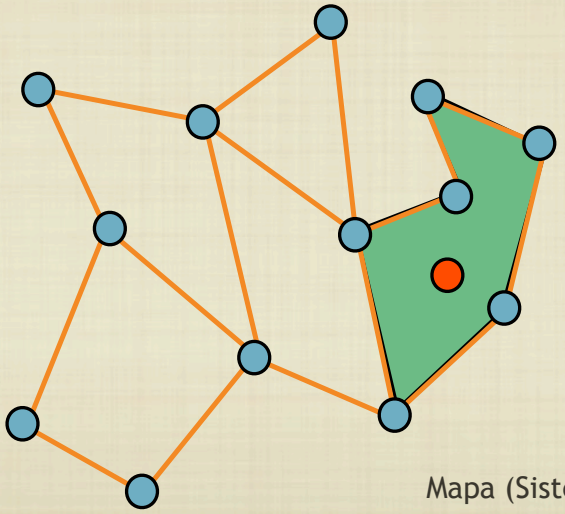
Algoritmos de Busca Pontual

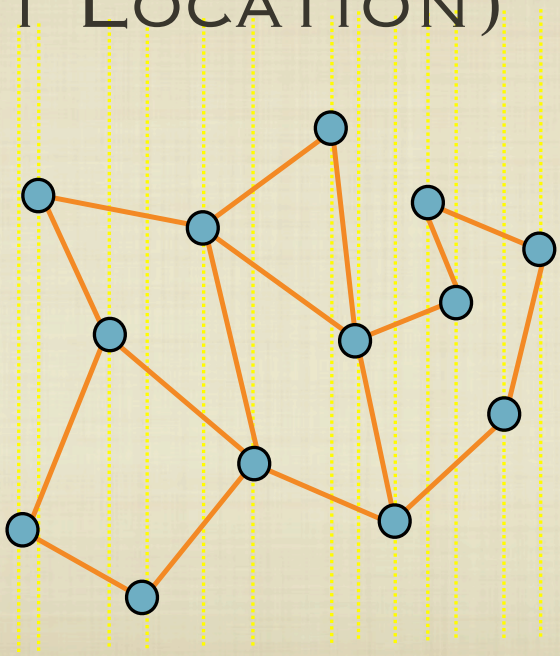
João Comba

Localizacao Pontual (Point Location)



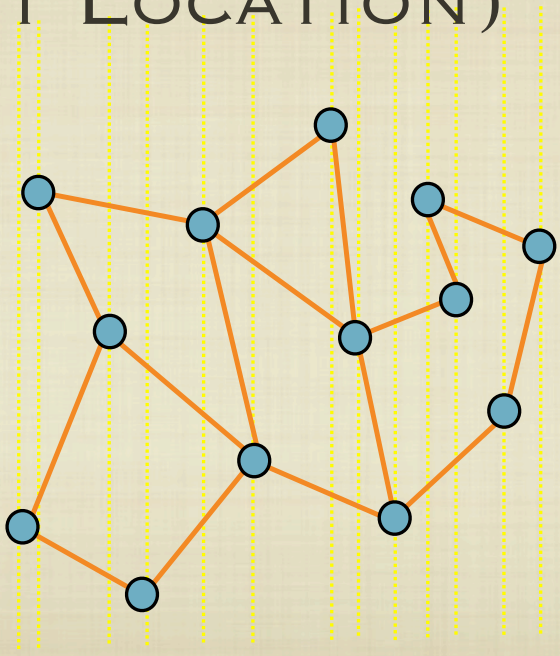
Mapa (Sistema de GPS)

Localizacao Pontual (Point Location)



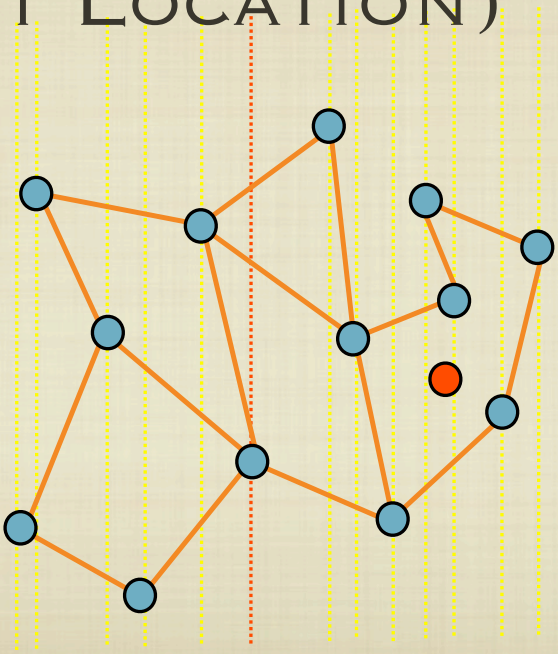
Cortes verticais pela coordenada X, Manter cortes ordenados por X

