Altair Technology Conference 2018

CoSim 기법을 이용한 경장갑차 시스템 모델 구성과 제어

Light armored vehicle system modeling and control by using CoSimulation

김석산(Altair)

ATC 2018

Agenda

- Activate CoSimulation Introduction
- MotionSolve Modeling
- Activate Modeling
- Analysis Results

Activate CoSimulation Introduction

MBD (Model Based Development)

- Today's Products Are Multi-disciplinary, Smart & Connected

Mechanical System Design

+

E&E System Design

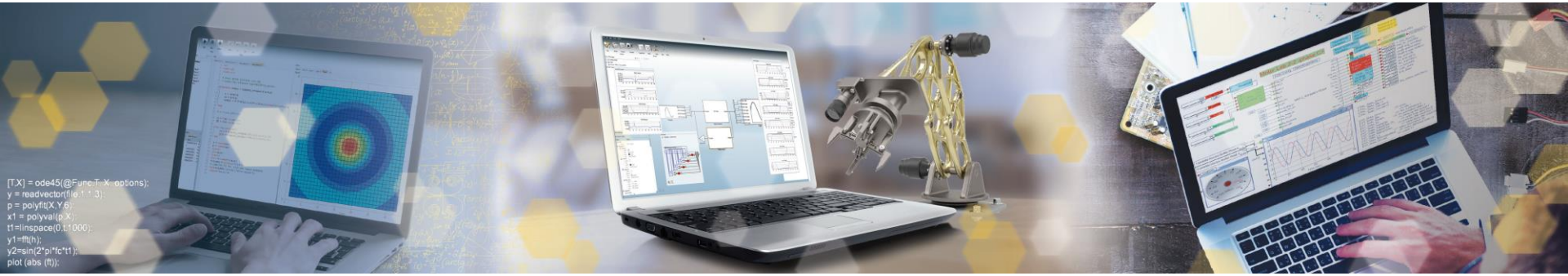
+

Control System Design

System Simulation

