

Distributed Fringe Search with MPI

Lukas Mosimann & Christian Zeman

ETH Zürich

Design of Parallel and High-Performance Computing

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1 Algorithm

- About Fringe Search
- Example
- Advantages / Disadvantages

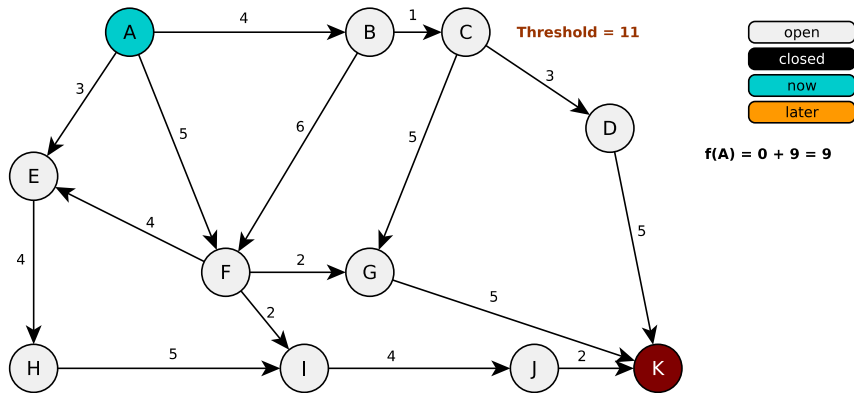
2 Implementation and Evaluation

3 References

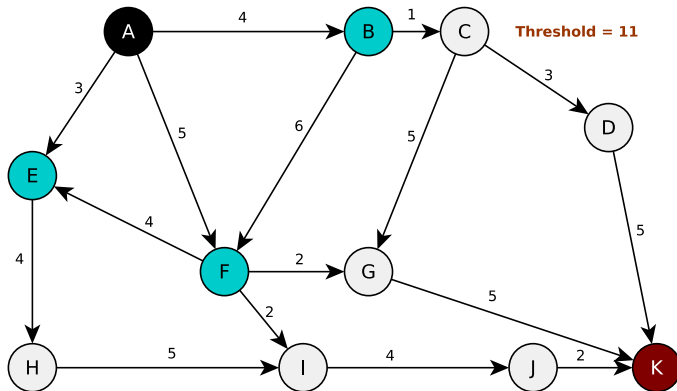
About Fringe Search

- Find a short path between two points
- Not optimal
- Similar to A*
- Uses threshold to determine the most promising nodes
- "Best-first" search with heuristic cost function
- Heuristic cost function h :
 - $h(x) \leq d(x, y) + h(y)$
 - e.g. Manhattan or Euclidean distance

