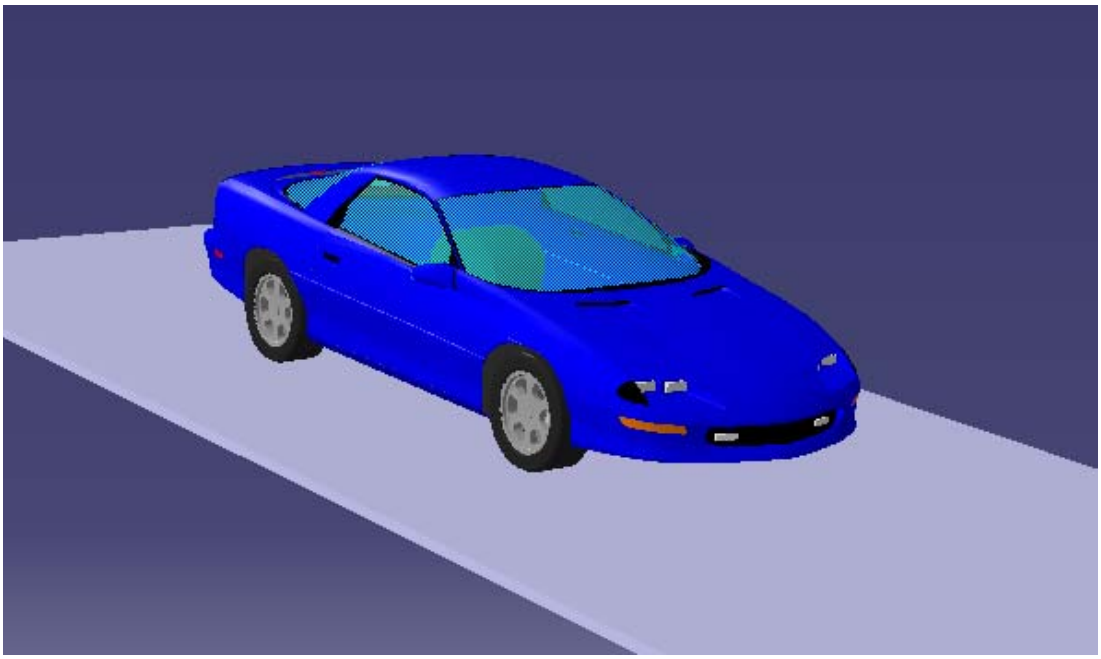
Lab 5: Interacting with Virtual.Lab Motion

A completed model has been provided for this lab session.

Objective

The objective of this lab session is to present the Virtual.Lab Motion program to new users. The user is stepped through the process of loading, solving, animating, and plotting results for an existing model. Primary focus is placed on presenting the basic menu functionality and view controls to provide a basis for detailed model construction and analysis in later lab sessions.

In this lab session we will be working with a simplified full-vehicle model of a Camaro, an image of the model is shown below.



Lab 5 Agenda

1. Starting Virtual.Lab Motion.
2. Loading an existing model.
3. Operations on the Navigation Toolbar.
4. Modifying the Model Display dynamically.
5. Changing between Workbenches.
6. Solving an Analysis Model.
7. Animating Results.
8. Saving a Model.

Starting Virtual.Lab Motion

Starting up the Virtual.Lab software

To start the Virtual.Lab environment:

1. Double-click on the VirtualLab Icon on your desktop.

Loading an Existing Model

1. From the File Menu on the Main Menu Bar, select **File → Open**.
2. From the File selection menu, select the Camaro.CatAnalysis document.
3. Select the **Open** button.

The Camaro.CatAnalysis document contains a fully defined Multibody Dynamics model. We will utilize this model to explore several areas of the Virtual.Lab interface.

Operations on the Navigation Toolbar

1. To use the Pan, and Rotate buttons, first select a button, and then select with the left mouse button in the Model Display window. Drag the cursor within the Display corresponding to the selected view command. Try this out in the Model Display window.
2. To use the Zoom In and Zoom Out buttons, simply click on the corresponding button with the left mouse button.
3. Try out one of the Multiple Option buttons discussed in the previous Navigation Toolbar section. Click on the black arrow to the right of the Isometric View button. Take the time to select on each view option individually.

4. You can also try out the multiple selection buttons by selecting on the arrow to the right of the Applys Customized View Parameters button. Select on each view type and observe changes made in the Model Display.

Modifying the Model Display Dynamically

- Zoom: Click and hold middle mouse button, click the right mouse button once, and drag the mouse up and down. Release the middle mouse button when done.
- Pan: Click and hold middle mouse button, drag mouse to right/left and up/down.
- Rotate: Click and hold both the middle and right mouse buttons, drag the mouse around the screen.

Try out these new methods on the camaro model.

