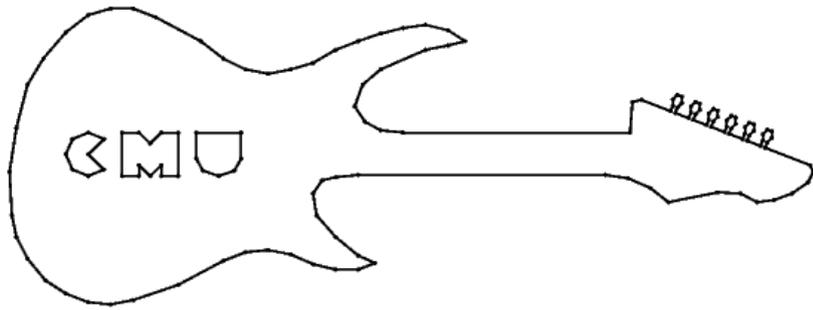
# Algoritmo de refinamiento Delaunay de Ruppert



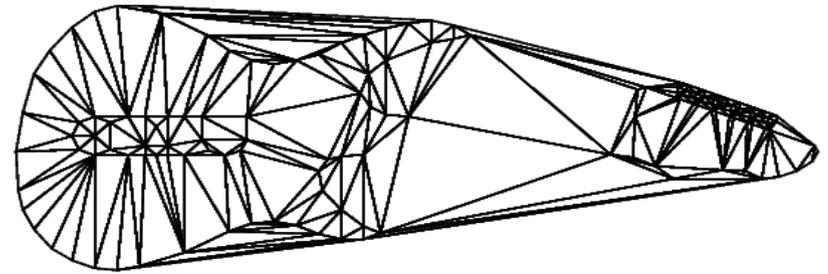
Erick Raul Olvera Prado



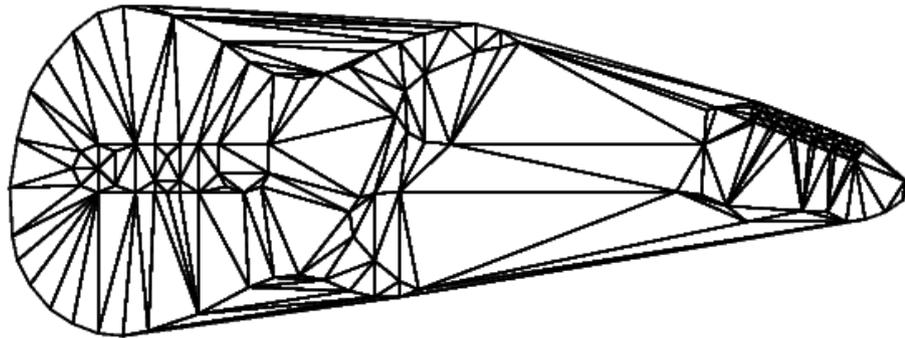
Triangulación Delaunay



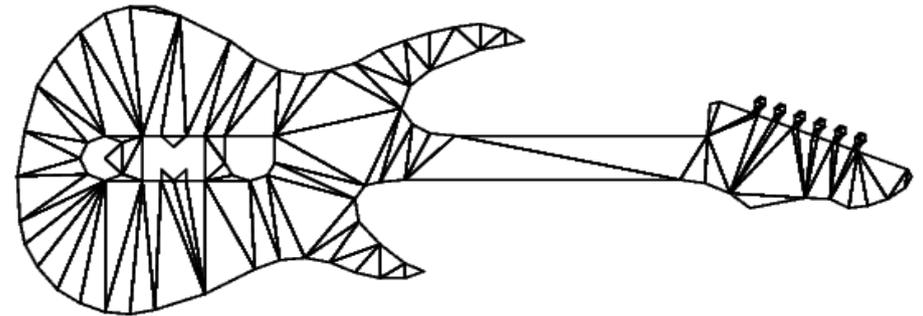
Planar Straight Line Graph (PSLG)