Example 1/7



Example 2/7



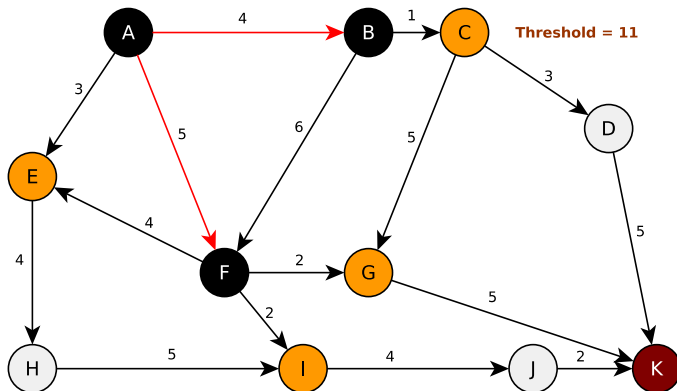
$$f(A) = 0 + 9 = 9$$

$$f(B) = 4 + 7 = 11$$

$$f(E) = 3 + 10 = 13$$

$$f(F) = 5 + 6 = 11$$

Example 3/7



$$f(A) = 0 + 9 = 9$$

$$f(B) = 4 + 7 = 11$$

$$f(E) = 3 + 10 = 13$$

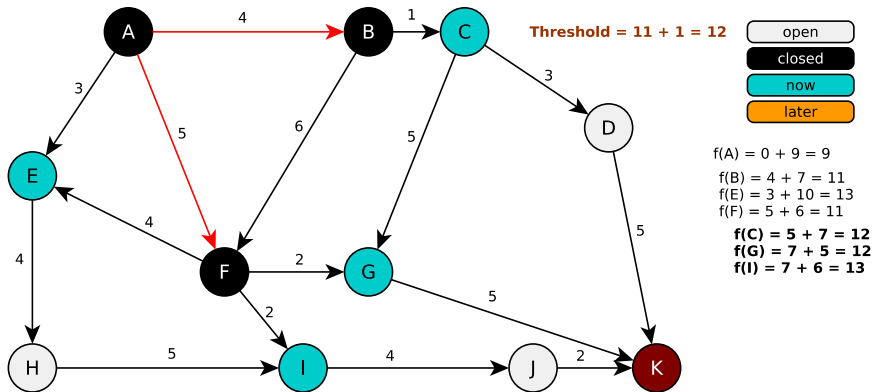
$$f(F) = 5 + 6 = 11$$

$$f(C) = 5 + 7 = 12$$

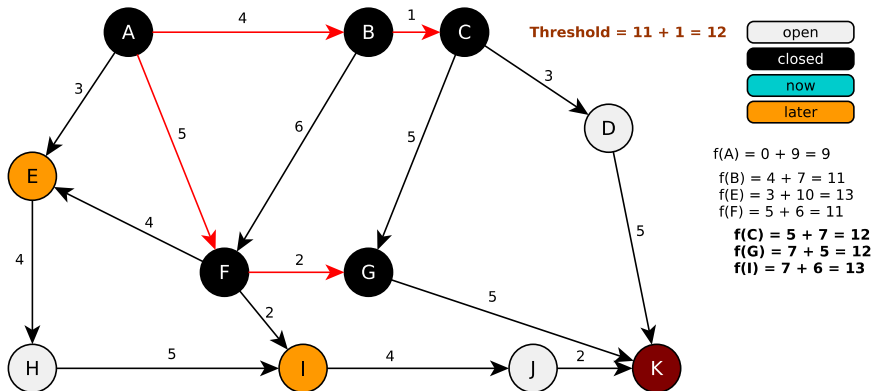
$$f(G) = 7 + 5 = 12$$

$$f(I) = 7 + 6 = 13$$

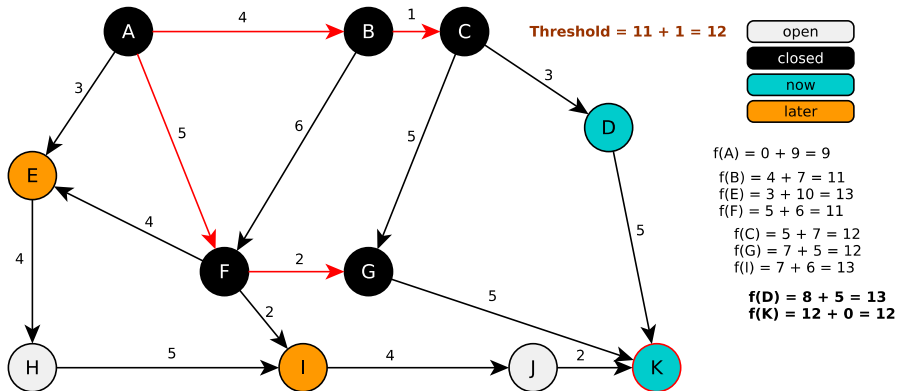
Example 4/7



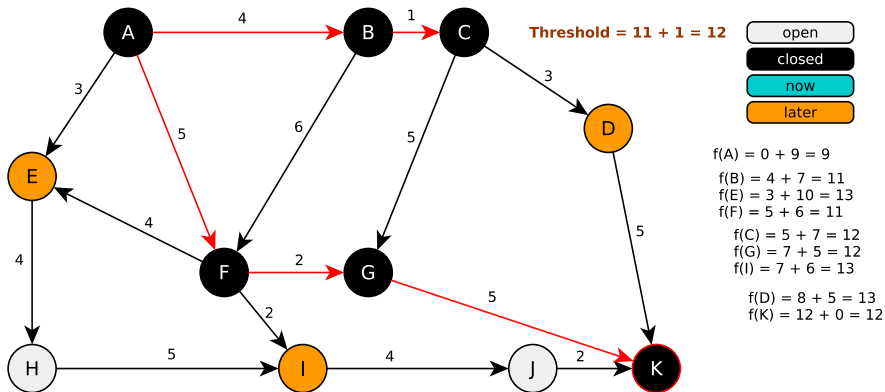
Example 5/7



Example 6/7



Example 7/7



- Advantages:
 - "Best-first" search with no sorting
 - Fast
 - Configurable (relaxation function for threshold)
- Disadvantages:
 - Not optimal
 - Bad configuration may lead to bad path

Implementation and Evaluation

- Implementation will be done with MPI
- Evaluation in terms of
 - runtime
 - length of path compared to optimal path
- Different configurations for threshold relaxation



Sandy Brand and Rafael Bidarra (2012)

Multi-core scalable and efficient pathfinding with Parallel Ripple Search

Computer Animation and Virtual Worlds, Volume 23, Issue 2 2012, pp 73 – 85.



Sandy Brand (2009)

Efficient obstacle avoidance using autonomously generated navigation meshes

Master Thesis (Delft University of Technology)

The End