Localizacao Pontual (Point Location)

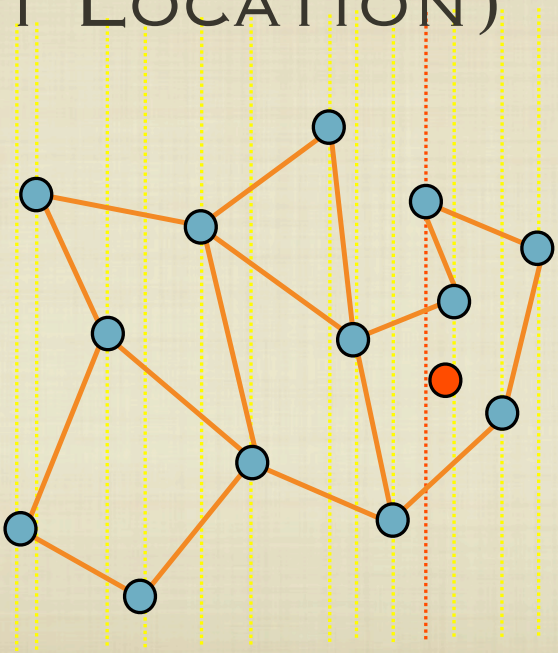


Pesquisa Binaria para Achar Corte

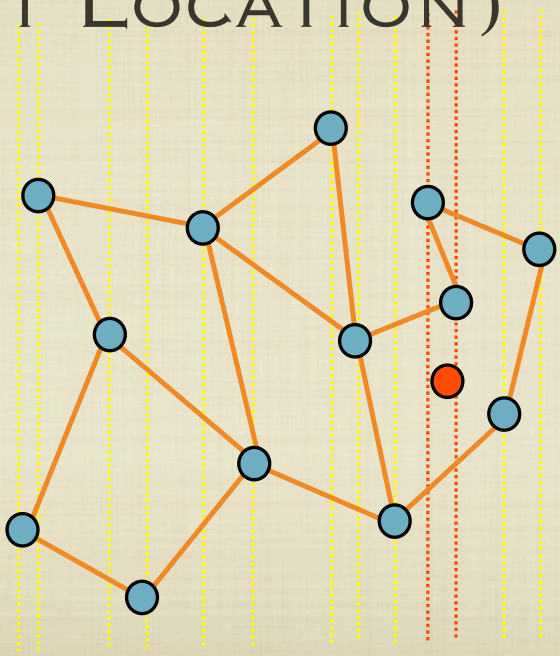
Localizacao Pontual (Point Location)



Localizacao Pontual (Point Location)

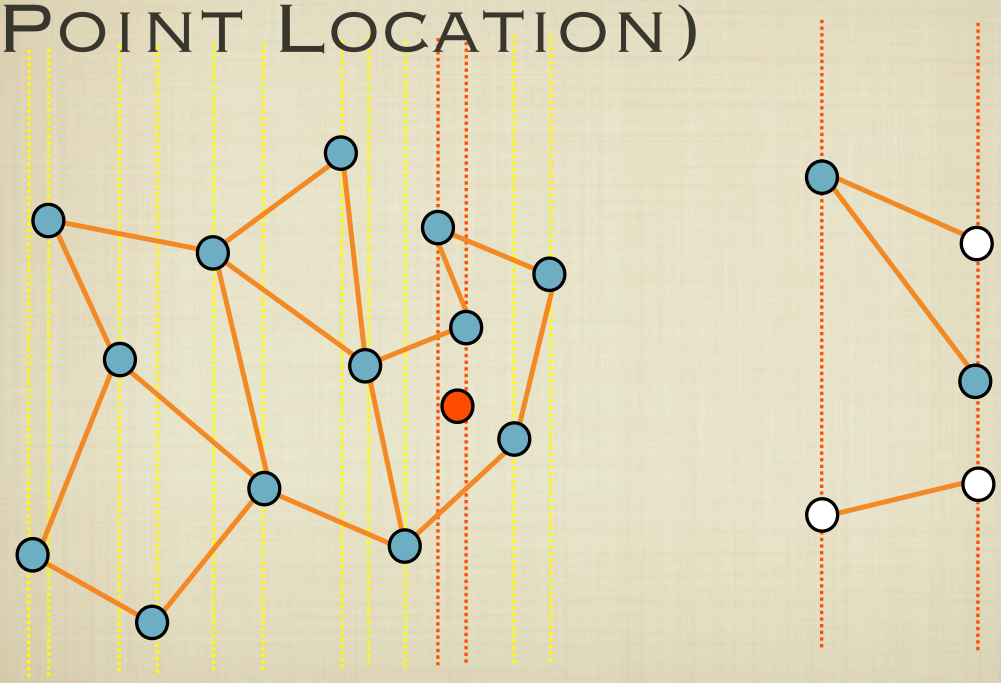


Localizacao Pontual (Point Location)



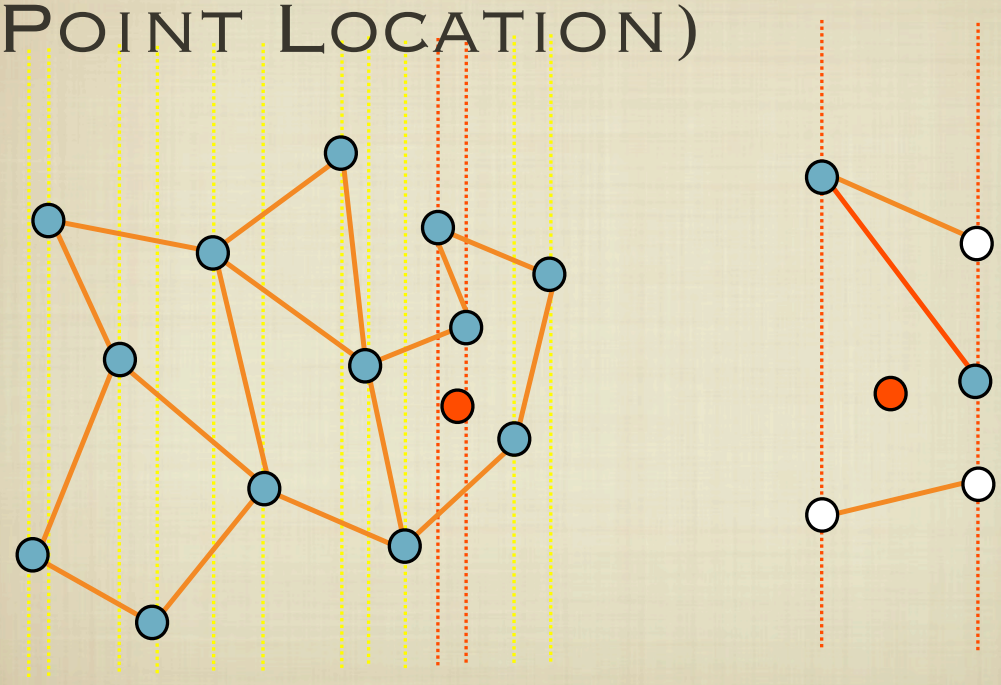
Corte achado : O(log(n)

Localizacao Pontual (Point Location)