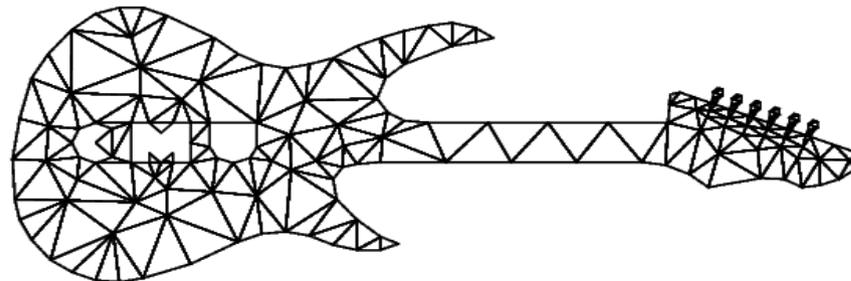
Triangulación Delaunay de una PSLG



Triangulación Delaunay Limitada de una PSLG



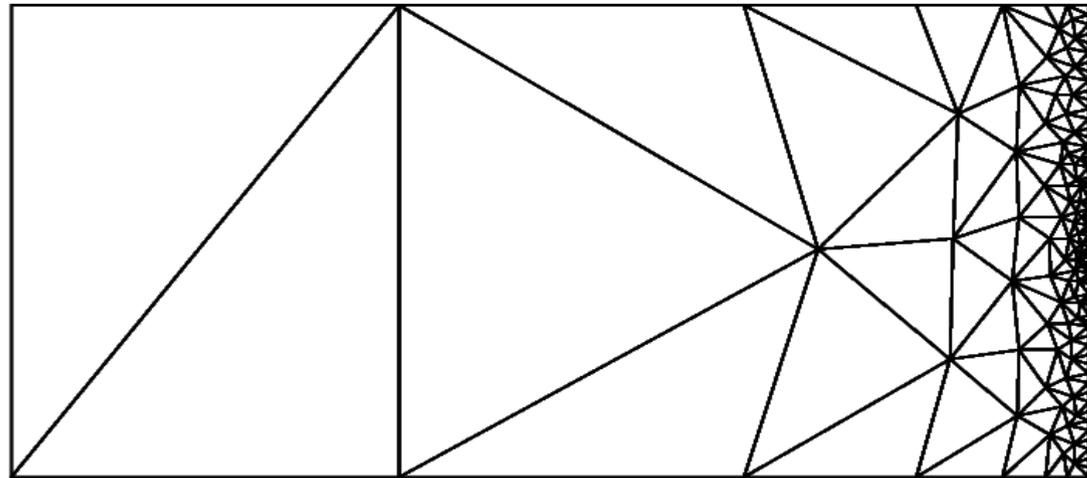
Remoción de concavidades y agujeros



Triangulación Delaunay Conformada de una PSLG (20°)

# Objetivos de un generador de mallas

- Triangulación debe respetar los segmentos.
- Mantener ángulos no muy grandes, no muy pequeños.
- Control sobre el tamaño de los triángulos.

