Individual CAD Assignment

Part 1

DUE DATE: Refer to the assignment on Canvas

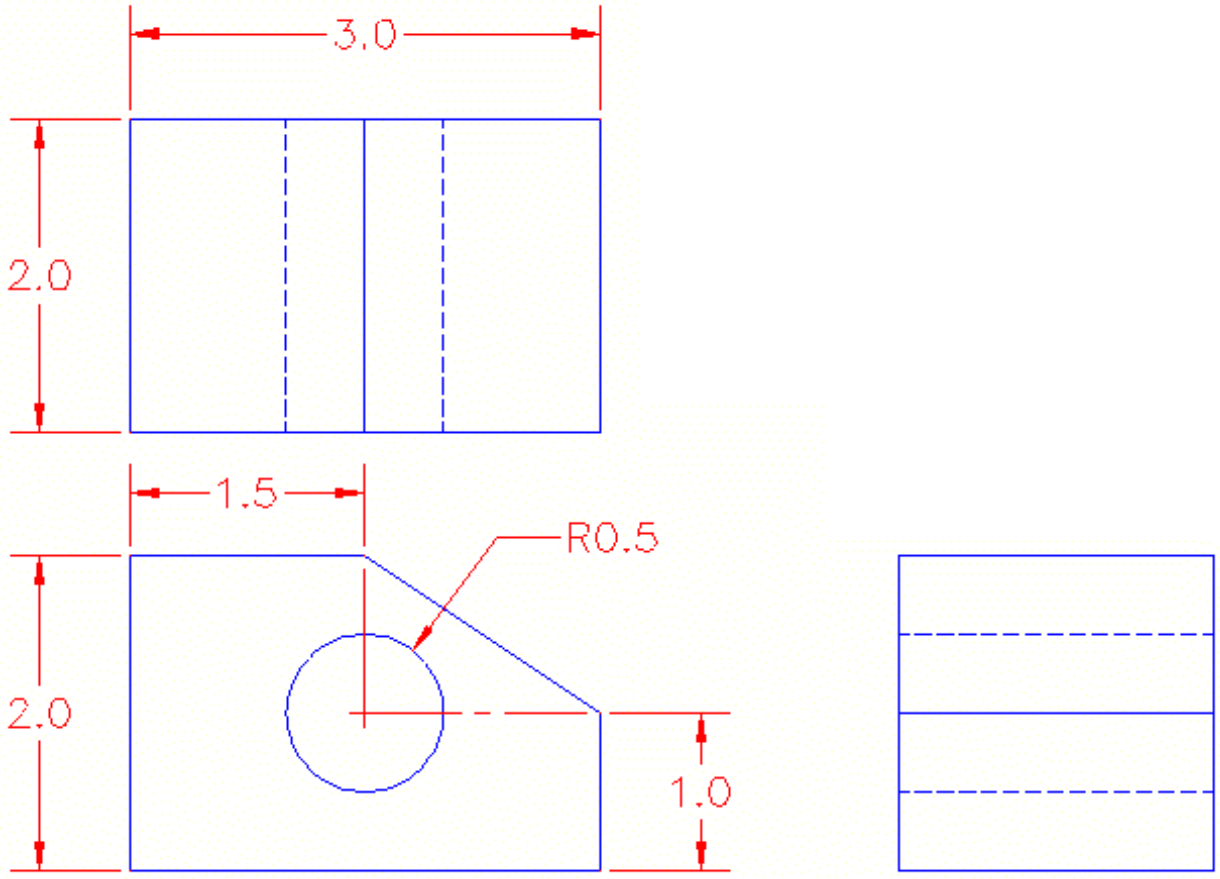
Goals

1. To be able to operate a standard piece of CAD software like SolidWorks or AutoCAD either on your local machine or through the lab computers at CMU.
2. To be able to read and understand a simple multiview drawing.
3. To be able to understand the working dimensions (Metric/Standard/etc.) in a CAD interface.
4. To be able to export a specific file type that is compatible with most 3D printing software.

