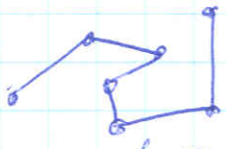
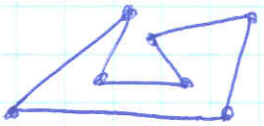
6.885
L1.3
Sept. 8, 2004

Reconfiguration: → fold from config. A to config. B
↘ possible ∀A, B?

- roadmap alg: general solution to such motion-planning problems [Canny et al.]
  - ... BUT: exponential time (in # degrees of freedom)
- PSPACE-hard for linkages
  - ... allowing self-intersection [Hopcroft, Joseph, Whitesides 1984]
  - ... disallowing self-intersection [Alt, Knauer, Rote, Whitesides 2004]
- special linkages:



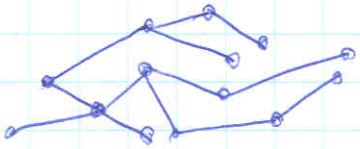
open chain



closed chain

	Chains	Trees (draws later)
2D	Always [Connelly, Demaine, Rote 2002]	Not [Biedl et al. 1998]
3D	Not [Cantarella & Johnston 1998]	Not
4D+	Always [Cocan & O'Rourke 2001]	Always [ditto]

↓ equivalent to straightening open / convexifying closed



tree — flatten

- deciding whether 3D chain or 2D tree can fold from A to B is PSPACE-hard [Alt, Knauer, Rote, Whitesides 2004]
- deciding whether can straighten/convexify/flatten: OPEN. or locked
- algorithms for proving several interesting linkages locked [Connelly, Demaine, Rote 2002]
- interlocking short chains [Demaine, Langerman, O'Rourke, Snoeyink 2002 & 2003]
  - ↳ 3-chain with 4-chain