Validation of Simcenter 3D motion model output Forces

We are looking for motivated master students Engineering Technology

Project description:

Formula Electric Belgium (**FEB**) is a team of highly motivated engineering students that build an electric formula student race car. Just like Formula 1 the team builds a brand-new car each year to compete in multiple international competitions during the race season. Formula Student is the largest international engineering and design competition in the world. The competition is characterized by combustion vehicles, electric vehicles and since recently also autonomous vehicles. Formula Electric Belgium strives towards innovations and the raw performance of technologies. It is for this reason that the team will focus on the autonomous/electric race cars. Research and development applications will be made by postgraduate students in collaboration with thesis students from the KU Leuven and bachelor students from Thomas More.

Thesis description:

Our race car uses a double-wishbone a-arm suspension system to attach the wheels to the chassis of the car. At each corner, this creates 4 attachment points at the chassis side, and 2 points on the wheel side. These 6 points together define the kinematic behaviour of the suspension, and along with this the forces in the a-arms themselves.

Today we use a spreadsheet to calculate forces in the suspension a-arms. This spreadsheet however was never validated, and the resulting forces thus not accurate. This means we often have to overdimension components for redundancy, which leads to unnecessary heavy and large components.

If an accurate model of the car is created in Simcenter 3D Motion, the output forces can be plotted for many different scenarios (torque, speed, steering angle can all be used as input data). These forces are of course simulated, and to be able to rely on these validation is necessary. This can be done by the use of strain gauges, placed on the a-arms, and calculating forces based on the strain values.

Thesis objective:

Create a Simcenter 3D Motion model of the car, based on the CAD model of the car of last year. Adjust the parameters of the model so that they match the real car as close as possible. Decide on a test procedure, and how they will be executed in the model (maximum lateral acceleration, maximum longitudinal acceleration, bump, …).

Test these same scenarios with the car and strain gauges. Think about adjusting the tire model in the simulation to have the right behaviour based on the grip levels available on the test facility, and how to determine these levels.

Process the data from the strain gauges in a correct way (filtering, matching data to events in time), and compare them to the data from the simulation.

Profile:

- Interested in vehicle dynamics
- Can work iteratively
- Creative
- Teamplayer

What do you gain?

- A unique engineering- and team experience where hard work and team atmosphere are central.
- Work with innovative technologies in a realistic environment/application.
- Create added value for your curriculum and the team

Are you interested? Please send your resume with accompanying motivation to:
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