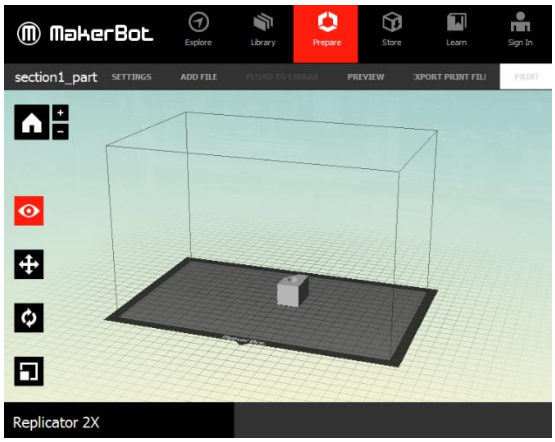
Deliverable

1. Deliver a 3D part file of an orthographic simple part. This file should be in the .STL file format (STereoLithography). It should be uploaded to Canvas. The dimensions are in cm and should be accurate as per the three-view drawing shown below. All required dimensions are given.
2. Generate a physical part using a 3D printer and show it to a TA before the Due Date. Setup instructions for the Lab's Makerbot Replicator 2X can be found below. Use an infill parameter of 10% and layer height of .3mm for this print to keep print times low.

The Part



Makerbot Setup Instructions



The desktop software can be downloaded from makerbot (for windows) http://www.makerbot.com/desktop

Importing an STL

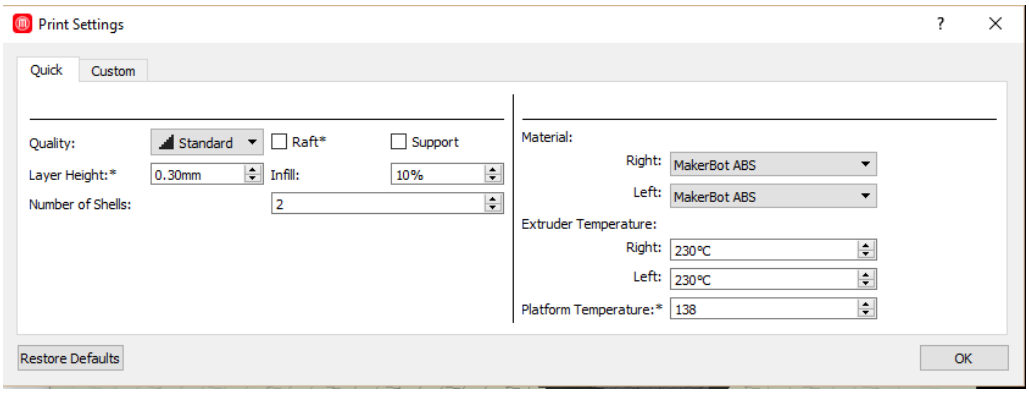
When you export a part from your favorite CAD program to STL, specifying mm will allow Makerbot to import the part while preserving 'real' dimensions. If you have an STL in another unit, you can use the 'Change Dimensions' button to manually scale the part.

Printing Considerations

To print a part, import an STL and arrange the part onto the printing surface. Use caution when laying out a part onto the print surface to ensure it is able to be printed layer-by-layer. Supporting material is available for overhanging features, but check the spool material on the printer before you configure support.

Each field will be broken down below:

- Raft – prints a supporting structure on the printing platform before printing the part. In general, rafts are not recommended if you use a platform temperature of 138 deg. C.
- Support – Enables supporting material printing
- Layer Height – This parameter controls the speed / quality tradeoff. Smaller layer heights in general should also be stronger.
- Infill – allows for empty space within a part to reduce weight, plastic volume, and print time.
- Material Extruders – The default 'MakerBot ABS' plastic should be used and is configured as the right extruder on the MRSD Lab Makerbots
- Extruder Temperature – 230 Degrees C is okay for our prints
- Platform Temperature – 138 Degrees C is recommended. Using this elevated temperature improves part quality without using rafts.