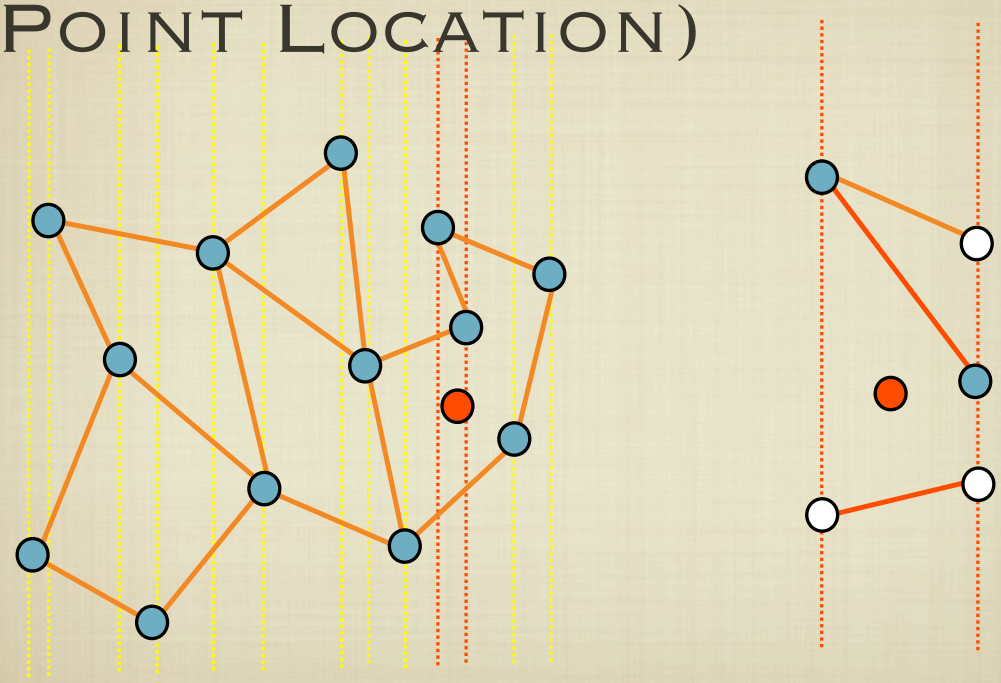
Manter arestas cortadas ordenadas por Y

Localizacao Pontual (Point Location)



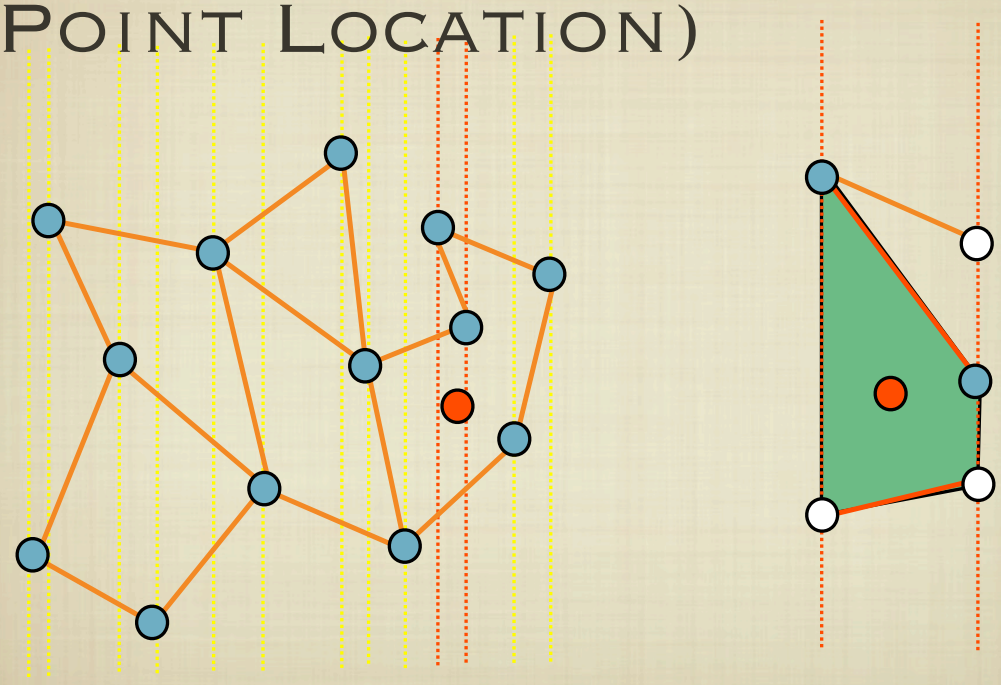
Pesquisa Binaria nas Arestas O(logn)

Localizacao Pontual (Point Location)



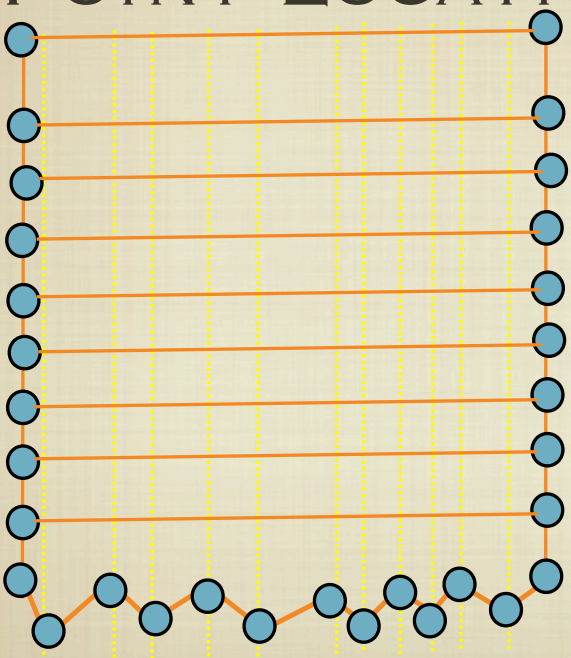
Pesquisa Binaria nas Arestas O(logn)

