Automata: Putting it all together
Tentative Schedule

Announcement: Week 07 Quiz (05/09/11)

18:00 Grade Homework 4, Wiper Demo, Folding Chairs Reconstruction
18:30 Lecture “Putting it All Together”: Automata example (The Gymnast)
19:00 Break (use time to find partner)
19:15 Project Time: Automata web searches and concept sketches
20:15 Team Presentations (3-slides: inspirational video and sketches)
20:30 Clean up and Adjourn
Review

**Week 02: Simple Machine I: Levers, Shafts, And Cranks**

- Hands-on Lab
  - Simple Crank
  - Crank 3-bar
  - Crankshaft
  - Complex Crank

- Homework
  - Constructed slider-crank mechanism

**Week 03: Simple Machine II: Cams, Springs, And Linkages**

- Hands-on Lab
  - Cam Follower
  - Cam Follower Vehicle
  - Torsional Linkage
  - Multi-jointed Torsional Linkage
  - 4-bar linkage walker

- Homework
  - Flat folding chair

**Week 04: Simple Machine III: Ratchets, Drives, And Gearing**

- Hands-on Lab
  - Planetary Gears
  - Bevel Gears (and Pin Wheel)
  - Worm Gears
  - Rack-and-Pinion

- Homework
  - Windshield Wiper

Result is a cookbook with fundamental recipes. Now, you can create a meal.

Copyright Paul Oh 2011
Input: handle crank (Week 02)
Cam and follower (Week 03)
Follower pushes ratchet (Week 04)
Conversion of translation to stepped rotation
Detent prevents ratchet 2 from reversing
Output: multi-link figure rotates

http://www.youtube.com/watch?v=zy5B_bzNID4
Crank Handle (Week 02)

Figure is Linkage (Figure 03)

Cam Follower (Week 03)

Spring (Week 03)

Drive Train (Week 04)

Pin Wheel (Week 04)

Drive Train (Week 04)

Ratchet With Detent (Week 04)

Copyright Paul Oh 2011
Step 1: Assemble rails

Connect the 2 bricks with a plate. Secure connection with a beam. Construct 2 of these.
**Step 2: Assembly Gear Train**


Copyright Paul Oh 2011
**Step 3:** Construct the gymnast figure

- 2x Beam 2x4 Liftarm Bent 90 (32140)
- 2x Pin Long (32556)
- Beam 7 (32524)
- 2x Bush 1/2 Type 1 (4265A)
- 2x Bush 1/2 Type 1 (4265A)
- 2x Beam 3x5 Bent 90 (32526)
- Axle 4 (3705)
- Cross Block 1x3 with 4 pins (48989)

Create upper body by inserting long pins in Beam 7. Create arms by attaching 2x4 liftarms. Create lower body by connecting 3x5 beams to cross block. Attach lower and upper bodies with axle. Secure with 1/2 bushes.
**Step 4:** Attach gymnast to rails

Align and thread Axle 10 through gymnast. Secure with 4 knob.
Align and thread Axle 10 at rail bottom. Mesh 8T gear. Secure at end with 3x0.5 liftarm (handle)
Step 5

Construct detent by threading Axle 4 through 2x4 liftarm. Secure with 1/2 bush and cross block. Attach towball to cross block. Secure rails with plate. Secure crank axle with bush.

A rubber band will be used for the detent. Attach the 3x5 liftarm to top of rail. Rubber band will be looped to towball and long pin.
Step 6

Use 2x8 plates to secure rails at top and bottom. Brace 1x6 bricks at bottom of rail structure. Use 1x2 bricks to complete brace. Loop rubber band at towball and 3x5 liftarm.
Step 7

2x Brick 1x8 with holes (3702)

Secure 1x8 bricks at underneath rails (towards bottom)

Copyright Paul Oh 2011
Automata Project

19:00 Break (use time to find partner if needed)
19:15 Project Time: Automata web searches and concept sketches

Grading Criteria: NB: Project counts towards 35% of final grade

- Automata must consist of at least 2 simpler mechanisms e.g. crank and ratchet
- Must be only Lego pieces (can self-purchase extra parts if needed)
- Option to work on a 2-person team
  
  • 15%: Brief explanation of how automata works
  • 15%: Video (20-seconds in WMV format) compares role model and your creation
  • 25%: MLCAD Build instructions including Bill of Materials
  • 25%: Step-by-step build instructions (photo-based). Bring hardcopy to class next week
  • 20%: Oral Presentation (5-min) showcasing the 4 points above

20:15 Team Presentations (3-slides: inspirational video and sketches)

- Web search for Automata that you’d like (and have parts) to reproduce
  - Slide: results of web search
- Concept sketches
  - Slide: scan of concept sketches
- Prototypes: some possible reproductions in Lego
  - Slide: Photos of reproductions, MLCAD constructions

Copyright Paul Oh 2011
Next Week

Week 06

18:00 Automata Presentations. Fabricate others’ designs
19:00 Break
19:15 Motor Theory
19:45 Programming: Motor Velocities and Data Acquisition
20:30 Clean up and Adjourn

Bring $60 check (dated for June 10, 2011) for gyro deposit