Minimum Spanning Trees

State-of-the-Art and Open Questions

Algorithms: Design and Analysis, Part II

State-of-the-Art MST Algorithms

Question: Can we do better than $O(m \log n)$?

↳ running time for Prim + Kruskal

Answer: yes!

$O(m)$ randomized algorithm [Karger-Klein-Tarjan JACM 1995]

$O(m \alpha(n))$ deterministic [Chazelle JACM 2000]

↳ "inverse Ackermann function"

← in particular, grows much slower than $\log^* n :=$ # of times you can apply log to n until result drops below 1 (inverse of "tower function" $2^{2^{2^{\cdot^{\cdot^{\cdot}}}}}$)

Open Questions

Weirdest of all:

[Pettie/Ramachandran JACM 2002]

optimal deterministic MST algorithm, but precise asymptotic running time is unknown!

[between $O(m)$ and $O(m\alpha(m))$, but don't know where]

Open questions

- Simple randomized $O(m)$-time algorithm for MST

  [sufficient: do this just for the "MST verification" problem]

- is there a deterministic $O(m)$-time algorithm?

further reading: [Eisner 97]