Localizacao Pontual (Point Location)



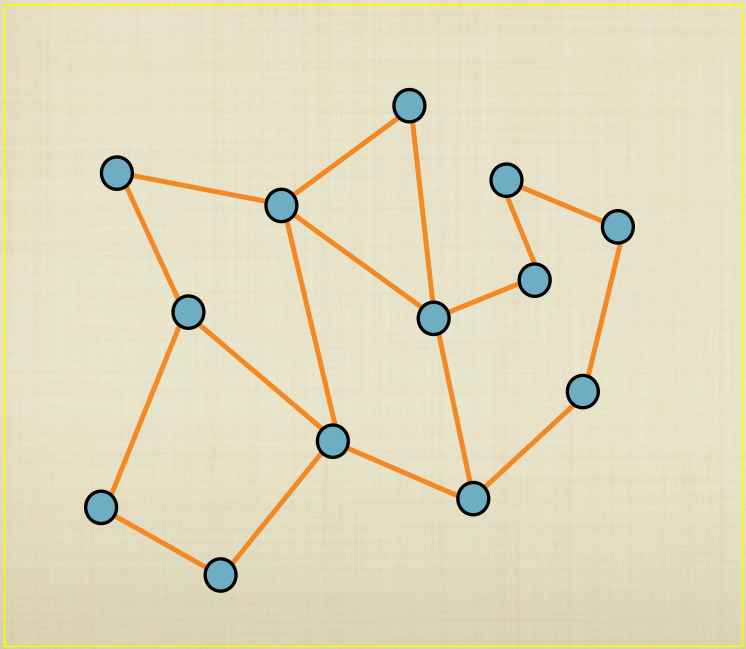
Pesquisa Binaria nas Arestas O(logn)

Localizacao Pontual (Point Location)