Controller Implementation & Testing

Altair Math & System Modeling Solutions



COMPOSE™

Math tool

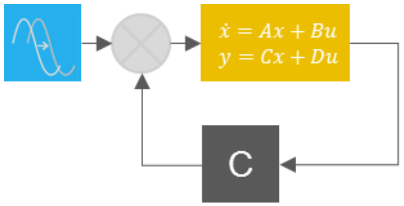
ACTIVATE™

Multi-domain simulation

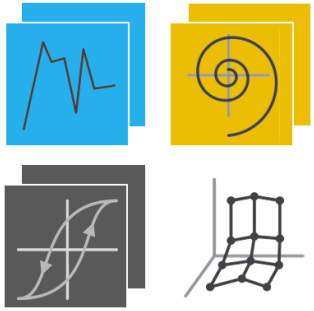
EMBED™

Embedded Development

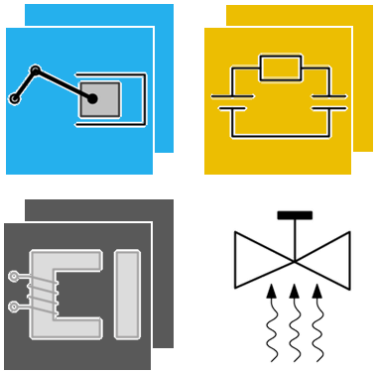
Activate



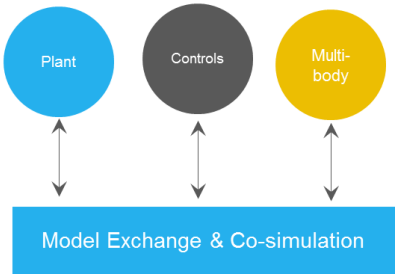
Block diagram Environment



Signal-based Modeling

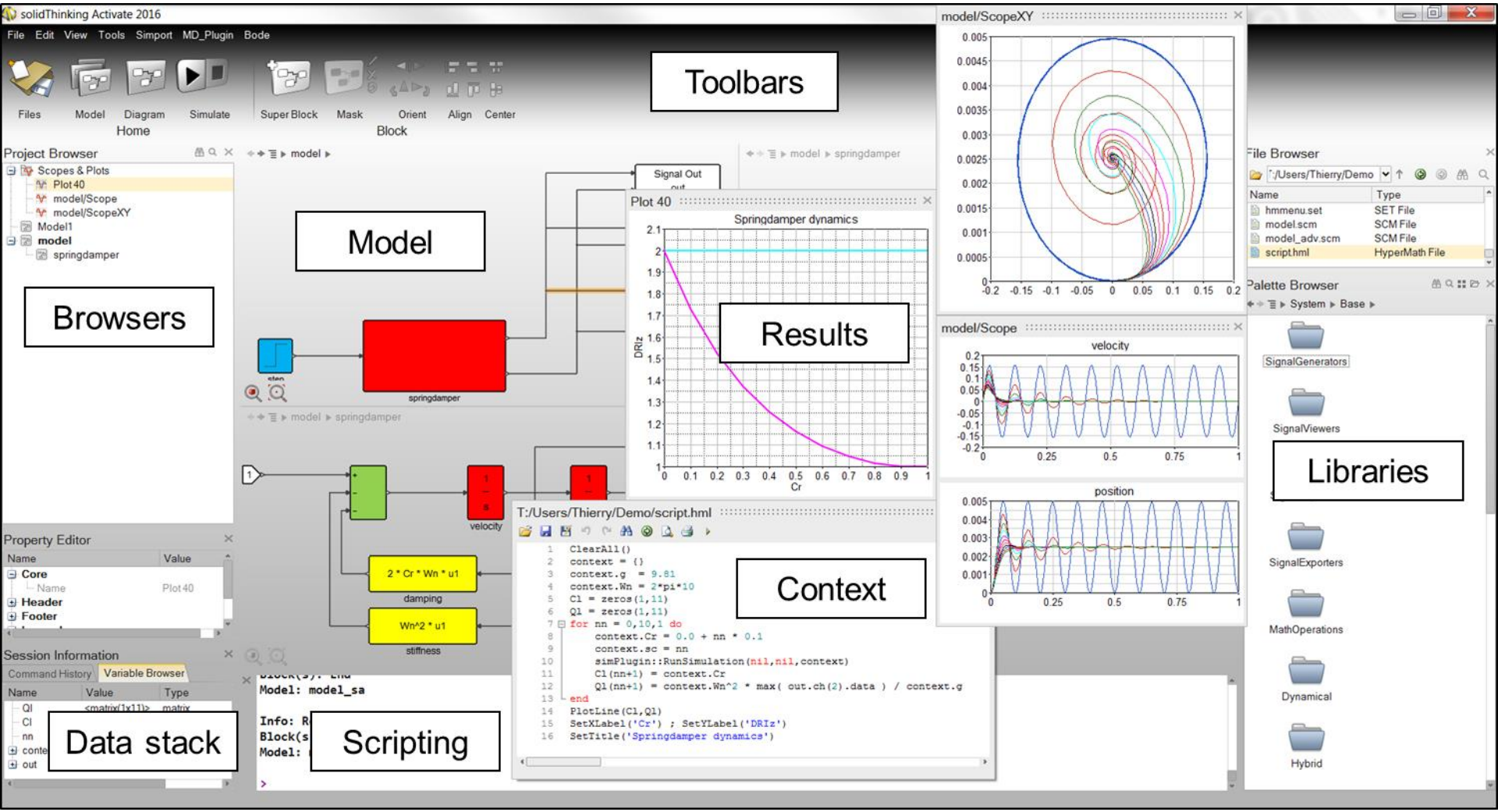


Physical component Modeling (Modelica™)



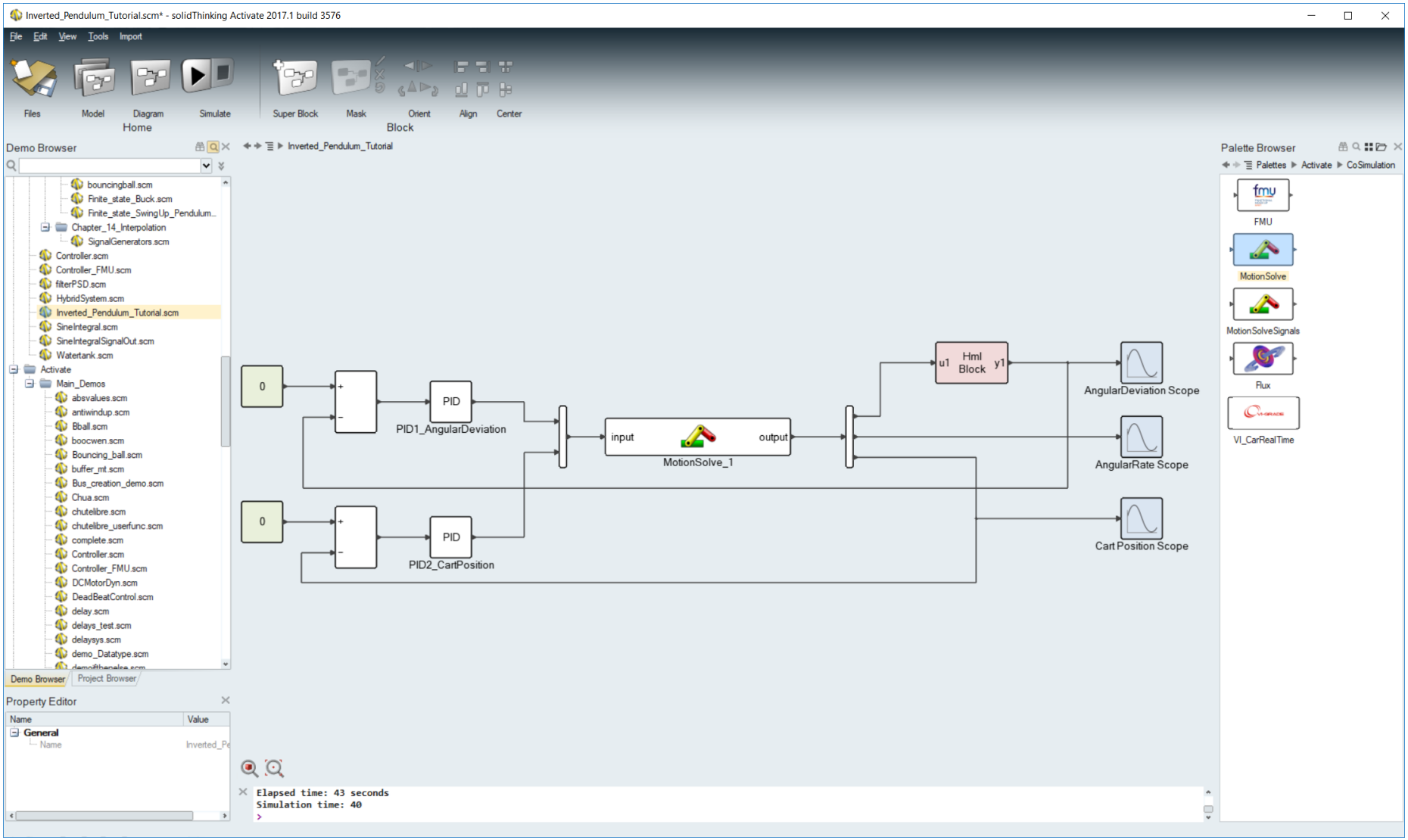
Functional Mock-up Interface (FMI)

Activate


solidThinking Activate 2016
File Edit View Tools Simport MD_Plugin Bode
Files Model Diagram Simulate Super Block Mask Orient Align Center
Home
Block
Toolbars
Project Browser
Scopes & Plots
Plot 40
model/Scope
model/ScopeXY
Model1
model
springdamper
Browsers
Model
Signal Out
springdamper
velocity
2 * Cr * Wn * u1
damping
Wn^2 * u1
stiffness
Plot 40
Springdamper dynamics
DRIz
Cr
Results
model/ScopeXY
model/Scope
velocity
position
Property Editor
Name
Value
Core
Header
Footer
Session Information
Command History
Variable Browser
Data stack
Model: model_sa
Scripting
T:/Users/Thierry/Demo/script.hml
ClearAll()
context = {}
context.g = 9.81
context.Wn = 2*pi*10
Cl = zeros(1,11)
Ql = zeros(1,11)
for nn = 0,10,1 do
context.Cr = 0.0 + nn * 0.1
context.sc = nn
simPlugin::RunSimulation(nil,nil,context)
Cl(nn+1) = context.Cr
Ql(nn+1) = context.Wn^2 * max(out.ch(2).data) / context.g
end
PlotLine(Cl,Ql)
SetXLabel('Cr') ; SetYLabel('DRIz')
SetTitle('Springdamper dynamics')
Context
File Browser
Name
Type
hmmenu.set
SET File
model.scm
SCM File
model_adv.scm
SCM File
script.hml
HyperMath File
Palette Browser
System
Base
SignalGenerators
SignalViewers
SignalExporters
MathOperations
Dynamical
Hybrid
Libraries