Part 2

DUE DATE: Refer to the assignment on Canvas

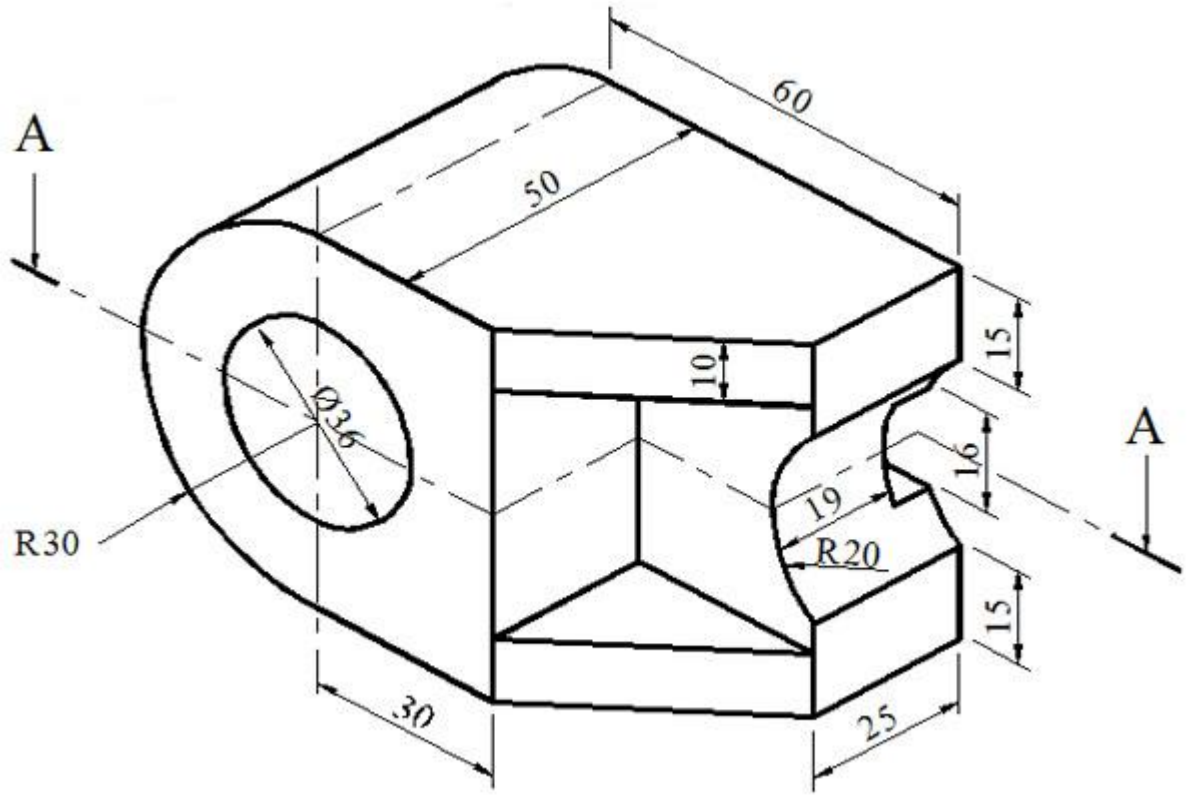
Goals

1. To be able to read and understand a complex drawing.
2. To understand the ins and outs of creating a complex 3D part.

Deliverables

Deliver a Solidworks (preferred) or STEP (**not STL**) file of the part shown below. It should be uploaded to Canvas. The dimensions are in mm and should be accurate as per the three-view drawing shown below. Assume the part is symmetric about the A section and that the 36mm hole extends fully through the part. All other required dimensional information is given below.

The Part



You can assume that the 16mm slot on the back of the part extends all the way through the part

