Minimum Spanning Trees

Algorithms: Design and Analysis, Part II

State-of-the-Art and Open Questions

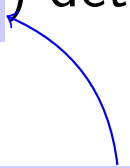
State-of-the-Art MST Algorithms

Question: Can we do better than $O(m \log n)$? (Running time of Prim/Kruskal.)

Answer: Yes!

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

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



"Inverse Ackerman 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" $2^{2^{2^{\cdots^2}}}$)

Open Questions

Weirdest of all: [Pettie/Ramachandran JACM 2002] Optimal deterministic MST algorithm, but precise asymptotic running time is unknown! [Between $\Theta(m)$ and $\Theta(m\alpha(n))$, 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]