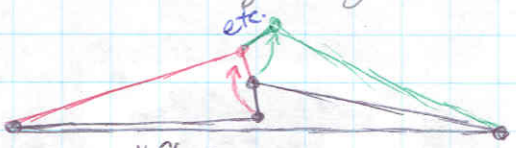
6.885
L5.5
Sept. 22, 2004

How many flips?

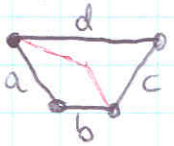
- can be arbitrarily large even for $n=4$ [Joss & Shannon 1973]



- OPEN: bound #flips in terms of geometric features: $\frac{\text{perimeter of polygon}}{\text{min. vertex/edge distance}}$ [Overmars 1998]

Deflation = reverse of flip that avoids crossings

- some polygons have infinite deflation sequences [Fevens, Hernandez, Mesa, Morin, Soss, Toussaint 2001]
  - ↳ quads. with $a+c=b+d$ & $|\{a,b,c,d\}|=4$



- OPEN: characterize such polygons [Fevens & Taslakian]

Flipturn: rotate pocket 180° in 2D around midpoint of lid [Joss & Shannon 1973]

- $O(n^2)$ suffice [Ahn et al. 2000; Aichholzer et al. 2002]
- $\Omega(n^2)$ sometimes necessary [Biedl 2004]
- final polygon & location determined [Aichholzer et al. 2002]

PROJECT: Applet for experimenting with flipturns (& ideally flips & possibly deflations)

- NP-hard to find longest flipturn seq. [Aichholzer et al. 2003]
  - OPEN: shortest?
  - OPEN: shortest or longest flip sequence?