Jansons Institute of Technology

Approved by AICTE New Delhi Affiliated to Anna University

Coimbatore, India, Tamil Nadu, India.

JIT - Indian Institute of Production Engineers (IIPE) Student Chapter

Organizes Webinar

On

Model Based System Engineering (MBSE) and Open Standards

(With an Electric Vehicle Case Study)

Modelon

Live On 21-04-2021 @ 4.00 PM Onwards

YouTube

Resource Person :

Elavarasan Dharumaseelan
Technical Expert,
Mechanics and Vehicle Dynamics,
Modelon Engineering Pvt. Ltd.,
A 100% owned subsidiary of Modelon AB,
Sweden.

ABOUT JIT:

Jansons Institute of Technology (JIT) is a world class Engineering College established in 2009 and the second venture of the Jansons Foundation in the field of Higher Education. JIT has been promoted by the Jansons Business Group which comprises 14 operating companies in five business sectors, predominantly in the Textile sector connecting 40 countries across the world and other sectors are Granite, Retail, Medicare, and Education. JIT offers six UG Programmes.

JIT is approved by the All-India Council for Technical Education (AICTE) and the Government of Tamil Nadu, and is affiliated to Anna University, Chennai. JIT, guided by its motto, 'the most preferred destination for Technical Education', takes every effort to create infinite opportunities to students for their professional development. JIT employs the finest brains in Technical Education as its faculty to lead its students to a fruitful learning.

ABOUT IIPE:

The Premier Body of Indian Manufacturing Professionals. Aim to serve the manufacturing fraternity - whether you are an engineer or an accountant or even a medical doctor, but engaged in some way contributing to the manufacturing and technology excellence of this country.

Involves in establishing, form and maintain libraries, collection of models, designs, drawings, books, articles in connection with the development and improvement of Production Engineering discipline. Actively interact with universities and educational bodies, to sculpt the curriculum in tune with modern world class manufacturing trends.

JANSONS INSTITUTE OF TECHNOLOGY

RESOURCE PERSON

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A Webinar on Model Based System Engineer (MBSE) and Open Standards

21-04-2021 @ 16.00 Hrs IST

Organized by

Indian Institute of Production Engineers

JANSONS INSTITUTE OF TECHNOLOGY

Approved by AICTE and affiliated to Anna University, Chennai
Karumathampatti, Coimbatore - 641659

