MSC ADAMS Guide

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1 Introduction

For the AutoBike project, we have used a simulation software called ADAMS. It has been useful for the development of the controller but requires a few steps to get going.

2 Install the program

You will need to create a user ID at the ADAMS from their web page and apply for a student licence, see:
http://www.mscsoftware.com/page/adams-student-edition.

3 Open the project with ADAMS

1. Download the *Bicycle CAD + Simulation files* from Teams, that folder contains all Solidwork parts, all ADAMS files and Matlab files used when creating the simulation model.

2. Start *Adams View Student Edition 2018.1*.

3. Select the opening option *Existing Model* and browse for the *File Name: Bike.bin*. *Bike* is located in *Bicycle CAD + Simulation files\Simulation Files* and then press *OK*.

4. Good job! You have now successfully opened the ADAMS workspace containing a bicycle which is based on the CAD model, should look something like Figure 1. If you are interested in the CAD model you can find it in *Bicycle CAD + Simulation files\Bicycle CAD-Files*.

5. I will leave you here, for now, feel free to test around. Remember that you can always re-download and start over if something goes horribly wrong! TIPS: You can download the *Adams Tutorial Kit for Mechanical Engineering Courses* and do the tutorials. Also, read the Instruction book that comes with the download.

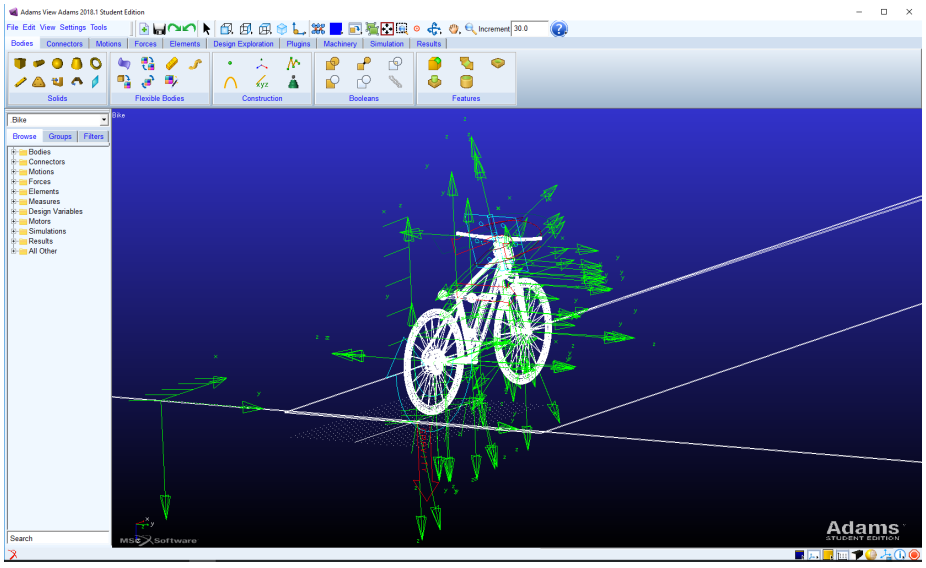

Figure 1:

4 Create MATLAB plant in ADAMS

You can use ADAMS to generate MATLAB Simulink plants of the bicycle dynamics. This step requires some knowledge about how to link forces and motions to ADAMS Variables, this is well described in the ADAMS Manual.

1. Create *State Variable* for every parameter that should be an I/O to the plant. Find it under *Elements* and select *Create State Variable*. See Figure 2 how it should look.

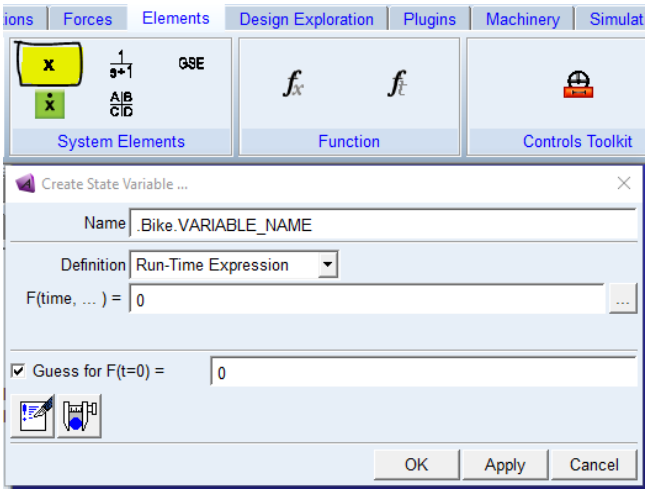

Figure 2:

2. Now when you have your ADAMS Variables i.e state variables defined you can create a plant. Go to *Plugins* and select *Load the Controls Plug-in*. Press *From Pinput* and add all Adams Variable which is intended as input and likewise for the outputs by pressing *From Pinpout* to add.

