

9/25/08
CG

Triangulating a Monotone Poly

P is y -monotone

S is a stack

Ops 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 $V(D)$ $u_1, \dots, u_n$

Push u_1, u_2

For $j \leftarrow 3$ to $n-1$

If (u_j different chain 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

2) Pop S

b) Push(u_j, S)

Timing each vertex Pushed at most once.

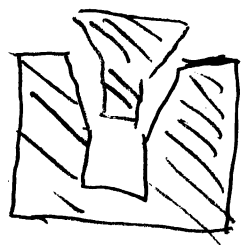
$O(n)$ time

Linear Programming

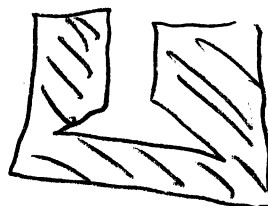
Casting with a mold

prob Goal: Cast  (Polyhedron)

Mold



Good Mold



Bad

top facet & ordinary facets

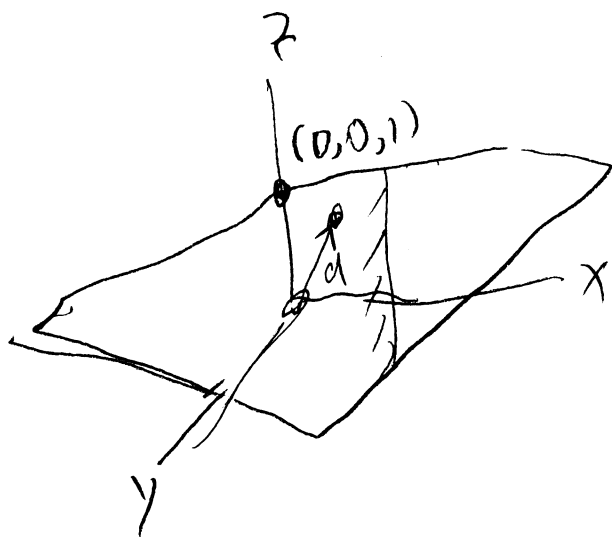
Lemma Poly P can be removed by translation $\vec{d}$

iff $\text{angle}(\text{Normal}(F), \vec{d}) \geq 90^\circ \quad \forall \text{ normal facets } F.$

$$\vec{d} = (d_x, d_y, 1)$$

$$\vec{n} = (n_x, n_y, n_z)$$

$$n_x d_x + n_y d_y + n_z \leq 0$$



For each ordinary facet we get a halfspace of feasible points in plane $L = \{P \mid P_z = 1\}$ 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 is $O(n^2)$ expected time