FAQ for MecE 260 Motion Tutorials

Q: Why isn't my simulation running?

A: Good luck.

A: Here is a basic checklist for features that should be present in your motion study:
- Gravity
- Solid Body Contact
- Additional acting force
- Assemblies with moving parts resolved as **Flexible**

Q: Why is my car falling apart?

A: Mates, SOLIDWORKS' Motion requires a minimal amount of efficient mates for optimal calculations. A poorly mated assembly will act 'unnatural' because the mates do not hold it together. SOLIDWORKS' mates are very literal and require proper attention to match the desired result.

Q: Why does my car fly away?

A: Likely one of these three things:
- your forces and material properties are incorrect
- you forgot to enable the car assembly as **Flexible**
- your starting position has two contact surfaces clipped into each other

Q: Why does my car/cupcake/part fall through the track?

A: There are a numerous amount of reasons why this is the case, here is a list of some with accompanying explanations:

- Low frame rate
  SOLIDWORKS renders based off of frames and collision isn't rendered unless it occurs within the frame. A low frame rate combined with a high speed will cause the crucial moment of contact to be skipped. Increasing the frame rate may solve this problem, at the cost of a higher calculation time.
  Alternatively: Within the motion study properties, there is the **Precise Contact** checkbox. This will cost additional calculation time, but reduce the likelihood of pieces falling through the track..

- High Penetration
  If a solid body has abnormally high penetration (on impact) with respect to its body size, SOLIDWORKS may render the object as passed through.

- Missing Solid Body Contact
  You're missing Solid Body Contact, check if you have it loaded between the two respective parts.

Q: Why does my car go through my cupcake/part?

A: Parts and assemblies within SOLIDWORKS do not automatically acknowledge other parts. This is true for motion studies as well, mates are required for parts to acknowledge each other in an assembly. **Solid Body Contact** is required for every part or assembly that is supposed to collide or interact with another part or assembly.

Q: Why does my motion study calculation take so long?

A:The motion calculations will vary based off of computer hardware, be aware of some professional works that take days to render in comparison. There are common circumstances which may increase your calculation times:
- High complexity within the assembly, more moving parts will increase calculation time
- Loose parts or assemblies, each will be affected by attached bodies and gravity
- 'Extraneous' physics, such as the car tipping over and spinning on its wheel
- High penetration values on collision
- High stiffness values on collision
- Using an interference sensor

You may have to be a bit patient. Computation time is highly dependent on computer hardware and you can generally expect around 20 minutes for the jumping car tutorial. For design studies, the time will increase with the number of permutations to run with the design study.

Q: What are redundant mates?

A: Mates limit the degrees of freedom of a part/subassembly relative to the main assembly. A redundant mate occurs when two mates restrict the same degree of freedom of a part/subassembly. SOLIDWORKS Motion asks users to create perfectly efficient mates when simulating motion. Often it will produce a couple of redundant mates after calculation. Brief testing with sample assemblies have shown that a small amount of these redundant mates do not significantly affect results.

Q: Why does my car move so slowly?

A: Check if the **Solid Body Contact** friction values. Try rubber(dry) on rubber(dry), if this works then your custom friction forces were incorrect.

A: Ensure your gearbox is correctly mated. You can test this by creating a motion study with only the gearbox assembly and applying a motor. You can confirm your gear ratio values by applying angular velocity plots on your gears.

A: There are many ways to apply movement to your car, ensure that the method you picked has the correct values. Force, for example, will take into account the weight of the bodies it is applied to.

Q: Why can't I link my dimension sensor to my dimension?

A: Make sure that the dimension is a **reference dimension**. This can be done by clicking Smart Dimension and in the PropertyManager select reference dimension.
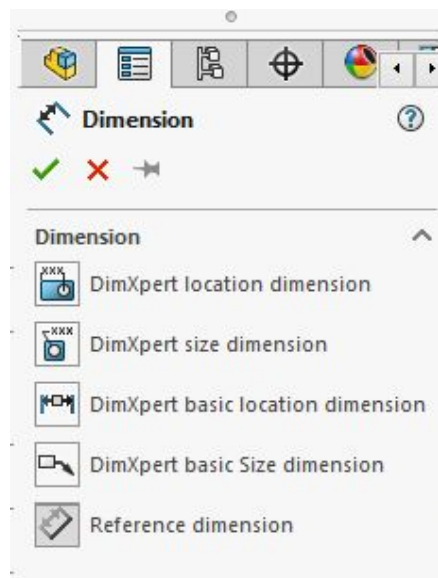
General Tips

- **Save often**, no one is liable if SOLIDWORKS crashes and loses your current instance
- Have 2 position mates that define the horizontal and vertical starting positions of the car. For the vertical positioning mate, try to have a small vertical offset between the wheels and surface of the track (<5mm). SOLIDWORKS calculates solid body contact more accurately if it can "catch" it during a frame. You can disable these mates locally within the motion study.
- Calculate the motion in the timeline view to see if the car is simulated properly. If the Solid Body Contact is off (i.e., parts are going through each other), try increasing the frame rate. Move to Event-based once the car moves properly.

- When changing the initial conditions of the motion study, make sure to have the motion study at the beginning (timeline bar at 0 seconds)
- Although a good software, SOLIDWORKS may not accurately simulate the complex motion of a mechanism. It may also be very time consuming to figure out how to simulate within Event-Based motion view. Complexity adds to computation time, and depending on your computer's hardware, SOLIDWORKS may crash if agitated during the calculation.
- Like cup holders in vehicles, have a feature on your launcher that safely contains the cupcake until it needs to be released. Same goes for the catcher. This will also make mate suppression much simpler during the simulation.
- Start by making a table of each phase of your simulation. Once you have a rough idea of each event of the simulation, it makes adding each one much simpler.

Example:

Event	Task
Enable Car to move	Suppress car position mates, start Motor
Enable Cupcake to be launched	Suppress cupcake position mates
Enable Launcher to move	Suppress launcher mates
Activate motion of Launcher	Turn on actuator of Launcher
Stop motion of Launcher	Turn off actuator of Launcher
Activate motion of Catcher	Turn on actuator of Catcher
Stop motion of Catcher	Turn off actuator of Catcher
Stop Simulation	Turn off Motor, End motion *(important)

- You can also add the end of an Event as a trigger. This may be useful for your launcher/catcher mechanisms.
- Test your features before moving onto the next
- You can manually set the mass of parts by going into Tools>Mass Properties, then in the Mass Properties window, click Override Mass Properties