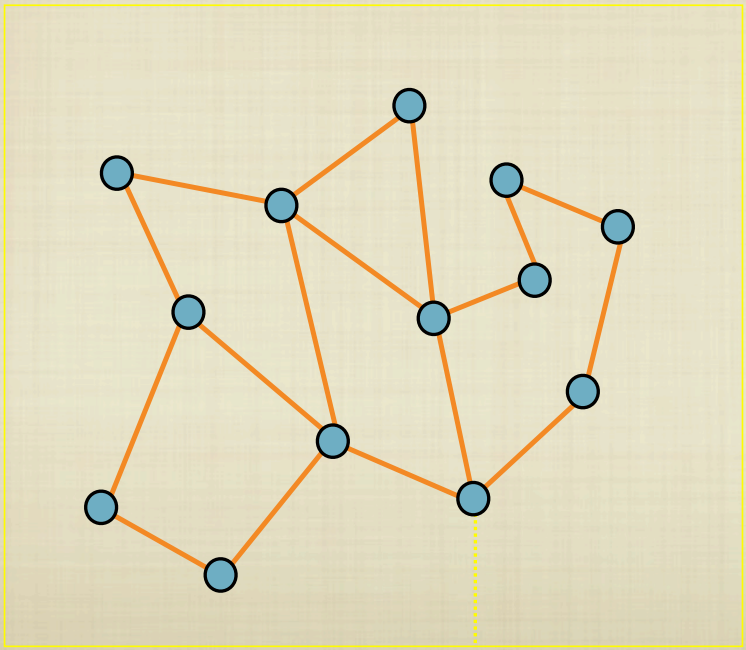


$O(n^2)$ memoria

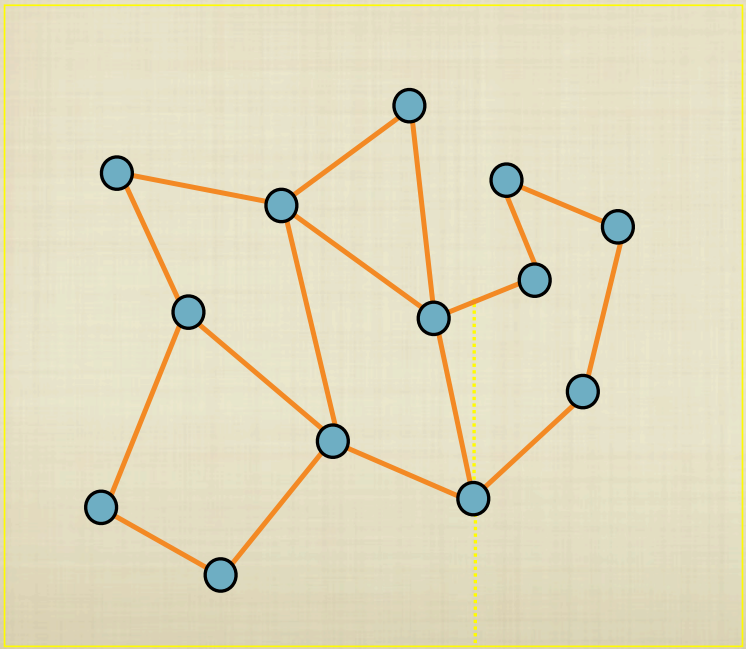
Mapa Trapezoidal (ou Decomposicao Vertical)



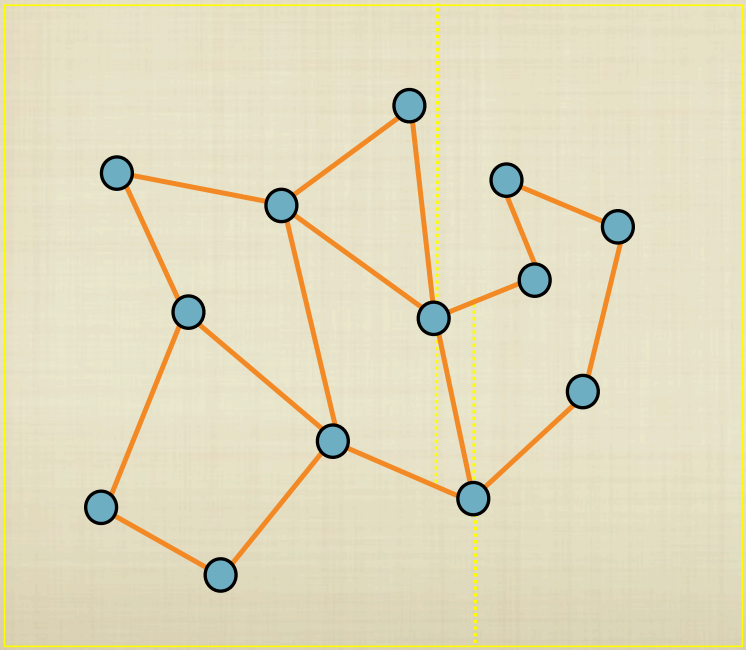
Mapa Trapezoidal (ou Decomposicao Vertical)



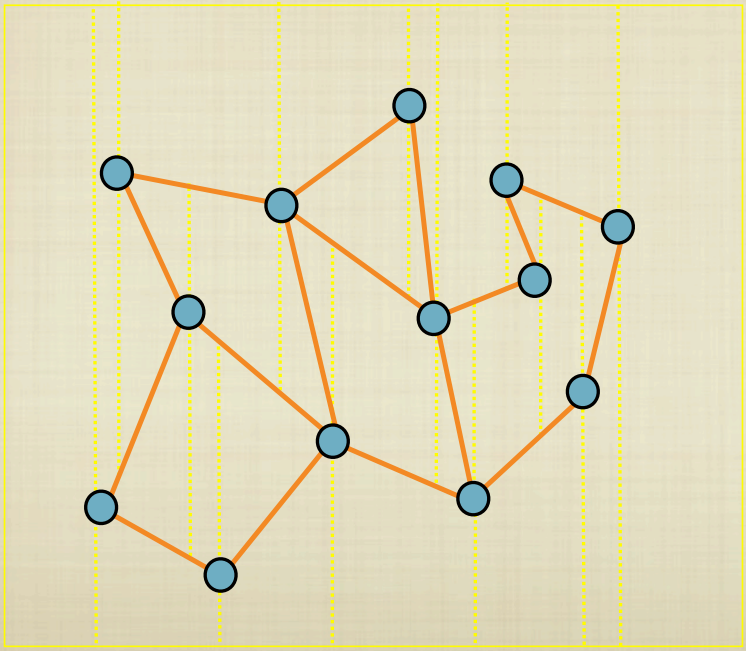
Mapa Trapezoidal (ou Decomposicao Vertical)



Mapa Trapezoidal (ou Decomposicao Vertical)

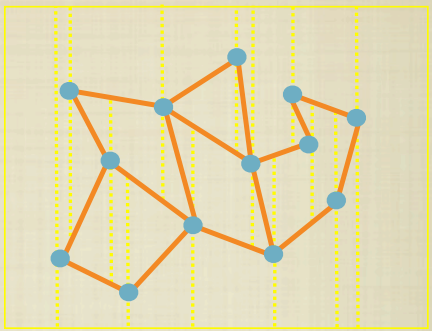


Mapa Trapezoidal (ou Decomposicao Vertical)



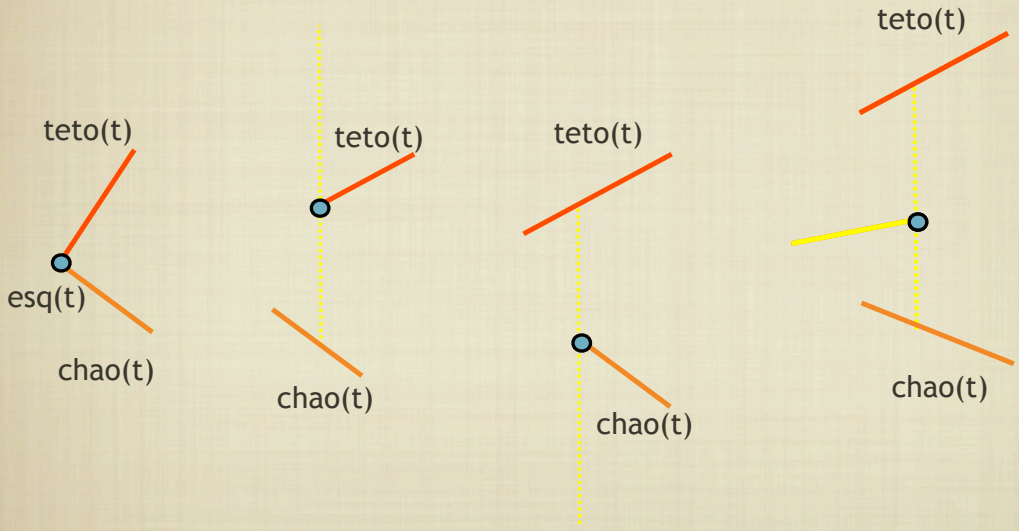
Mapa Trapezoidal

- Assumir Posicao Geral:
  - Nenhuma segmento vertical
  - Segmentos nao interceptam



LEMA: Cada face de um mapa trapezoidal de um conjunto de segmentos de linha S em posicao geral possui 1 ou 2 lados verticais, e exatamente 2 lados nao-verticais

Mapa Trapezoidal



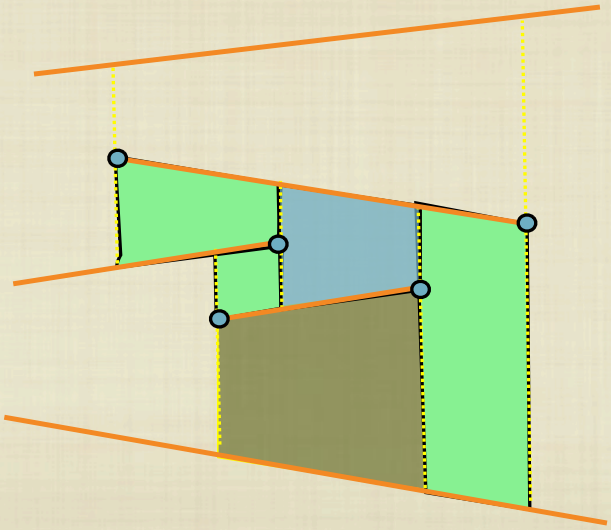
Mapa Trapezoidal

- LEMA: Cada mapa trapezoidal T(S) com n segmentos de linha contem no maximo 6n+4 vertices e 3n+1 trapezoides

