Mechanical Design

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Mechanical Design

- What Maslab provides
- Tools
- Safety Issues
- Helpful Hints
- Resources

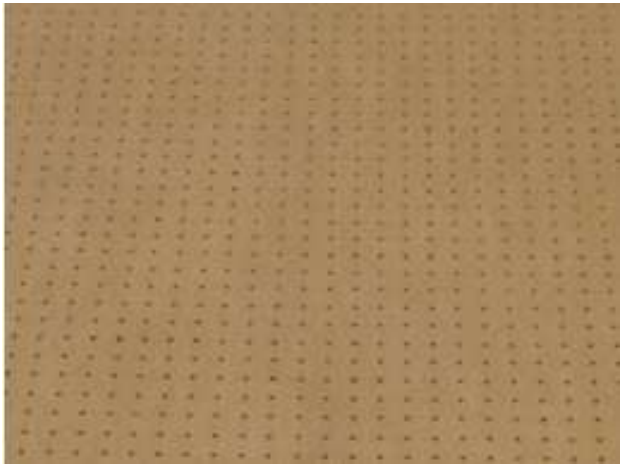
Raw Materials

- Pegboard
- Hardboard
- Plywood
- Sheet Aluminum
- Prototyping Foam

Raw Materials – Pegboard

Good for: Initial Testing

- Pre-drilled holes
- Cheap
- Easy to cut



Raw Materials – Hardboard

Good for: Intermediate design

- Pegboard without holes
- Cheap
- Easy to cut
- Replace with plywood later

Raw Materials – Plywood

Good for: Final design

- Looks good
- Strong
- Harder and slower to cut
- Pre-drill holes for wood screws

Raw Materials – Sheet Aluminum

Good for: Small structural members

- Bending can increase strength
- Holes with hole punch
- Cuts with shear

Raw Materials – Prototyping Foam

Good for: Bulky parts

- 2” blue foam
- Cut/sculpted with hot knife

Other Materials

- Wooden dowels
- Hollow metal tubing
- Spring
- PVC pipe
- Foam pipe insulation
- Gears
- ...

Fasteners

- Bolts & Machine Screws

- Wood Screws

- Glue (hot glue, super glue, wood glue)
- Tape

Motors

- Servos
  - Limited range of motion
  - Cannot bear load of metal motors
  - Can be modified for larger range of motion
- High speed and high torque motors

Tools – Scroll Saw

- Cuts thin (¼”) wood and polycarbonate
- No metal
- Makes curved cuts
- Use medium pressure, don't force it!
- Ask staff to change broken blade

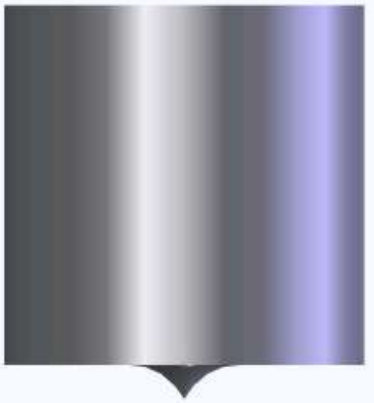
Tools

- Hacksaws, wood saws
  - wood, pvc, cardboard
- Pipe cutter (small red gadget)
  - brass tubing
- Rotary cutting tool
  - quick, but inaccurate

- Mitre saw
  - accurate wood cuts (any angle)
- Drill press
  - wood, plastic, metal (different bits)
  - clamp small pieces

Tools

- Shear/Brake
  - thin (1/16 sheet aluminum and polycarbonate)
  - right-angle bends in sheet metal
- Punch
  - use center punch (pointy tool) to make dent
  - position punch head using dent

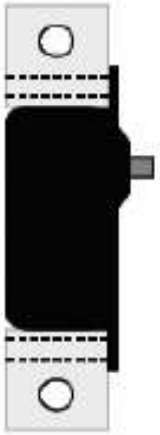


Safety & Maintenance

- Wear safety glasses in shop
- Use fan when soldering
- Return tools when done with them
- Put bolts, tools, and bits in their place
- Put scrap under when drilling
- Preserve benches

Techniques – Mounting

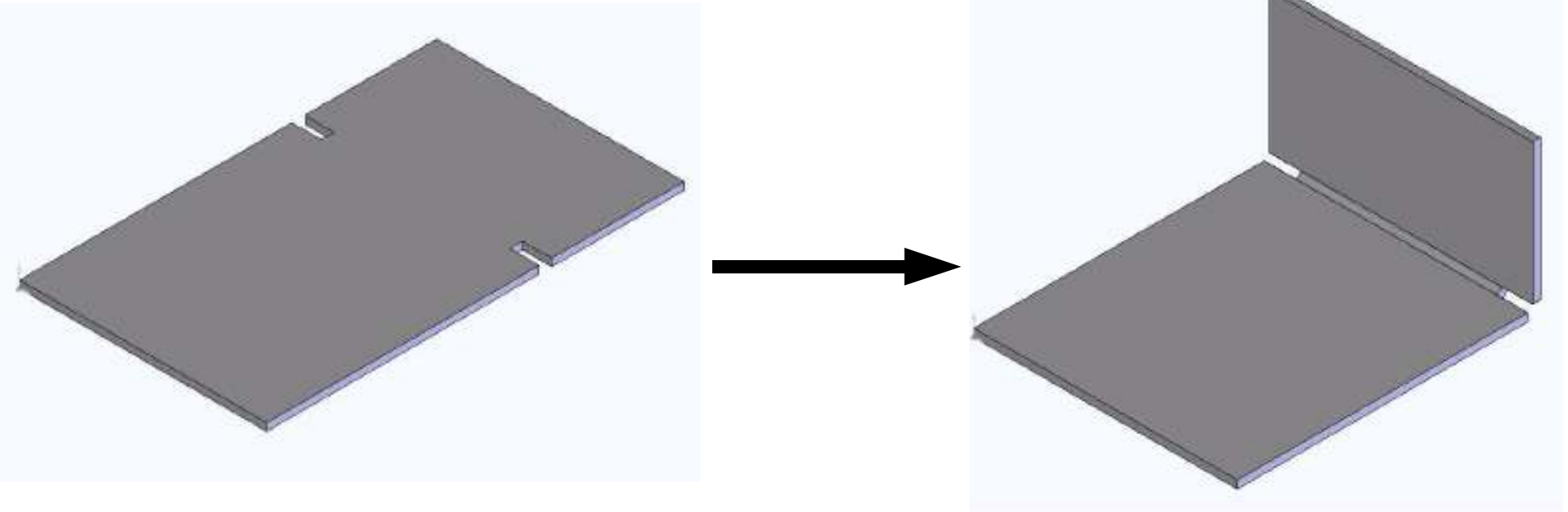
IR Sensor



Servomotor

Techniques – Metal Bending

To bend without brake ...



Make guide cuts using snips (and holes along line for larger pieces)

Bend along your cuts

Resources

- Central Machine Shop
  - Basement of 38
  - Metal and plastic stock
- Edgerton Shop
  - Across Vassar Street
  - Training/safety lecture required

Resources – Parts

- Mcmaster.com
  - raw materials, fasteners, ...
- Sdp-si.com
  - gears, shafts, bearings, pulleys, chains
- Allelectronics.com
  - surplus – limited selection, cheap
- Usplastic.com
  - sheet and rod plastic, plastic tubing