Switching Between Workbenches

The Virtual.Lab software allows for multi-attribute engineering. It provides access to Motion, Durability, and Noise & Vibration technologies. The complete definition of a Mechanism Model requires that four separate workbenches of tools be utilized. Each workbench will be introduced during the Basic Virtual.Lab Motion lab sessions.

The first is the Product Workbench which controls the hierarchy of the Part Documents. The second is the Part Design Workbench, which contains all the tools necessary for defining a part. The third is the Mechanism Design Workbench, which contains the Mechanism Modeling tools. A part can either be defined prior to being assigned to a Body, or it can be defined after the Body has been defined. Both of these procedures will be covered in later lab sessions. The final workbench of tools is necessary to define a flexible body within a Mechanism Model, but flexible bodies will not be addressed in the Basic coarse.

Here are the steps to switch between workbenches:

To activate the Mechanism Design Workbench

Double-Click on the Analysis Model branch of the Virtual.Lab Specification Tree.

To activate the Part Design Workbench

Double-Click on the any Part document. A Part Document is indicated within the Specification Tree by the symbol shown:

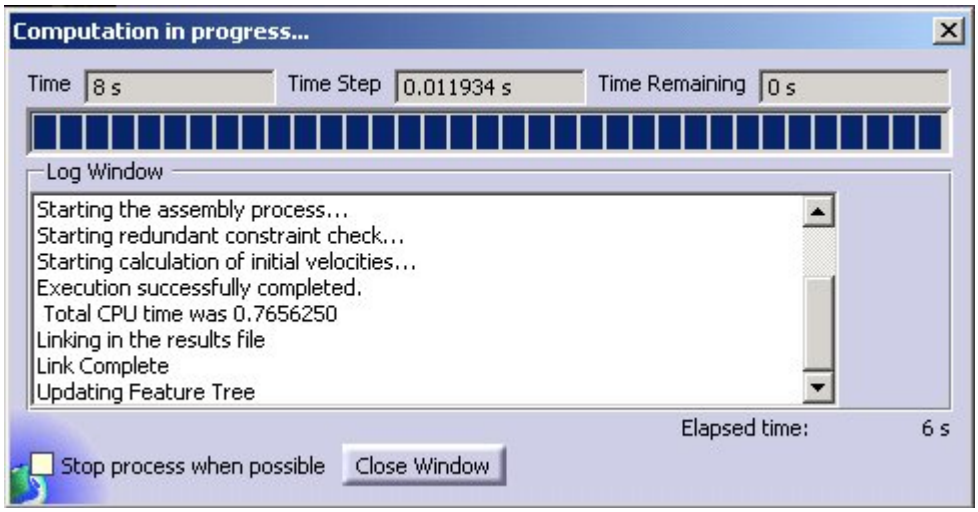
Try switching between these two workbenches a couple of times.

Solving an Analysis Model

Once the Analysis Model has been fully defined, the next step is to define the Analysis Case and to run a solution.

As was already mentioned, all elements for the Camaro.CatAnalysis document were previously defined.

1. Under the Analysis Model → LMSMotion branch of the Virtual.Lab Specification Tree, Double-Click the Solution Set branch. This will bring up the Solution Set dialog box.
2. In this case all result files will have a pretext of LMSMotion. To change this setting, set the *Ending Time* field entry to `8s` and the *Print Interval* field entry to `.05`.
3. Select on the *Dynamic* Tab of the Solution Parameters window. Set the *Reaction Force* field entry to `true`, by first selecting on the arrow to the right of the field.
4. Click **OK** to close the Solution Set window.
5. Click the **Compute Solution** button from the Mechanism Design Workbench. This will run an analysis of the model to 8s, and will provide all reaction forces for plotting within the Virtual.Lab Graphing Tools.
6. Once the Analysis shows that it has completed successfully, click on the **Close Window** button in the Computing dialog box.



Animating Results

Now that a solution has been completed on the camaro model, it is possible to animate and visualize the motion of the system. Two rotational drivers were placed on the steering of the vehicle, such that the front tires of the vehicle would first turn to positive five degrees rotation, then negative ten degrees, and finally back to zero degrees rotation in eight simulation seconds.

To animate the simulation:

1. Select once on the Solution Set branch of the Specification Tree, the branch should highlight orange.
2. Click the **Animate** button. This will bring up the Animation Toolbar at the top of the screen.
3. Click the **Parameters** button from the Animation Toolbar. Within the Player Parameters Definition Dialog, set the *Sampling Step* Field Entry to the Print Interval of `.05s` that we used during this solution. Click on the **Parameters** button again to close the dialog box.
4. Now Click the Play Forward button from the Animation Toolbar.

Saving a Model

The easiest way to insure that all changes to your model and any external files that are being referenced are saved is to select the Main File Menu and **Save All**.

This completes Lab Session 5.