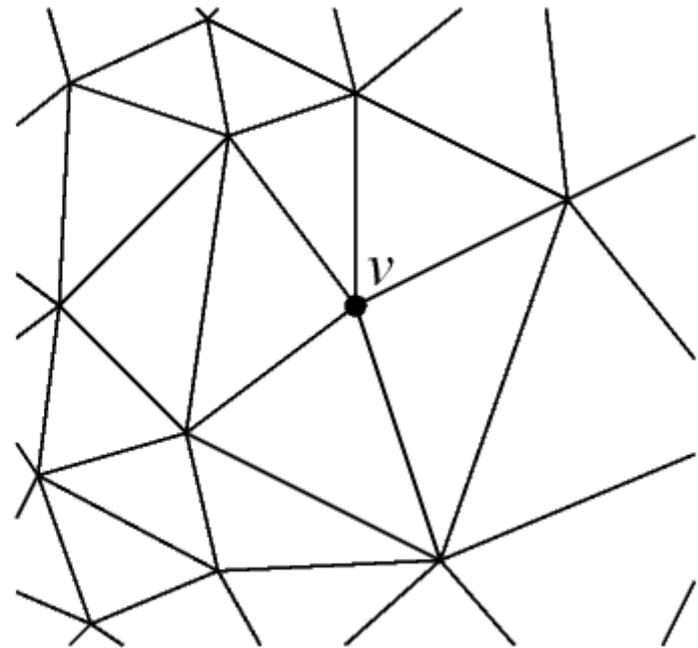
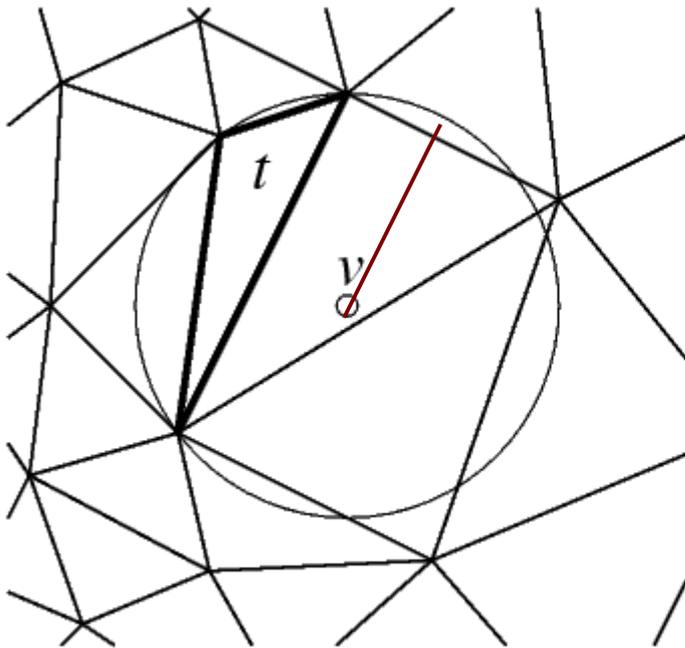


# Idea detrás del Refinamiento Delaunay

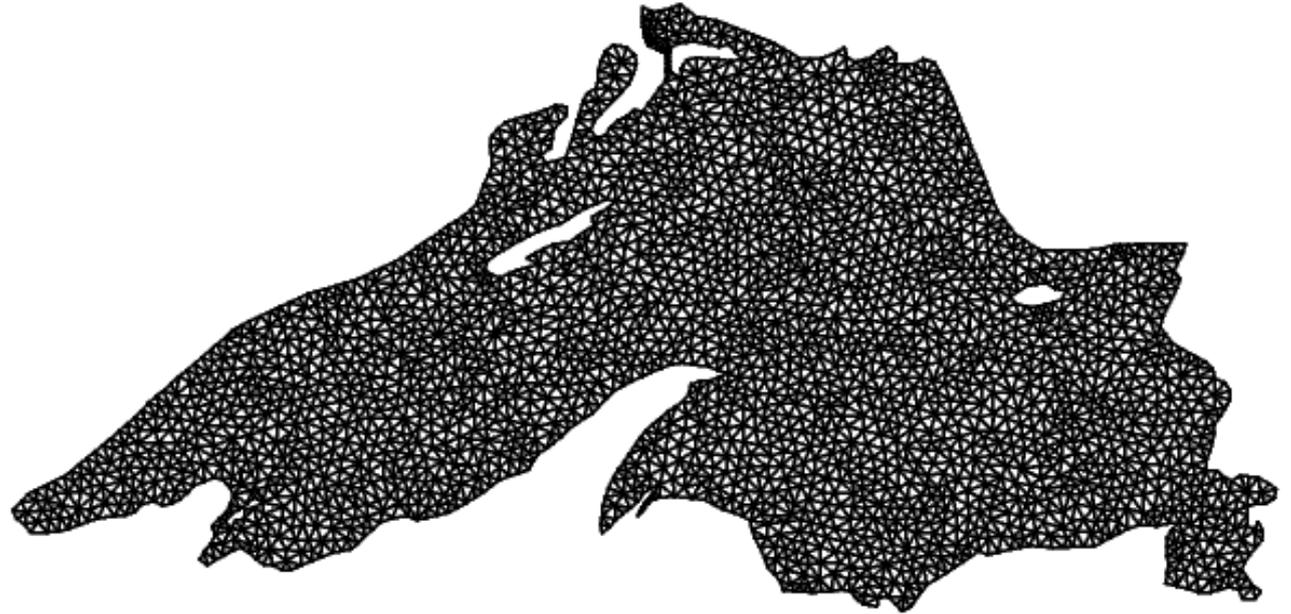
- Relación *radio del circuncírculo-borde más pequeño*, (Walkington, 1995)

