Advanced CAD Week 1: Constraints and Assemblies

Rohawks 3419 -- Celina, Nathan, Lili -- 2019-2020

Lesson Goals

- Explain the importance of assemblies, how we use them, and how to manipulate them.
- Highlight & briefly describe different types of constraints & their applications.

Lesson Plan

- Pre-Lesson Setup
    - Bring a laptop if they have one: setup is faster and allows the use of GrabCAD
    - Download/update to the latest version of Inventor
    - Share GrabCAD files with those interested in the class
    - Download GrabCAD, possibly ask Siegmann and computer lab techs if we can get GrabCAD on the school computers
- Assembly Overview
    - "Place" command: used to take pre-existing parts you have access to and import them into the assembly
        - Allows use of parts created outside the assembly or downloaded online, e.g. motors, pistons, sheet metal, etc.
    - "Create" command: allows creation of parts within the assembly.
        - Usually used for small pieces, e.g. sensors.
- Assembly Applications
    - You use assemblies when looking at how multiple solid parts interact and come together.
    - It's easier to manipulate different parts in assemblies because assemblies have an extra tool that part files do not: ***CONSTRAINTS!***
- Constraints
    - Constraints are commands you can give to pieces telling them how to fit together: for example, you can tell two holes to be in line with one another, 2 parts to be flush, or one thing to be tangent to another thing.
    - The MOST USED CONSTRAINT on this team is INSERT: we use INSERT to line up holes or put something into a hole ⇒ for bolts and their respective holes, a shaft inside of a 3D printed piece, etc.
    - Mate/flush: positions parts so that they are touching each other.
    - Motion constraint: sets it so that the motion of one component affects another, such as for gears.

- Assembly constraints are like sketch constraints in that complete assemblies are fully constrained.
- Show the whole Onyx assembly, then zoom in on the ball chute to demonstrate a few constraints.
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- List key assembly properties (mass, center of gravity), describe general reasons to look at those (weight limits, possibility of tipping).

Supplementary Materials
- We need to have the CAD file of the part on hand - could share with everyone through GrabCAD so they could explore it for themselves, or send a link with the download for those on school computers who can't get GrabCAD.
- A Google Slides about assemblies and constraints or a video of them being used on Onyx.
- Post the presentation online for people to look at at home or people who can't attend.
- Should assign some type of homework so that they retain knowledge for the next class - maybe complete a worksheet about types of constraints and what they do.