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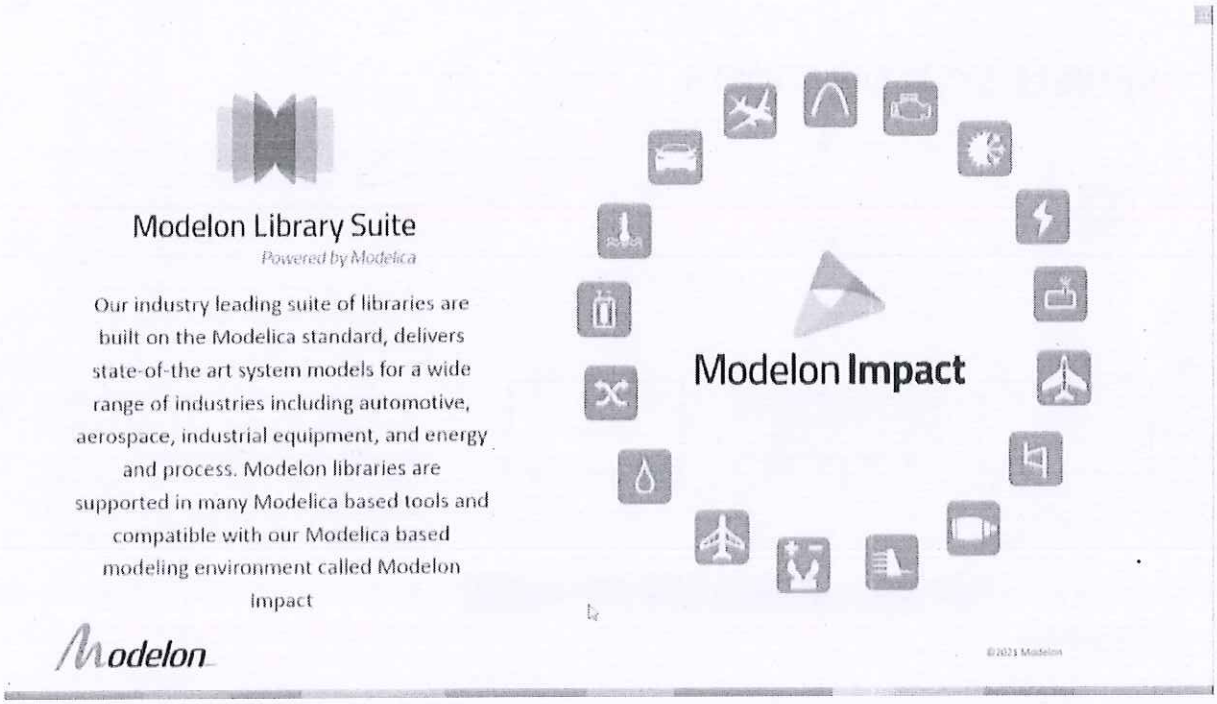
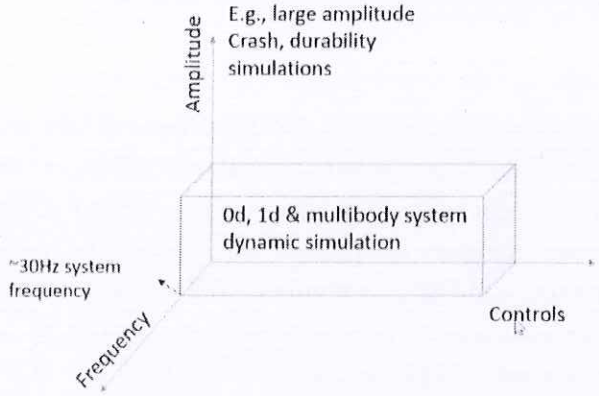
DEPARTMENT OF MECHANICAL ENGINEERING

Webinar Report on "Model Based Systems Engineering (MBSE) and Open Standards"

On behalf of JIT – Indian Institute of Production Engineers Student Chapter and Department of Mechanical Engineering, organized an online live webinar titled "Model Based Systems Engineering (MBSE) and Open Standards". The resource person for this webinar is Mr Elavarasan Dharumaseelan is a Technical Expert within Modelon Engineering Pvt. Ltd., a 100% owned subsidiary of Modelon AB, Sweden. The resource person elaborated the product development concepts and MBSE. And related the existing simulation techniques in automotive design, the role of dynamic system simulation and importance of open standards in MBSE. Discussed a case study where detailed, configurable, scalable vehicle models of multi-body & multidomain combination created for an electric pickup truck with various Range, performance, drivability, handling, ride comfort attributes and simulated, further results are discussed. Detailed the scope of MBSE in multiple ways like concept evaluation, system sizing, optimization, controls development, controls calibration, Al training, etc.



POSITION AND ROLE OF DYNAMIC SYSTEM SIMULATION



- System simulation bridges the gap between 3d world and controls world
- It interacts with both structural and controls worlds
  - Provides boundary conditions to 3d simulations
  - Helps in controls development
- It also provides insight how system behaves in different dynamic conditions so that concept evaluation, component sizing and optimization are made possible by this

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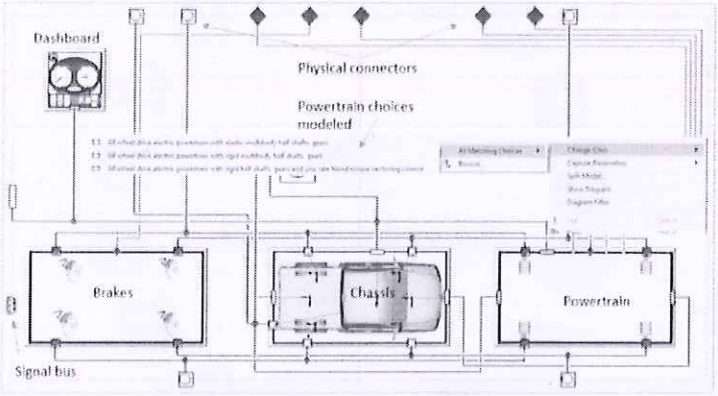
VEHICLE SYSTEM MODELS



Electric pickup vehicle top level architecture

- Multibody & multi-domain based models
- Modular approach capturing least components like suspension members, tires, drivetrain shafts, joints, non-linear bushings, battery cells, cooling system, etc
- Detailed enough for the studies intended (can predict roughly upto 30 Hz system frequency range)
- Configurable to pick right fidelity to speedup the simulation. For eg., elastic driveline for drivability and rigid driveline for range, handling simulations.
- Scalable architecture for future upgrades
- Models use Modelon's Vehicle Dynamics, Electrification & Liquid Cooling libraries

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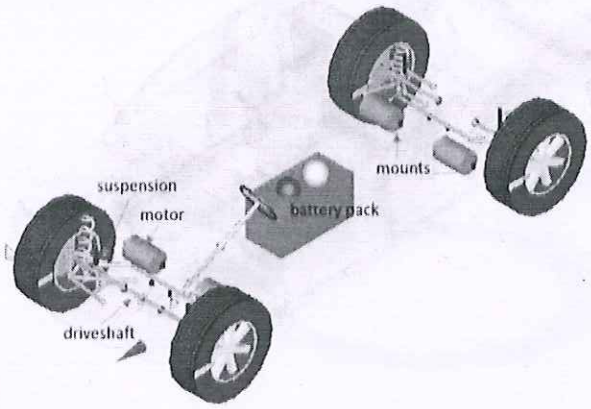
MULTIBODY VISUALIZATION OF THE VEHICLE



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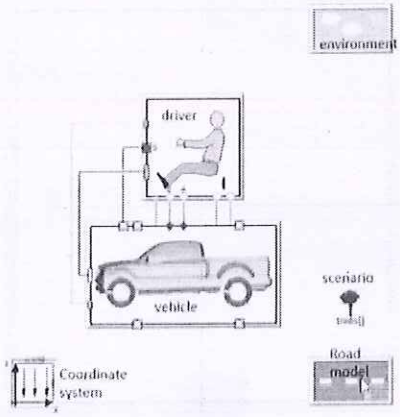
ATTRIBUTE ANALYSIS: TEST SETUP



High speed cornering test model setup

- In order to check the vehicle's performance against the selected attributes, the vehicle model is placed along with appropriate driver and ground models

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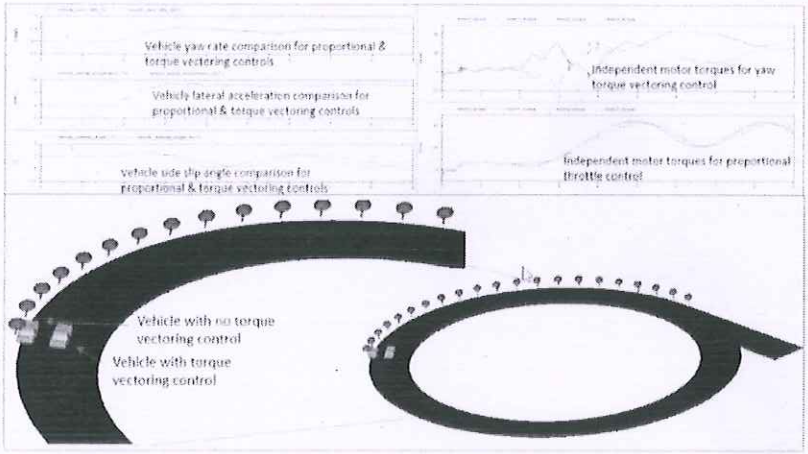
ATTRIBUTE ANALYSIS: HANDLING



Test case simulated:
High speed (42 mph) cornering with & without dynamic torque vectoring control

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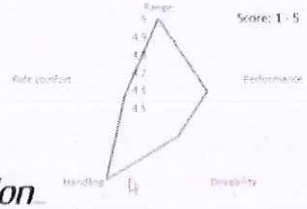
ATTRIBUTE ANALYSIS: RESULTS SUMMARY AND DISCUSSION

Attributes	Objective metric	Subjective metric	Reference values / range
Range	182 miles (293 km) for 70% SoC		250 miles for 100% SoC
Acceleration	0-60 mph in 5.35 secs		0 – 60 mph in 4.9 secs
	0-100 mph in 10 secs		0 – 100 mph in 12 secs
Drivability	Shuffle frequency: 1.4 Hz		1 – 10 Hz for passenger cars
Handling safety	NIL	Dynamic torque vectoring overcomes understeering	NIL
Ride comfort	Sprung mass frequency: 1 Hz		Sprung mass frequency: 0.5 – 1 Hz for passenger vehicles
	Road induced frequency: 8 Hz		
	Acceleration RMS: 1.948 m/s²		Vertical acceleration RMS < 2 m/s² for trucks

Vehicle reference values

Literature reference ranges

Approximated multi-objective design spider chart of electric pickup for given parameters set & results



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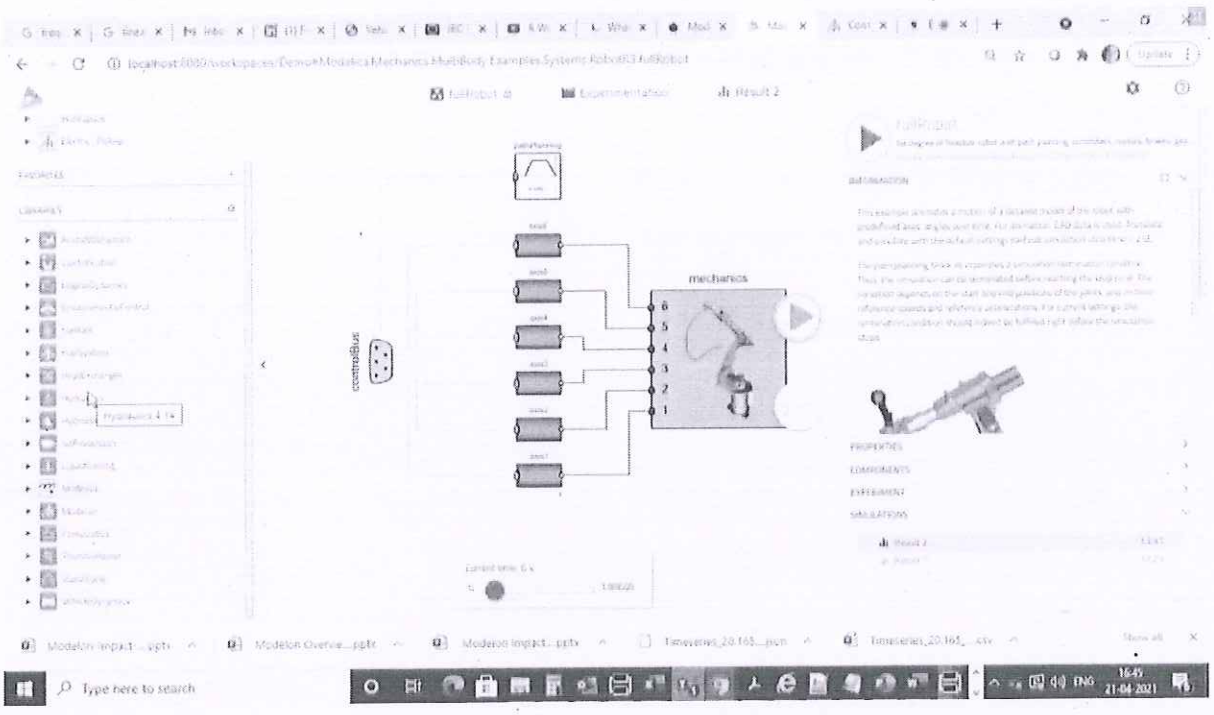

M. KRISHNAKUMAR.

FACULTY. INCHARGE.

(HOD/MECH)