$$r/l = 1/(2\text{sen } \theta_{\min})$$

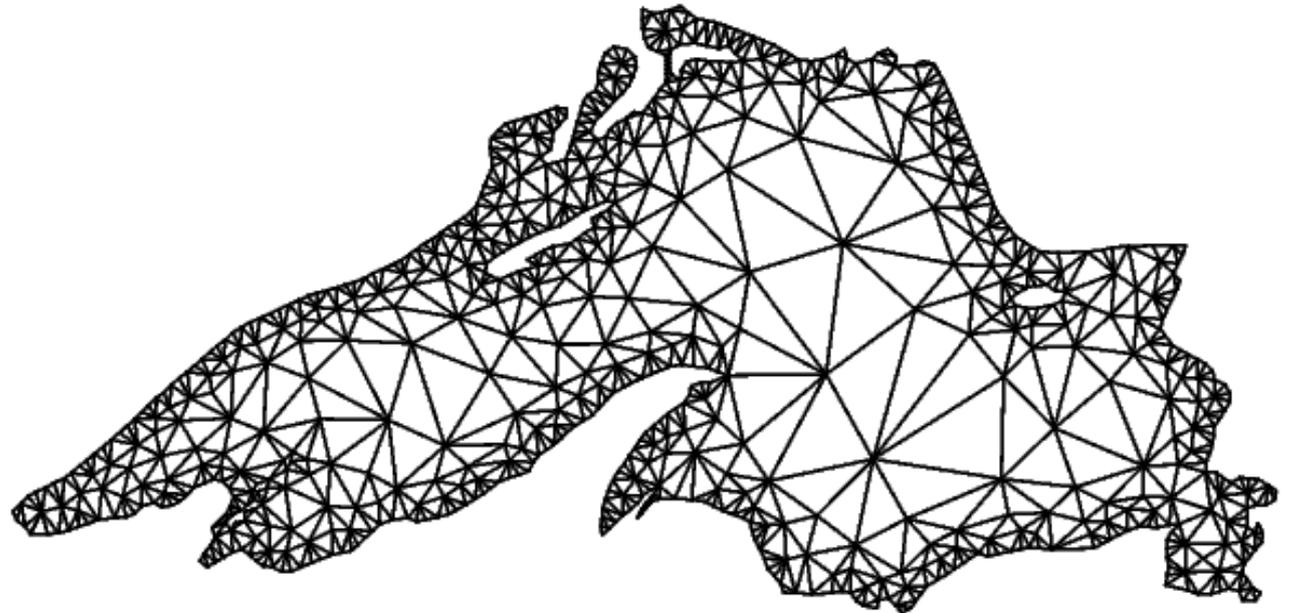
$$r/l < B = 1/(2\text{sen } \theta_{\min})$$