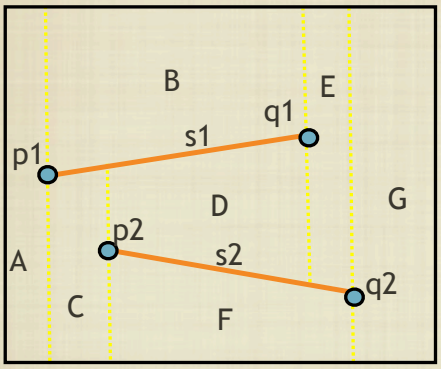
- Numero de vertices:
  - Vertice de R (4)
  - Ponto do segmento S (2n)
  - Ponto de parada de seg. Vertical (2(2n))
  - Resultado: 4 + 2n + 4n: 6n + 4

- Numero de faces:
  - Cada trapezoide possui 1 esq(t)
  - esq(t) para no maximo 2 trapezoides
  - 3n+1

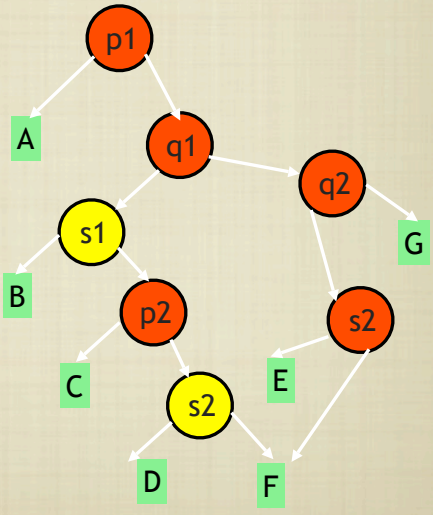
Relacoes de adjacencia



Representacao e Estrutura de Busca



- 4 ponteiros:
  - esq(t), dir(t): pontos
  - teto(t), chao(t): segmento
- 4 vizinhos

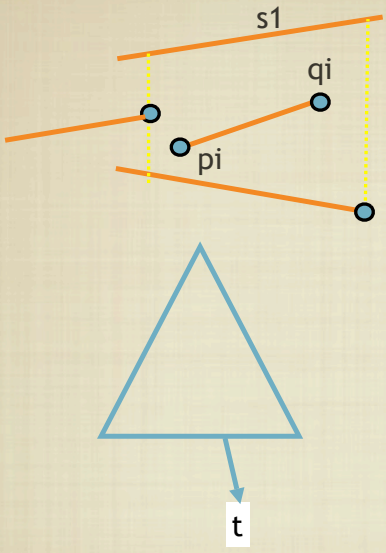


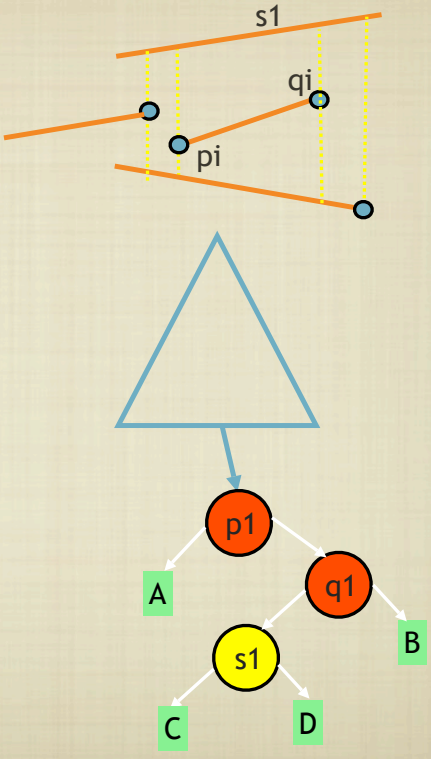
Construcao

Algoritmo MapaTrapezoidal(S)
Entrada: Conjunto S de segmentos em P.G.
Saida: Mapa trapezoidal T(S)

1. Criar um bounding box R
2. Permutar randomicamente os elementos de S
3. FOR i=1 TO n
4. DO Encontrar os trapez t0, …, tk interceptados por si
5. Remover t0, …, tk de T e trocar pelos novos trapezoides decorrentes de si
6. Remove as folhas de D e criar folhas para os novos trapezoides. Conecta estas folhas aos nodos interiores

Atualizacao de T





Mapa Trapezoidal

- TEOREMA: O algoritmo MapaTrapezoidal(S) calcula o M.T. de um conjunto S de n segmentos de linha em P.G. e uma estrutura de busca em O(nlogn) tempo esperado. O tamanho esperado e' O(n) e a consulta de um ponto q leva O(logn).