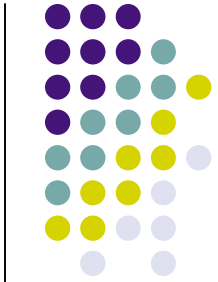
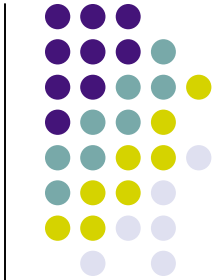
Self-reconfigurable robots



- SR Robots: systems that can reconfigure themselves with large numbers of modules.
- Potential of these systems is
  - Adaptability/versatility
  - Robustness/Sustainability
    - Self-diagnosis
    - Self-repair
  - Reduced cost.

What we need to solve



HARDWARE

- Connector design, latching mechanisms
- Specific power, specific torque, specific energy
- Hardening designs for real applications.

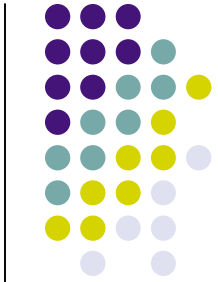
SOFTWARE

- Scalable, distributable, algorithms
- Robust fault tolerant software

CO-DESIGN

- New paradigms for codevelopment of modular SW and HW. (SW and HW design more tightly coupled than any existing system)
- Better ways to exploit hardware/software interaction

Example Grand Challenge Problems



- Robot that can survive or recover being blown up.
  - System that self-repairs.
- Robot that can morph through a collapsed building and reconfigure to stabilize the structure.
- Robot that can self-assemble micro modules in vitro.
- Robot that can replicate geometry and motion of any object through morphing.