Triangulating a Monotone Poly

P is Y-monotone

S is a stack

- push
- pop

Sort by y-value vertices of P. O(n) time!

Loop invariant

1) Untriangulated Y-monotone poly P_i
2) S contains either all left or all right vertices
3) They form a concave chain.
Init. Sorted \( Y(D) \), \( u_1, \ldots, u_n \)

Push \( u_1, u_2 \)

For \( j = 3 \) to \( n-1 \)

If \( (u_j \text{ different from } \text{Top}(S)) \)

Pop all of \( S \) and make a star centered at \( u_j \)

else

a) While \( \text{NextTop}(S), \text{Top}(S), u_j \) not concave

    1) Make a tri

b) Pop \( S \)

d) Push\( (u_j, S) \)

Timing each vertex pushed at most once.

\( O(n) \) Time
Linear Programming
Casting with a mold

prob Goal: Cast $\n$ (Polyhedron)

Mold

Good Mold

Bad

top facet & ordinary facets

Lemma Poly P can be removed by translation if

$$\angle(\text{Normal}(F), d) \geq 90^\circ$$ \hspace{1cm} \forall \text{normal facets } F.$$

$$d = (d_x, d_y, 1)$$
$$n = (n_x, n_y, n_z)$$

$$n_x d_x + n_y d_y + n_z \leq 0$$
For each ordinary facet we get a halfspace of feasible points in plane $L = \{p \mid p_2 = 1\}$ say $h_i$.

$P$ is castable iff $\bigcap h_i \neq \emptyset$.

This class testing $\bigcap h_i \neq \emptyset$ is $O(n)$ expected.

Thm: Castability in $O(n^2)$ expected time.