Chew:  $B = 1$

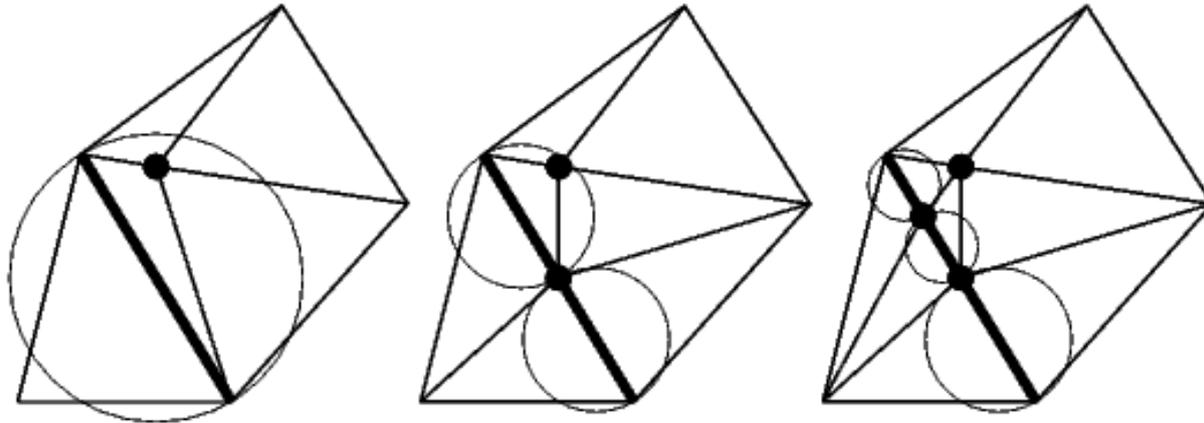


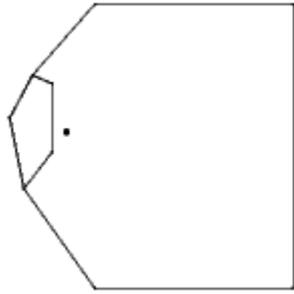
Ruppert:  $B = 2^{0.5}$



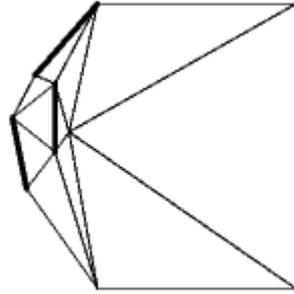
# Descripción del Algoritmo

- Inserción de vértices en centros de circuncírculos y en segmentos. Governado por 2 reglas:
  - 1) Círculo diametral no “invadido” por otros vértices, y
  - 2) Triángulo cumple  $r/l < B$ .

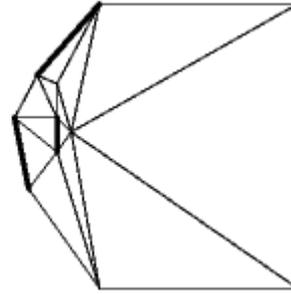




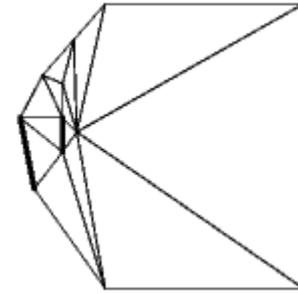
PSLG muestra



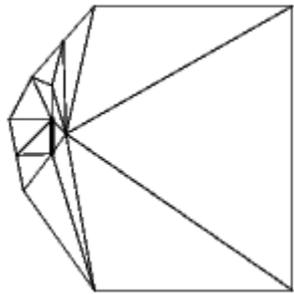
Triangulacion Delaunay Limitada, segmentos "invadidos" en negritas



