Student presentations II

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SURVEY & THEORY **Abbott & Zhou**: dynamic shortest paths & cuts

- some major techniques in dynamic shortest paths:
  - random sampling
  - transformation from decremented to fully dynamic
- weighted single-source shortest paths can't be done better than recomputing Dijkstra (if $m = \Omega(n \lg n)$)
- THEOREM: similar result for weighted dynamic s-t cut

THEORY **Jelani Nelson & Vincent Yeung**: dynamic geometric cuts

- THEOREM: $O(\lg n)$ update, $O(\lg^3 n)$ query for dynamic ham-sandwich cuts of 2 convex polygons
  - ↳ simultaneously bisect measures of both (# vertices, perimeter, or area)
  - & two-line partition of union of polygons
    - ↳ two lines bisecting total measure into four equal parts
  - ⇒ point of Tukey depth $\geq n/4$
    - ↳ min # points in halfplane thru pt.
- OPEN: dynamic Tukey median (max. Tukey depth)

SURVEY **Pramook Khungurn**: dynamic planar graphs

- planar embedding (without changes) in $O(\lg n)$/op. [Tamassia]
- incremental planarity testing in $O(\lg n)$/op via SPQR decomposition, $O(\alpha)$ with fancier tricks (tight?)
- fully dynamic planarity testing in $O(n^{2/3})$/op via Lipton-Tarjan separator clusters, $O(\sqrt{n})$/op via sparsification
- lots of good k-connectivity (vertex or edge) results for planar graphs for fixed k
- shortest paths results too.
  - → single source SP tree
  - → two-vertex queries