Final Work: Spacecraft

Introduction

The assignment for spring 2016 is to design a spacecraft. The purpose is for you to design your own version of it. Examples of existing designs can be found on the last page.

This assignment is about how you use the software and how well you convey *design intent*, emphasis on *modifiability* and *readability* of your model tree. In reverse this is **not** about real world engineering requirements such as standards compliancy, legal requirements for safety and so on. Please remember that design intent does imply some understanding of what might important, here any educated guess suffices. The important part is to have a workable 3D model.

You have a high freedom of choosing your method of execution, also the pain of starting from scratch. Take this time as an excuse to experiment with the software.

Requirements

Your objective is to demonstrate the understanding of the basics of *parametric design*, using Creo Parametric. Demonstrate ability to use tools on your own for achieving a predefined goal. Produce a model that is *usable* and *changeable* by others in an *intelligent fashion*.

You shall electronically return a model of a spacecraft that consists of:

- intelligently named model files
- a master assembly using bottom-up design
    - filename shall be prefixed with AAA_ to easily identify it as the master model to open
- at least 15 individual parts
    - Solid models
- at least one (1) subassembly
- possible to configure the model with at least three (3) different kinds of parameters
    - At least two (2) of them should affect the dimensions of the parts
    - Asked when model is regenerated
- **model needs to be stable and work in the CAE classroom setup**

You shall return a written report that contains:

- use the provided Word document template as a basis for your document (found in MyCourses)
- description of your model
- general description of your process
- description of any problems or limitations your model you may have (nothing wrong with known limitations)
- your own estimation for your grade to the report. (N.B. It has no influence to the grade)

In addition your written report shall also include three manufacturing drawings:

- one (1) master assembly exploded view with:
    - Bill of materials
- Two (2) other drawings demonstrating your skill, you may wish to include cross sections, tolerances, surface roughness marks and so on that are part of the manufacturing process.
- use Aalto A3 template
- make sure the part can be manufactured by using this document
- don't use your simplest (most complicated) part or a standard part as the basis of your drawing

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Returning the Final Work

Copy the model to the network drive before the deadline on **Monday 11th April 2016 at 12:00**. After moving the files, be sure to check that the model works also when opened from the network drive.

The deadline for the written report and paper drawings is the same as for the model. The papers should be returned to the **mailbox next to the door in room K344** (inside the CAE classroom). <u>If the paper is not returned into the mailbox then your work is not accepted</u>.

Missing the deadline means you need to do the final work again next semester. You can apply for an extension one week before DL (4th April 2016 at 12:00); you will be penalized -1 from your final grade if you do so. The DL for belated final work is 16th May 2016 at 12:00. Do not return partial works, apply for an extension instead.

Instructions for Submission

- copy your files in some empty folder in the Z drive
- make this folder as your working directory, open the model, test it and run purge (open system window from Tools tab, type purge; this removes old versions of the files)
- make a folder with your student id under \\work\courses\T\Kon\41\3006\submissions\
- copy your files to the newly created folder
- delete any unnecessary, core or trail files (there should be only the latest versions of the files)
- return your paper submissions to the mailbox in CAE class

Hints and tips

Start your work immediately making a simple plan on paper. The workload of your other courses tend to pile up at the end of the period starting early ensures you get things done. Please note that your end work is supposed to take about 80 hours to complete. Do not attempt to do the 80 hours in one go, reserve at minimum one month for doing this.

Make a simple plan on paper: Sketch your initial idea down, it will help you execute the work by making it easy for you to know what parts need to be worked on next. Also make a rudimentary timetable for your work.

A precise model: all parts are modeled with enough accuracy that manufacturing them would be possible. This is in principle a clear and appropriate method, , but you will probably have to choose a less complicated model, or make one up yourself, so that the number and complexity of the parts is kept in check.

A more general/approximate model: not all parts are modeled, and/or some parts are left at a much cruder level. Choose this approach if you wish to model a complicate spacecraft that if there will be much more than 15 individual parts. In this case you can for example leave some unimportant parts and details un-modeled, or simplify the geometry in difficult places, and focus more on the good functionality of the model.

There must be at least three different parameters that can be easily modified, preferably, by questions in the program script. These parametric variations can be very simple, removing/using a certain part, or changing a dimension, but they must be different types, for example one parameter changes a dimension, second moves parts or changes its orientation and third removes or changes part or feature. If you feel that you have problems thinking of appropriate things to modify, here are a few examples:

- some feature of the spacecraft might be optional
- length of a part may be user defined
- some parts may be in alternate angles or places

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Extra points in the grading can be achieved by adding, in addition to the basic requirements, the following:

A more advanced parametric construction (several parameters affects numerous features and/or parts; even a light "design-automation" can perhaps be made). Good and appropriate use of more specialized tools and modeling techniques (e.g. different kind of parameters, using blend, variable section sweep, helical sweep, smart use of family table etc.).

Grading

If your submission fulfills all the requirements in this document and follows the general principles of the course and is easily understandable then you will receive a grade of 3. Omissions and problems may lead to score deduction. To get a higher grade you will need to show the understanding of more advanced concepts and *self-study*. Please document where you think you have done more than the requirements.

Idea Gallery: