David Charlton: Dynamic Shadows

- 3D ambigrams / trip-lets: 3D shape with desired three orthogonal projections
- Example of $n^3$ complexity for 3 shadows of complexity $n$ (previous example didn’t have proper shadows)
  -- for maximal shape with those projections
- but if 3D shape is connected then $O(n^3)$ complexity (as previously conjectured) & can be computed in $O(n^3)$ time
  - sweep plane + amortization
  - output-sensitive

- OPEN: can any 3 shadows be achieved by some (nonmaximal) 3D shape of $O(n^3)$ (disconnected) complexity?

- OPEN: faster existence check?
Paul Christiano & Shaunak Kishore:
resilient DSs (memory errors)
- RAM, adversary corrupts \( S \) words at any time
- want correctness with prob. \( \geq 2/3 \)
- error correcting codes: \( O(S) \) space to store \( S \) words, \( \leq S \) errors, \( O(S) \) en/decode
\[ \Rightarrow \text{array with } O(nS) \text{ space } \]
\[ \Rightarrow \text{linked list with } O(n+S) \text{ space } \]
- search trees with \( O(n+S) \) space, \( O(\lg n+S) \) op
- predecessor with \( O(n+S) \) space, \( O(\text{OPT}+S) \) op
- interval tree with \( O(n+S) \) space, \( O(\lg n+k+S\lg S) \) op
- scapegoat trees for dynamization
  [Galperin & Rivest]
- OPEN: \( O(S\lg S) \Rightarrow O(S) \)?
- OPEN: devandomize:
  other range queries?
Sarah Eisenstat:

- kinetic minimum spanning circle
- relation to farthest-point Delaunay $\Delta^*$
- FPDT contains at most one acute $\Delta$
- if one exists, then it's the min. spanning $\mathcal{O}$
- else min spanning $\mathcal{O}$ has longest edge as diameter

(case missing in [Guibas])

$\Rightarrow$ need kinetic DS for longest edge & acute $\Delta$ in FPDT

- $O(n^{2+\varepsilon})$ for convex hull
- $O(n^{3+\varepsilon})$ for FPDT
- $O(\#\text{external events})$ for acuteness
- $O(n^{2+\varepsilon})$ for diameter
- $\Omega(n^3)$ external events for linear motion based on lower bound for diameter [AGHV 1997]

(but doesn't work as is ~ substantial care)

$\Rightarrow O(n^{1+\varepsilon})$ efficiency (same as FPDT)

- OPEN: higher dimensions?
David Stein:
- partitioning distributed assembly tasks
  - motivation: automated assembly @ Boeing using robots
  - DAG of dependencies
  - directed graph of reachability (geometry)
  - operations:
    - deliver part to needed task
    - place part

- heuristic scoring function
- NP-hard partitioning problem
- problem: O(n) space in every robot not local, broadcasts
David Wilson:

- maintaining recency (Move To Front)
  - one op.: $MTF(x)$ returns # distinct items
    since last $MTF(x)$
    (or recency query + $MTF$ update)
- motivation: cache modeling
- reduction to partial sums on bit vector
  via slow growth in #0’s & amortized rebuild
& can be de-amortized

$\Rightarrow O(\log \omega n)$ DS
& $O(n)$ space
- also works for dynamic set (insert & delete)
  via amortized rebuilding
  or modification to partial sums to support
  grow/shrink at the ends $\Rightarrow$ worst case

- **OPEN**: $\Omega(\log \omega n)$ lower bound?
- partial sums LB doesn’t seem
to apply $\sim$ less “communication”

- **OPEN**: partial retroactivity?
  - cleanups an issue