Part 3

DUE DATE: Refer to the assignment on Canvas

Goals

1. To work with a complex assembly of parts and mates.
2. To create working drawings for a complex assembly.

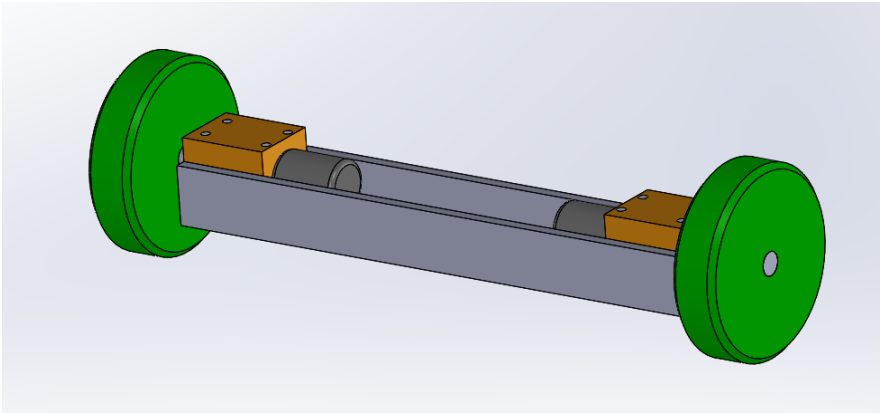
Deliverables

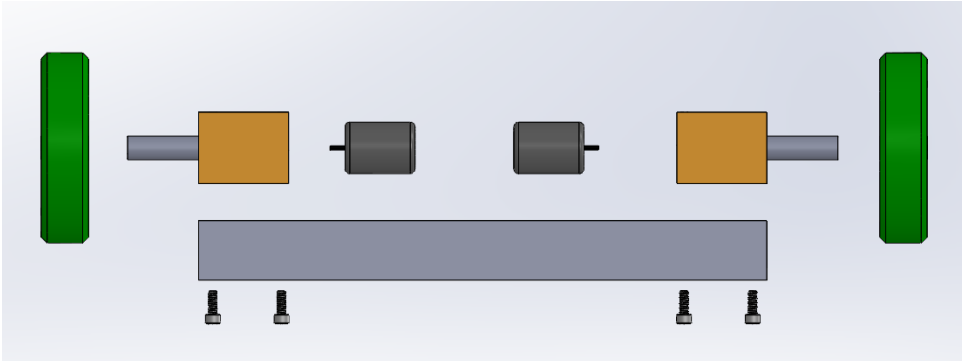
Deliver a set of drawings for the assembly that contains the following. **Please submit all drawings in PDF form, as one single PDF.**

1. Page 1: A complete table of parts-list, indicate source/supplier and model number (as applicable), quantity, and any other descriptive specifications. Add a line number for each unique item to be referenced in the exploded-view on page 2. Also include an isometric view of the assembly.
2. Page 2: Generate an exploded view of the model showing parts (numbered) and/or sub-assemblies (should be able to see approximately 5 separate parts). There should leading lines representing the mating methods for each part.
3. Page 3: Provide a multi-view (3 view perspective, and cross-sectional) of your assembly. The cross-sectional should indicate a critical mating section.

The Assembly

You will need to find an assembly with **5 or more unique parts**. Try to use something that has a sensor, motor, and fasteners (to be as close to a robot as possible). For example, here is a basic robot drive train with 5 unique parts:



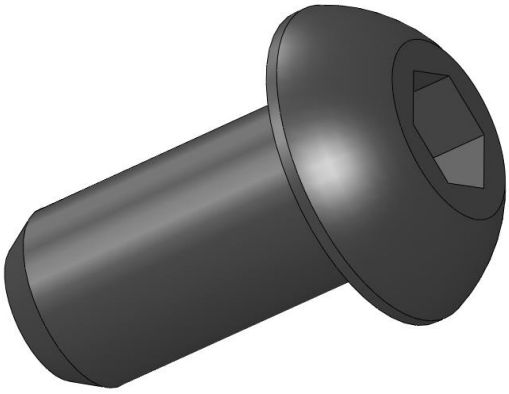


You have your choice of several options for this assignment:

- Replicate a robot drive similar to the one show above. The parts used are
  - P60 gearbox
  - RS380 motor
  - U Channel Chassis
  - 10-32 Bolts from McMaster-Carr
  - Custom 4” Wheel
- Any other robot from the lab, as long as it has 5+ parts.
- Your project. Assuming your robot will have multiple parts and require assembly. This requires that your project be well planned enough to CAD the robot before the due date of this assignment.

Notes

- You do not need to use any specific piece of CAD Software. There are even open source platforms you can use if you’re willing to deal with their somewhat lesser quality.
  - You can access SolidWorks on the cluster computers or you can get a 1-year student license for $25 from the CMU bookstore.
- For part 2 we recommend creating the part in 3D and using the software to generate the views for you.
- Don’t sweat the details. Part 3 is intended for you to do a larger assembly representing something more real-world. If the parts assemble correctly and look accurate then the intricacies of the part, including very accurate dimensions, do not matter.
  For example, screws in CAD are often just represented with cylinders and a head:



- Some good Dimensioning Style Guides:
  - http://www.pages.drexel.edu/~rcc34/Files/Teaching/MEM201%20L5-Fa0809-SpDimensions_RC.pdf
  - http://www.pltwcalifornia.org/view-content/61/Rules-for-Dimensioning.html
  - http://metal.brightcookie.com/2_draw/draw_t5/htm/draw5_2_1.htm