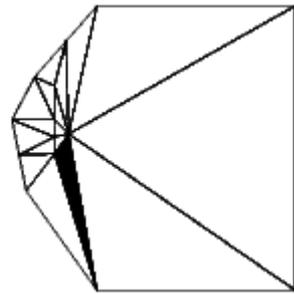
Un segmento "invadido" es dividido



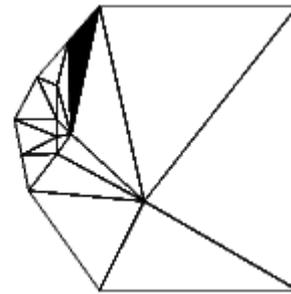
Otro



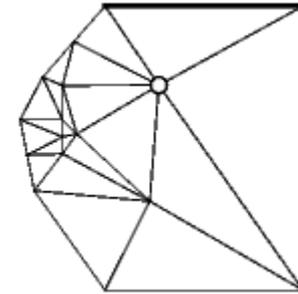
Otro



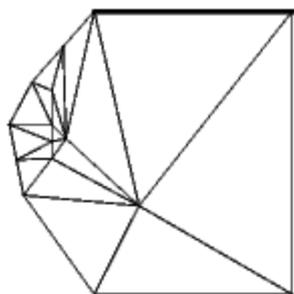
El ultimo segmento "invadido" es dividido, aparece un triángulo "delgado"



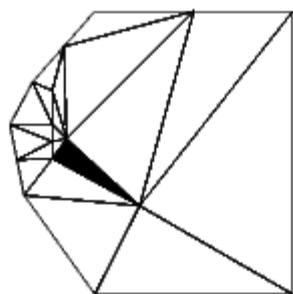
Se incerta el centro de su circuncírculo, aparece otro triángulo "delgado"



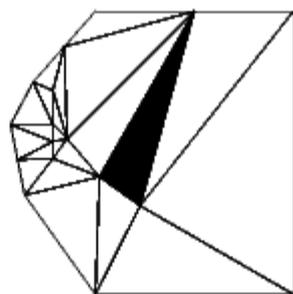
El centro invade un segmento y es rechazado



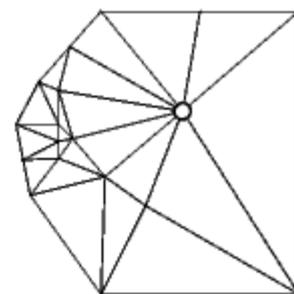
Aunque el vértice  
haya sido  
rechazado, el  
segmento sigue  
marcado



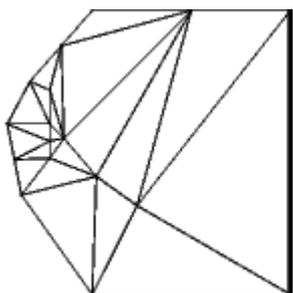
El segmento  
“invadido” es  
dividido, y el  
triángulo que llevo a  
su bisección es  
eliminado



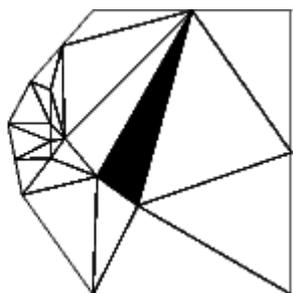
Se inserta el centro del  
circumcírculo



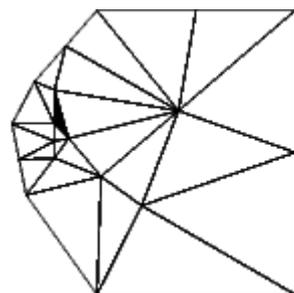
Se rechaza el  
centro del  
circumcírculo