3. Select MATLAB as *Target Software*, non_linear or linear as *Analysis Type*, and C++ as the *Adams Solver Choice*. Press *OK* to create a Simulink plant. The plant files will be saved to the same location as the *Bike.bin* file.

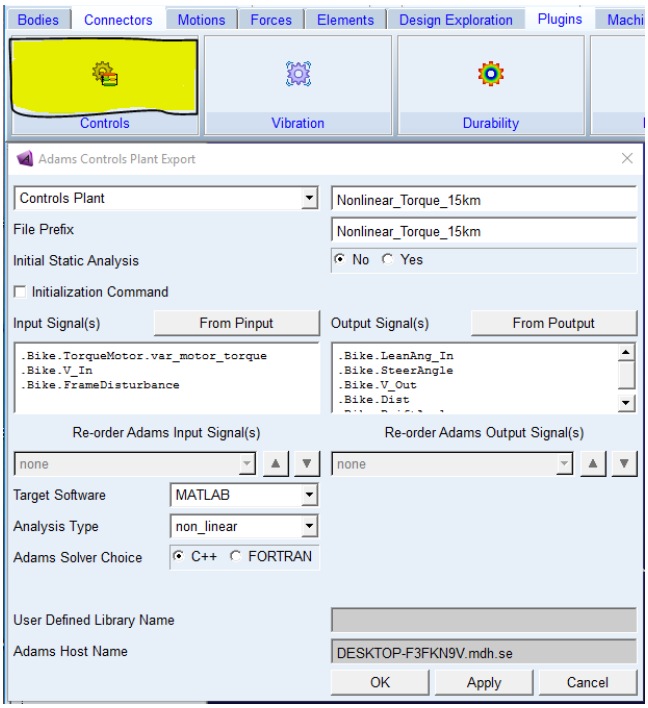

Figure 3:

5 Import plant to MATLAB Simulink workspace

Now it is time to add the ADAMS Plant to the MATLAB Simulink workspace and begin to build a control-loop around it.

1. Open and run the ADAMS Plant MATLAB file with the corresponding name as the plant created in ADAMS.

2. Type *adams_sys* in the MATLAB Command Window. You are expected to see something like in Figure 4

3. Now mark the orange box named *adams_sub* and copy it to a blank or existing Simulink project.

ADAMS can be run in two Animation modes, interactive or batch. Selecting the interactive mode will open ADAMS and show a visual representation of the bicycle behaviour. Batch mode run the simulation without opening and showing a visual representation of the simulation. You find this option when double-clicking on the Adams plant block in Simulink and then double click on the red box. You are now supposed to see the window showed in Figure 5

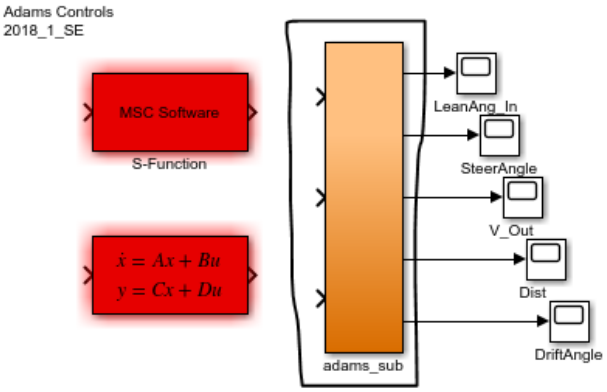

Figure 4:

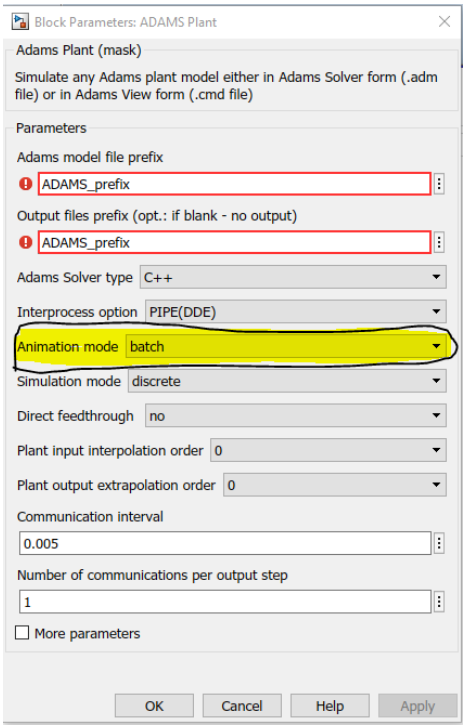

Figure 5: