Technical Workshop

Women in Aeronautics & Astronautics (WIAA)

Presented by:
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SolidWorks CAD

Inspiration

CAD

Prototype
SolidWorks CAD

• 2-D and 3-D sketch tools

• Functions Used:
  – Extrude (boss, cut)
  – Revolve
  – Fillet
  – Thicken
  – Boundary
  – Surface (extend, fill)
SolidWorks Layout

- Can create part, assembly (of parts), or 2-D engineering drawing
- Note that you are easily able to access all SolidWorks tutorials

Panel will show all sketches and features applied to the part
CAD Basics

- Let’s look at ‘Extrusion Boss/Base’ and ‘Extruded Cut’ features

- Sketch a circle in the [right plane] with radius: 1”

- [Feature] - [Extrusion Boss] and select the option [blind] by 1” to make a cylinder
(1) Let’s sketch the fish skeleton

- Select the [sketch] option in the [sketch] toolbar
- Select the right plane
- Draw an ellipse using [ellipse] tool
  - Center on (0,0)
  - Move cursor to top of origin frame to create ellipse reference point for $R_1$
- In the left panel, enter dimensions: $R_1 = 1”$, $R_2 = 0.85”$ and click green arrow
(2) Let’s sketch the fish skeleton

What we are doing is creating ellipses at these points to shape the fish body

• Click the [Right Plane] in the left panel

• Create another plane to draw ellipse by selecting [sketch] -> [plane]

• In the left panel, enter dimension: 1.5” and click green arrow to create the new plane
(3) Let’s sketch the fish skeleton

NOTE: You can update sketch (rebuild) by clicking on the traffic light tool up top

• Draw an ellipse with dimensions:
  \[ R_1 = 0.65\text{”}, \ R_2 = 0.65\text{”} \]

• In reverse direction, create new plane 2” away from your current plane and draw an ellipse with dimensions: \( R_1 = 0.90\text{”}, \ R_2 = 0.85\text{”} \)

• Finally, in reverse direction, create another plane 2” away and draw an ellipse with dimensions:
  \[ R_1 = 0.50\text{”}, \ R_2 = 0.40\text{”} \] (ellipse near fish tail)
(4) Let’s 3D sketch the fish skeleton

• Drop down in the [sketch] tool and select the [3D Sketch] option

• Next select the [spline] tool and click on the sides of the ellipses to connect them all

• [Features] -> [Boundary Boss/Base] to fill the fish skeleton
  – Click on all four ellipses in sequence
(5) Sketch the fins

- Highlight [front plane] from left panel and [sketch]
  - Use the [spline] tool to sketch the top and bottom fins using the [right plane] skeleton point as reference

Spline tool lets you adjust the line after you have already drawn it

You can also make the fins using 3D sketch to give it an angle and make it look more realistic!
(6) 3D Fins

- Drop down select [insert] -> [surface] -> [planar] and select any fin

- [insert] -> [thicken] and select each fin.
  - Make the thickness 0.05"
(7) Sketch the fish head

• First, create an [extruded cut] on the fish body with radius 0.40” [up to surface] of third plane and another cut of radius 0.20” on the last plane

• Revolve requires a reference line so let's sketch one that is 1” long on the [right plane]

• Sketch a horizontal line that is 0.55” and then use the [spline] tool to create an arc
(8) Almost done…

- Then create an [extruded cut] of 0.4” [blind]** on the fish head

- Similarly for the eyes, sketch a [circle] at origin on [front plane] with radius 0.05” and fully [extrude cut] in both directions

- The tail for this workshop will be directly connected to the body

- [New part] -> sketch an ellipse on the [right plane]
  - Dimensions: $R_1 = 0.50”$, $R_2 = 0.40”$
(9) Fish tail

- Extrude the ellipse by 0.7”

- Cut a circle of radius 0.20” to match with body
  - [Blind] of 0.5”

- Select the [fillet] tool and click on the lines of the outer ellipse
  - Use radius of

- Let’s make a slot for tail. Extrude cut a rectangle by 0.3” with:
  - Width: 0.2” (0.1” from 0,0)
(10) Fish tail

- Now we are going to draw the tail on the [front plane]
  - Use the [spline] tool to sketch your tail
  - Make sure the arc intersects the centerline

- Use [surface planar] and [thicken] tools to make it 3D
  - Thicken by 0.1”
Assembly!

- [File] -> [New] -> [Assembly]
- Main tools are
  - Insert components
  - Mate
- Select the back plane of the fish head and select [Mate] and then select the front plane of the fish body
  - Repeat on the inner circular boundary of both head and body
- Select the front plane of the
  - Insert components
  - Mate
Finished assembly

Let’s add custom textures!

- Right click the body and select [appearance]
  - Click on [face] to change just the skin

- [Tools] -> [Option] -> [File location]
  - Drop down and select [Textures] to change path of files
  - Add new location (ex. \Desktop)

- Apply custom texture
Rendering

- SolidWorks has a rendering tool already include in installation
  - Edit scene
  - Add decals
  - Change render quality