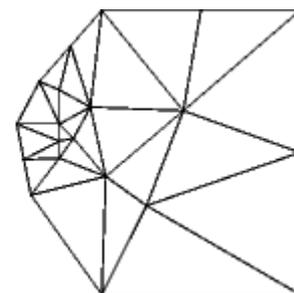
Se marca el  
segmento



No se eliminó el  
triángulo y se intenta  
insertar un centro otra  
ves

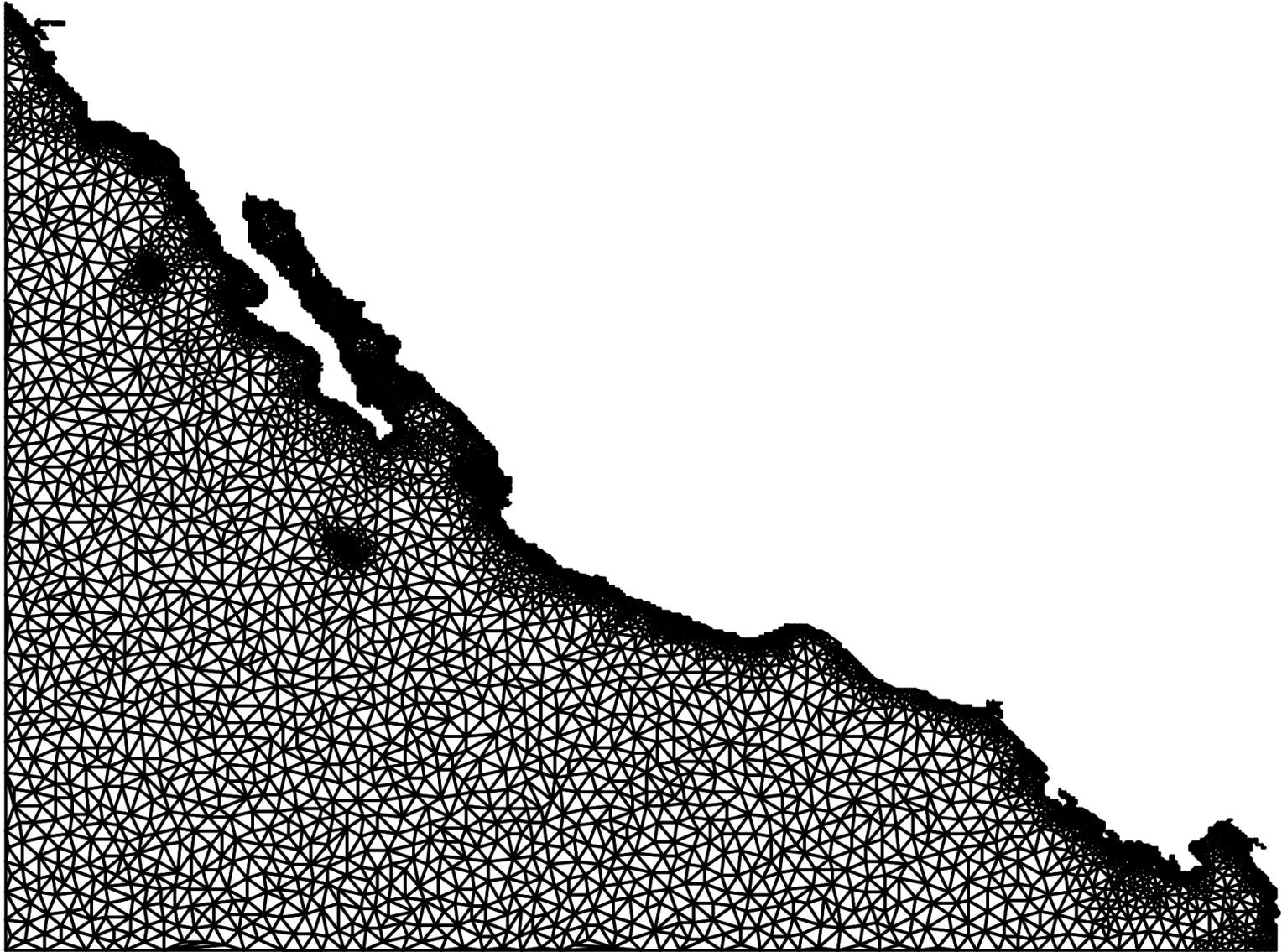


Se inserta el centro  
exitosamente y solo  
queda un triángulo  
delgado



Malla final.  
Ningun ángulo  
es menor de  
 $20.7^\circ$

# Dominio del Océano Pacífico hecho con Triangle (Mancha)



# Golfo de México

