Adams Real Time Workshop (4/16/2020)

Additional Q/A

Q: Does Adam Realtime include sensor modelling?

A: You can co-simulate Adams RT and VTD, which we will talk about in the last session

Q: will the loading torque at the wheel go back to the powertrain? is it a close loop system?

A: The driveshaft speed from the model is fed back to the engine system and enforced by the dyno.

Q: Is it possible to integrate a real-time model with a visualization environment such as Unreal Engine or Unity?
A1: Apologies, the above response was for another question. Adams does support FMI but I am not sure if unreal or unity support this. We will be touching on the application of Adams RT in Adas/Autonomous in the last presentation-

A2: We have a customer that integrated Unreal Engine with Concurrent system. We have also tested Unity with models running under Concurrent system

Q: Currently, we need to run the ADAMS RT model on Concurrent. Can we bypass the Concurrent and run ADAMS FMU on dSPACE Scalexio alone?

A: Although MSC supports both DSpace and Concurrent, the concurrent implementation was released first and is more mature. We continue to work on improvemnts to both interfaces.

Q: What is the level of correlation you have for 5 Link vs Leaf Spring? Is lateral stiffness is captured well?

A: The ford application is focused on primary vertical and windup rates and modes. The method should allow accurate capture of lateral stiffness

Q: Any possibility of integrating ADAMS RT with VI-Grade driving simulator hardware?

A: Yes, this is possible and we are continuing to make improvements and enhancements in this area.

Q: How do we decide where to reduce the DOFs in our model when converting to RT? And how much reduction is typically needed?

A: This depends on your application and the hardware specifications. You can keep the DOFs in the area of interest depending on your application. The next presentation should provide some more information on this.

Q: I have a follow-up question on running ADAMS FMU on dSPACE Scalexio. When will it become mature on dSPACE? Do you have a timeline?

A: You will see further support for Scalexio in Adams 2021 release as will support the more recent versions of the Scalexio OS and software

Q: Any correlation study on hard controlled brake stop test?

A: Some work is being done on brake HIL testing with Adams RT, but nothing that can be shared at this time.

Q: Why you choose to reduce the DOFs, I know it will help in simulation but it will help in real life?

A: The original High-DOF model is just too slow to run in real time. Reducing the DOF makes the problem small enough for the CPU to solve the model faster than real-time.-

Q: How do you deal convergence of a simulation, as scaling up the DOF not only effects the computational time but also the complexity invovled in solving them. How do you deal with convergence in Real time? It would be good if you can talk about solvers used.

A1: There are some New Feature Examples in Adams 2019 which talk about using the fixed step integrator and how it study the performance-
A2: Very similar results are seen with HHT and GSTIFF. This is why it important to have a test that drives the model with realistic inputs. Then you can compare converged response to RT-solver response and ensure accuracy and stability are maintained-

Q: What sort of tools are available for some of these reduction?

A: There is a tool for aito-reduction of the anti-roll bar from beam-based to a simple torsion spring. -

Q: Is there a tool for reduction of leaf spring?

A: There is not an out-of-the-box tool for this at this time. MSC is considering this enhancement for at least some configurations.

Q: Can the highest fidelity parts of the model be turned into black boxes/surrogate models?

A: There is "ongoing research" regarding this for some components. Right now, this would be limited to the sorts of black boxes that can easily be called from Adams. This is tricky to combine with RT

Q: Is VTD has capability for modeling and simulation for off road vehicles in unstructured environments?

A: Currently, VTD is focused on road scenarios, but there is ongoing work to extend the "road" into the surrounding terrain.

Q: For realtime ride is FTire used in realtime? Or is it a simplified version?

A1: Cosin (FTire developers) have Real-Time capable Ftire capabilities. It should be possible to combine Adams RT with this tire representation at RT speeds. Most current work is done with a PAC2002 tire representation. -

A2: CoSin supports Concurrent system (SimWB) to run their tire models in real-time using many cores. The ability to use multiple cores is especially useful to simulate tire models. So, it is possible to run FTire with Adams RT model in real-time

Q: As most of the model is being simplified for Real time. So using a pac2002 is anytime better than f-tire. Don't we think? (based on your previous reply)

A1: Yes, for most applications, I don't think that Ftire would help you much. It is typically more helpful between about 25 and 100 Hz. For some ABS brake HIL situations, it might still be relevant.-

A2: Also, as RT performance improves the frequencies that can be effectively captured may go up and Ftire may become more relevant.-
A3: The higher frequencies are desired in dynamic simulators to give more accurate vehicle feel and so higher fidelity tire models are prefered for these applications

Q: Like to know how easy is to compare the effect of different levels of model simplification on the accuracy of results, with confidence (without test data in hand)? Are there rules of thumb how high or low one can go?

A: The issue here is the results of interest – different results mandate different levels of fidelity. Accelerations will tend to degrade most easily, followed by forced, velocities and displacements. If the goal is focused on off-road autonomy, then the accuracy will be driven by the sensors that feed the autonomous algorithms. Most likely, decent estimates of sensor inputs can be maintained with a fairly rough model (~50 DOF). If you want absorbed power as well, you would need to improve the compliance and push up into the neighbourhood of 120 DOF (for a typical 4-wheeled architecture).

Q: Are you using CPU or GPU or a combination?

A: The Adams methods are all CPU-based, and the nature of the Adams numeric methods make it difficult to leverage GPU methods. If VTD is a part of the process, the VTD toolset requires significant participation from the graphics card.

Q: What kind of parallelization? OpenMP, MPI?

A: It is neither of these two. Parallelization in Adams is SMP based only. MPI is useful for breaking up modes into chunks and solving them in parallel. Since Adams models are not huge there is no benefit to MPI. We tried OpenMP, but found it competes with SMP for threads, resulting in no end benefit.

Q: Can I use subsystem variant while creating new assembly?

A: The creation of a new assembly does not allow the identification of a specific assembly variant. Instead, every new assembly is always created as the "default" variant. The default variant cannot be deleted. Every variant is specified as a change from the default variant, whether it id an assembly variant or a subsystem variant. This design allows for a compact database.