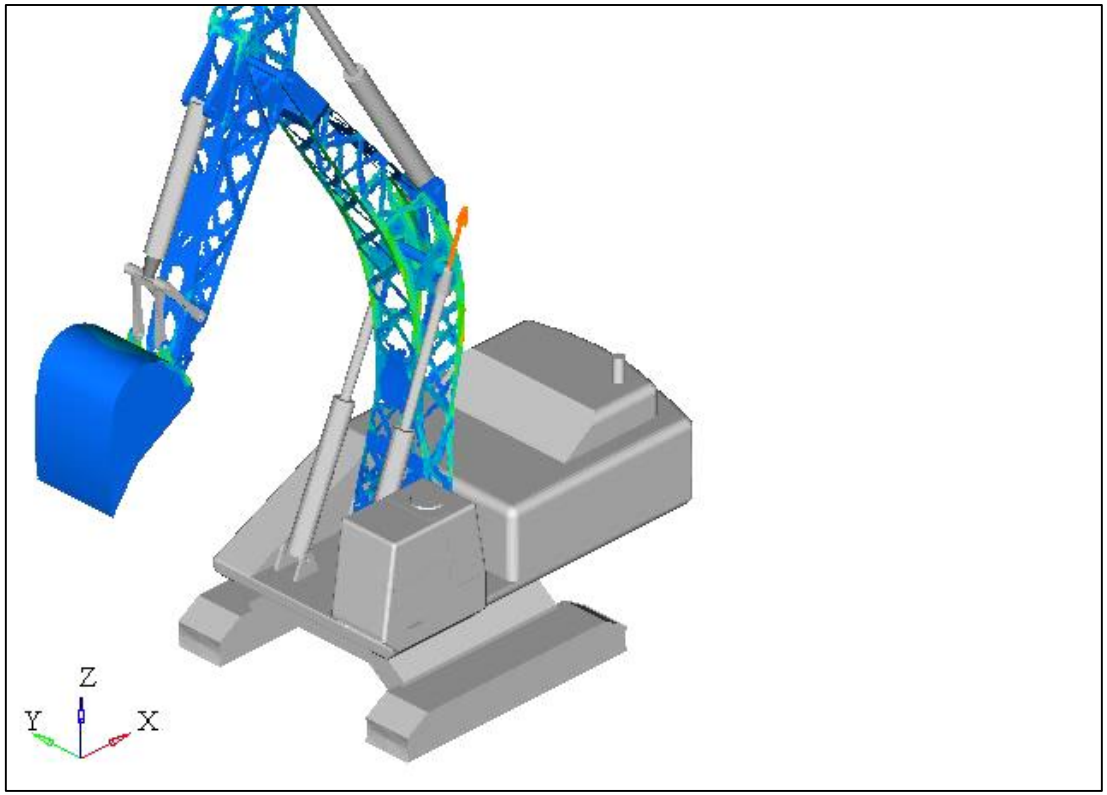
Co-simulation with other software

- Co-simulation interface



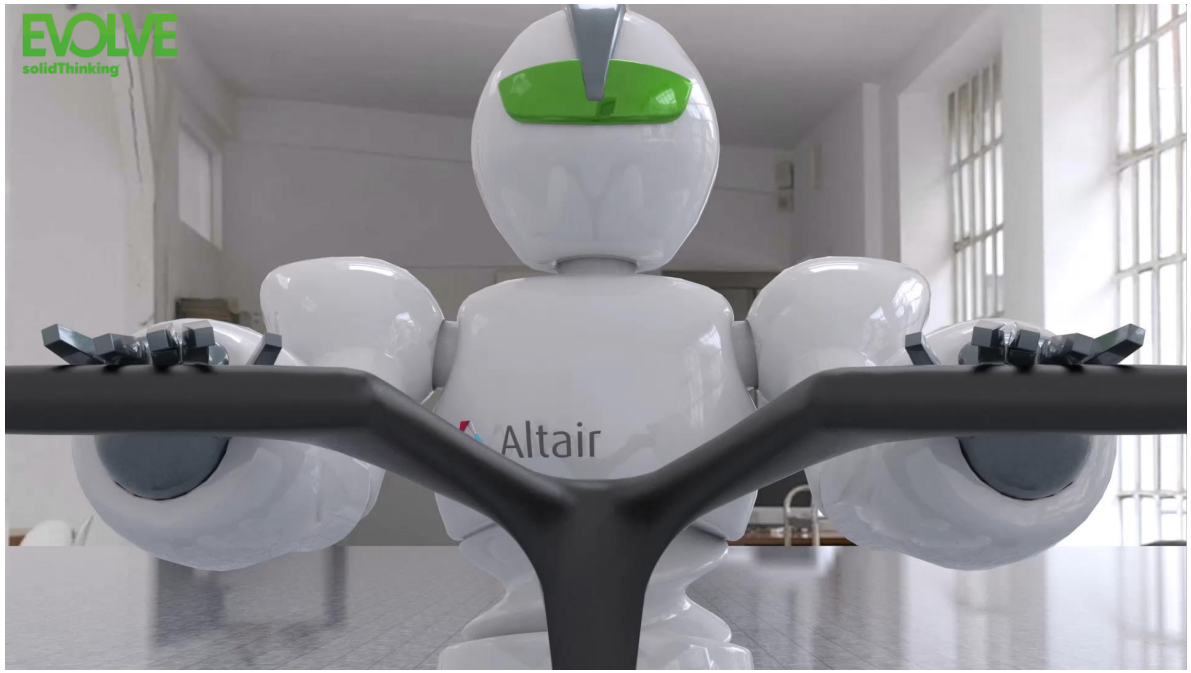
Co-simulation with other software

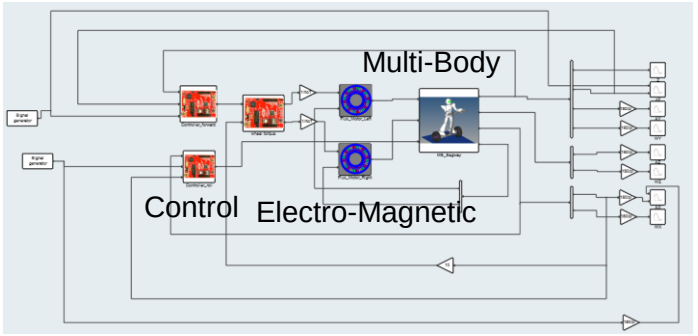
- Co-simulation with MotionSolve

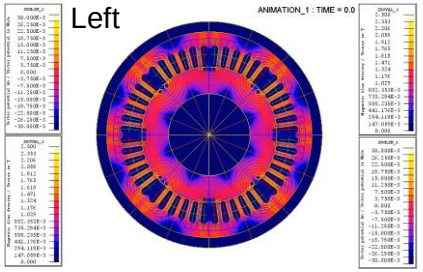


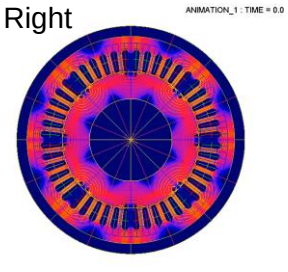
Co-simulation with other software

- Co-simulation with MotionSolve and Flux



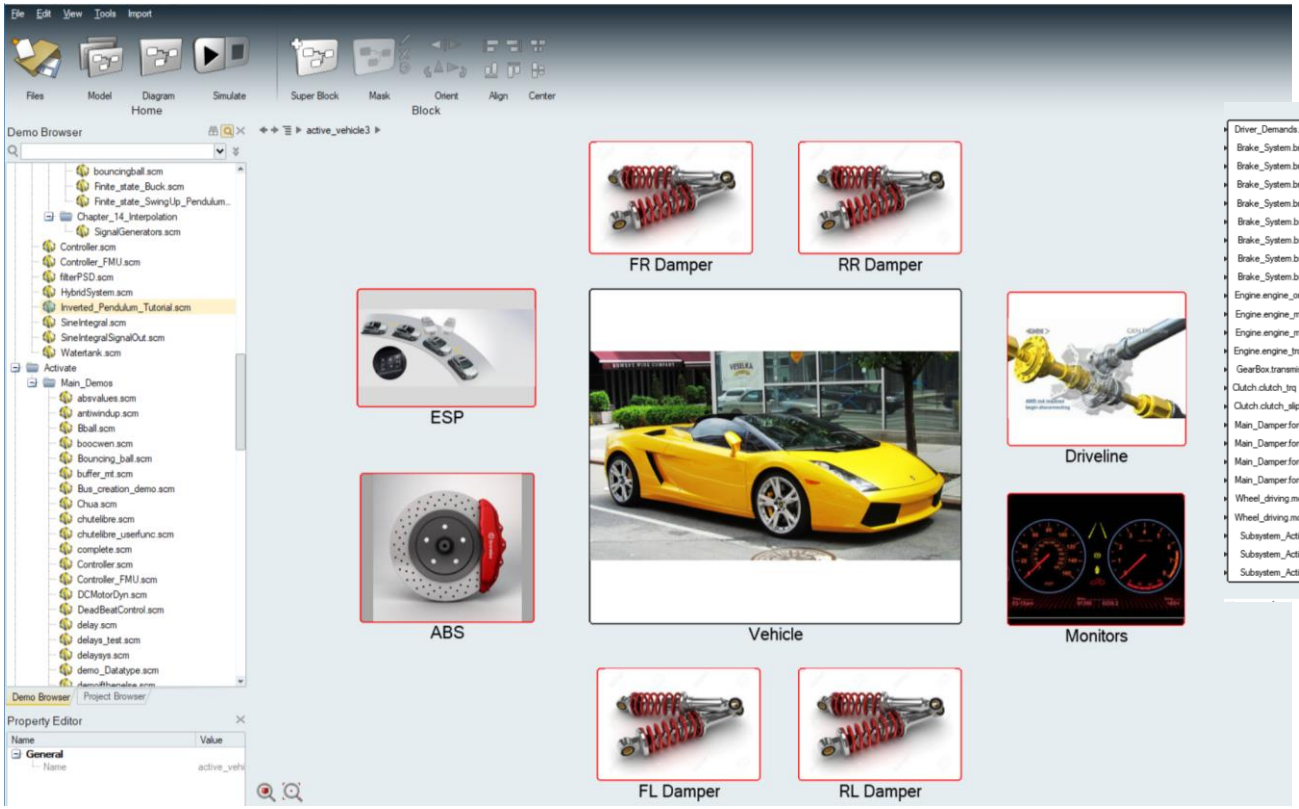


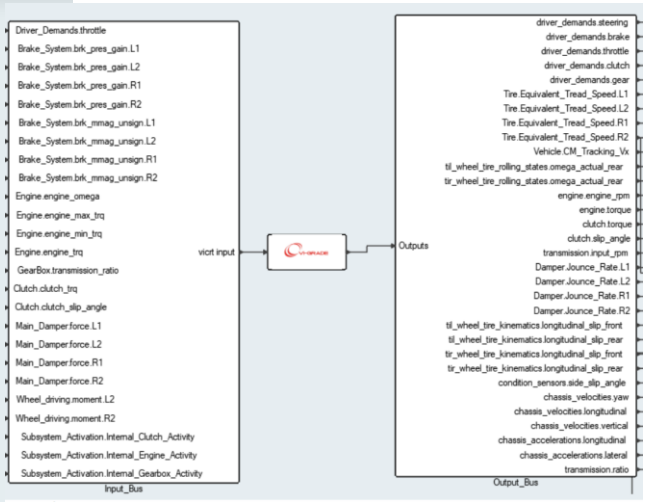




Co-simulation with other software

- Co-simulation With VI-CarRealTime

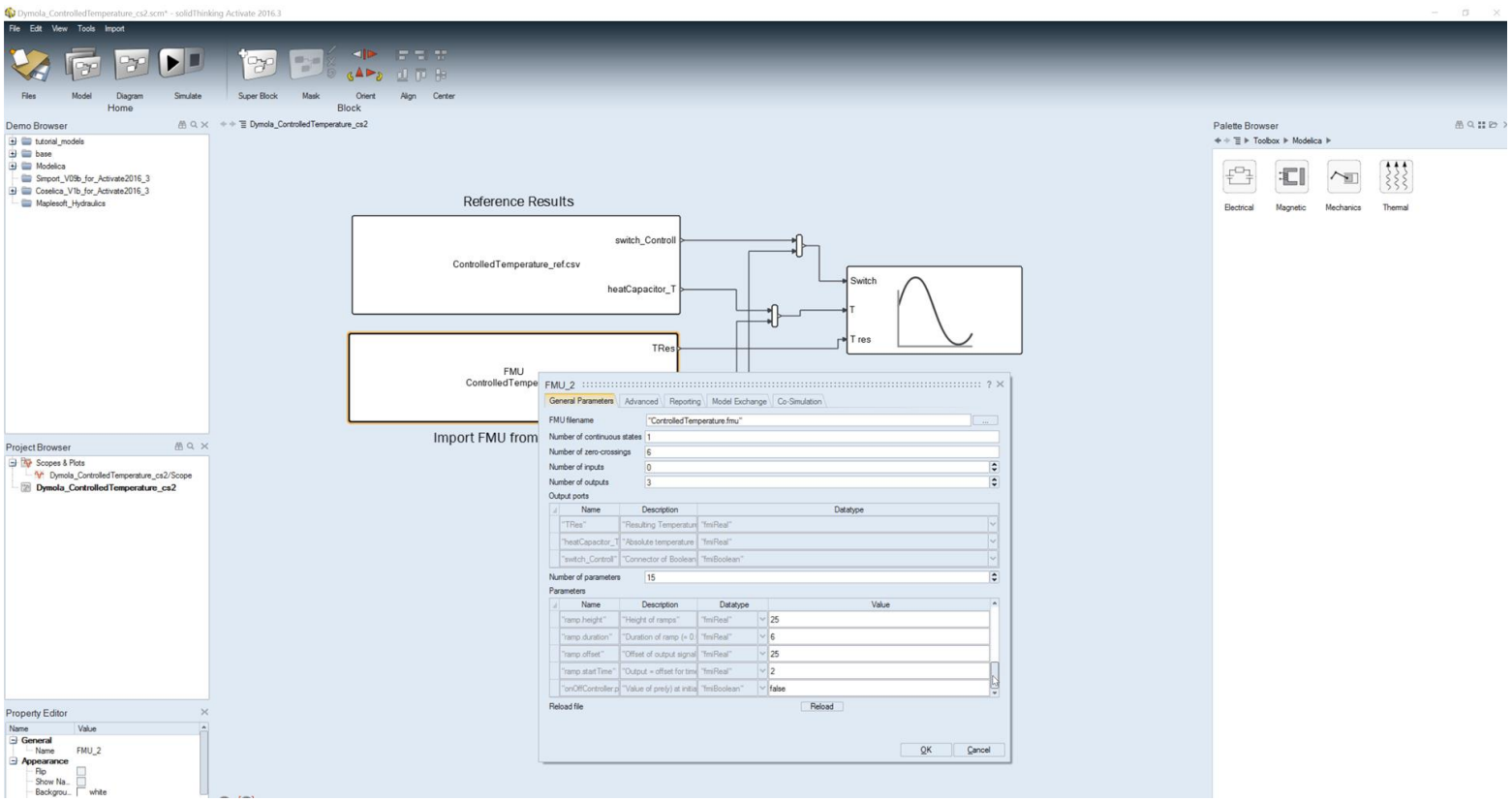




Co-simulation with other software

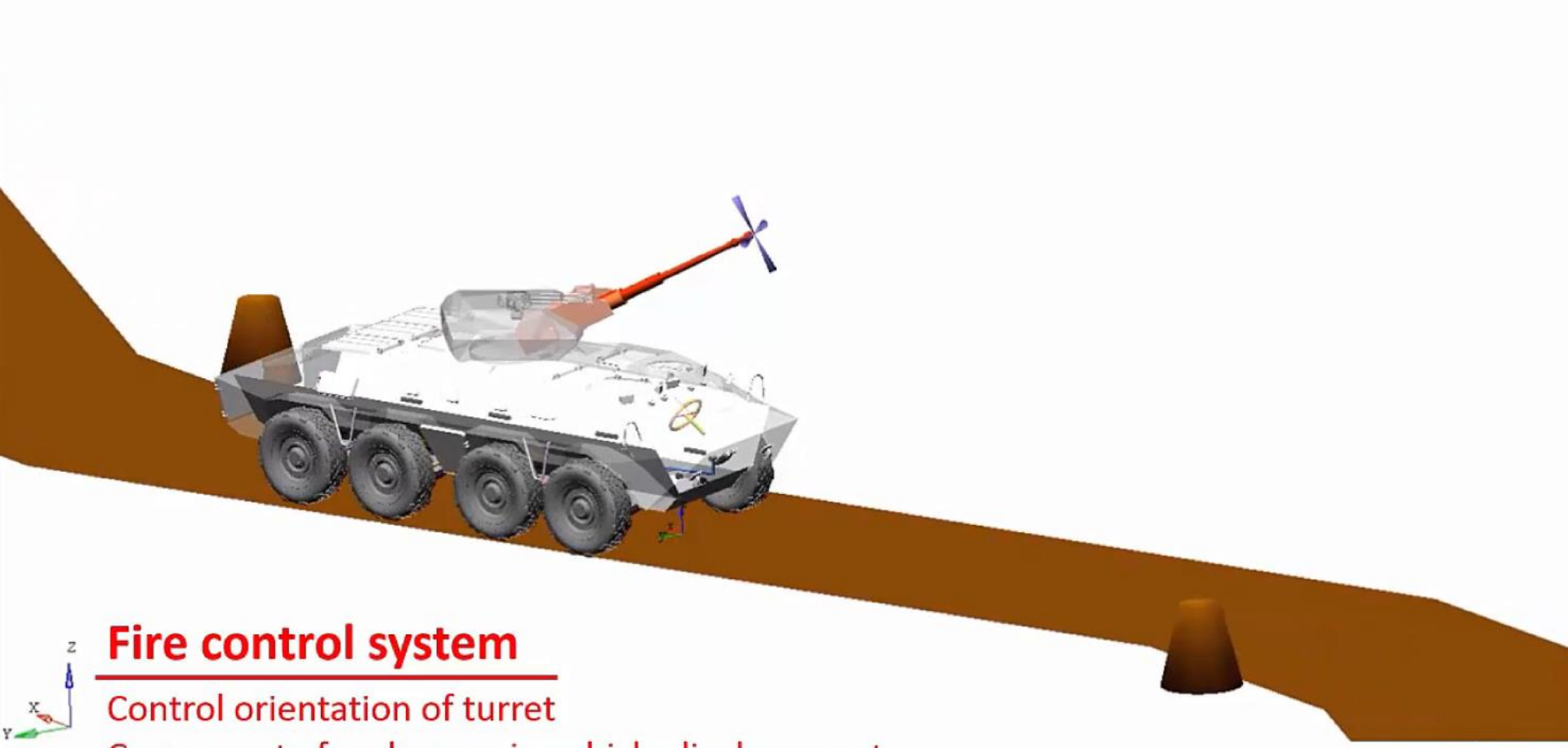
- Model Exchange & Co-simulation via FMI

Co-simulation via FMI with a Modelica tool



MotionSolve Modeling

MotionSolve : Analysis scenario



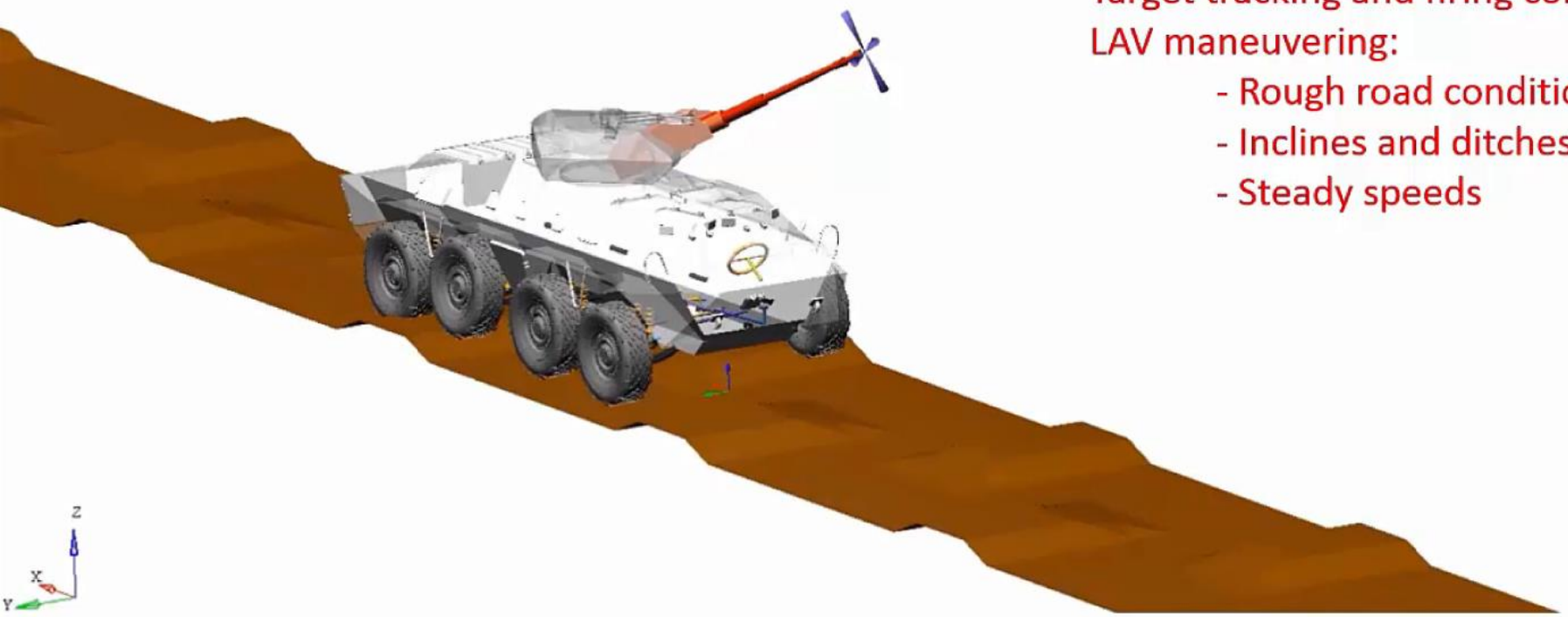
Fire control system

Control orientation of turret

Compensate for changes in vehicle displacement

Fire at a set rate to suppress target

MotionSolve : Analysis scenario



Scenario

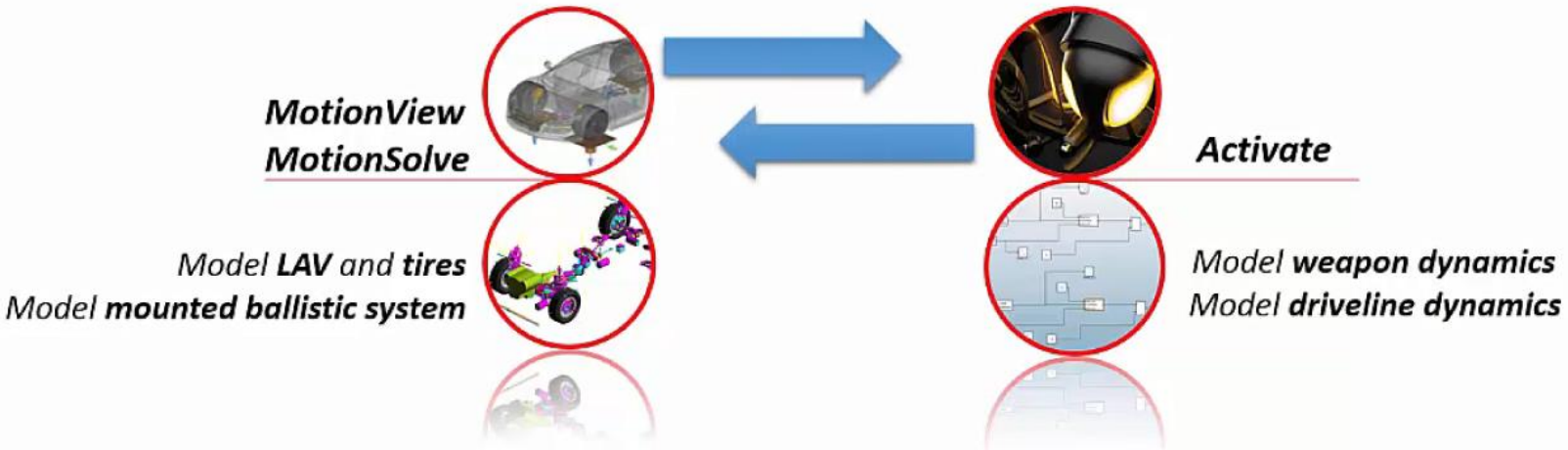
Target tracking and firing control

LAV maneuvering:

- Rough road conditions
- Inclines and ditches
- Steady speeds

MotionSolve : Analysis scenario

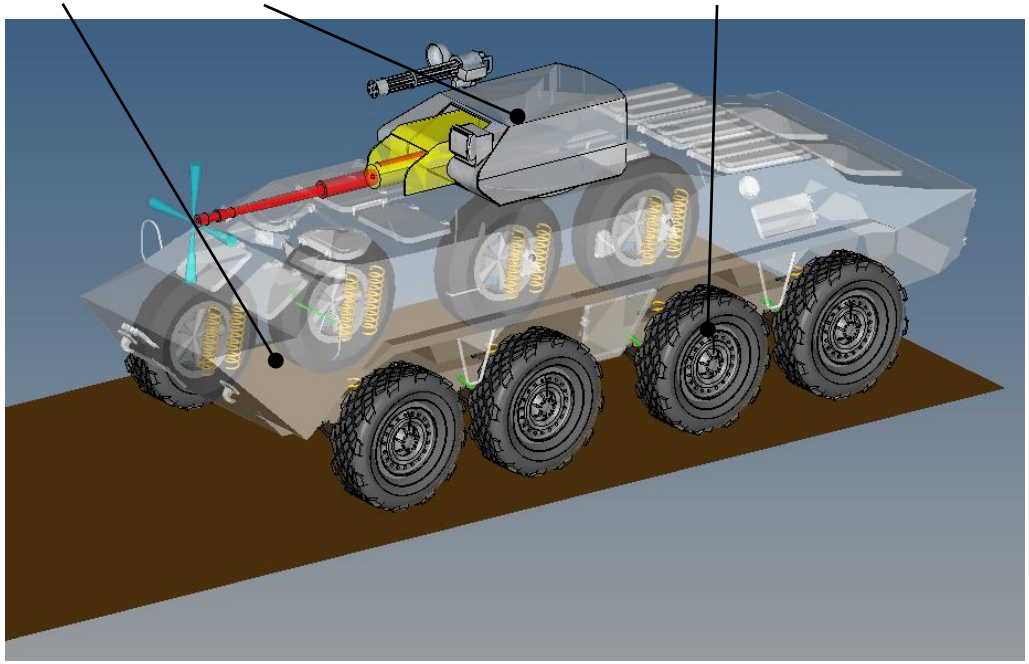
Co-simulation with Activate
LAV with ballistic system

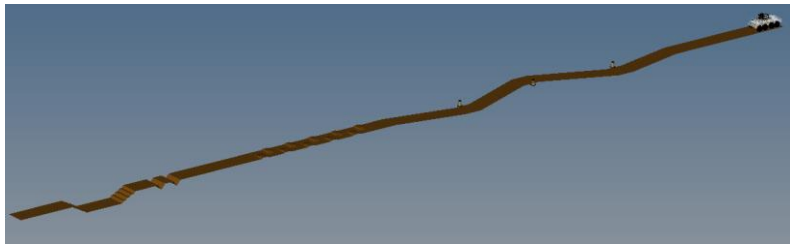


Light Armored Vehicle system

- Driver : MotionSolve internal control
- Tire : MF-Tyre
- Road : 2D polyline road data file
- Weapon control : Activate
- Driveline force control : Activate

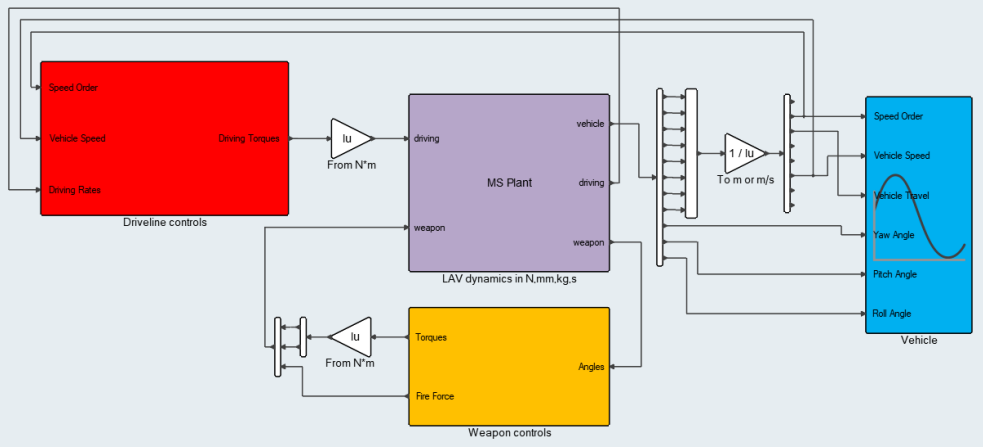
(1) Frame (2) Weapon (3) Driveline (4) Suspension (5) Steering (6) Ground road



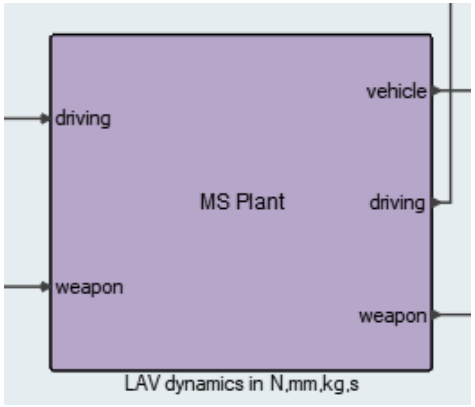


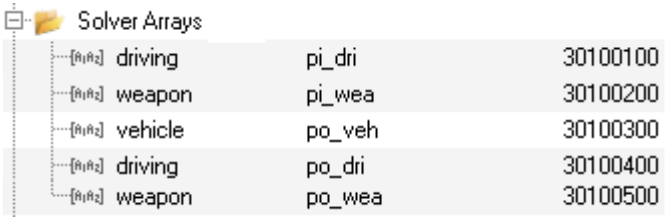
MotionSolve : Interface with Activate

- System Model in Activate : Connect MotionSolve file



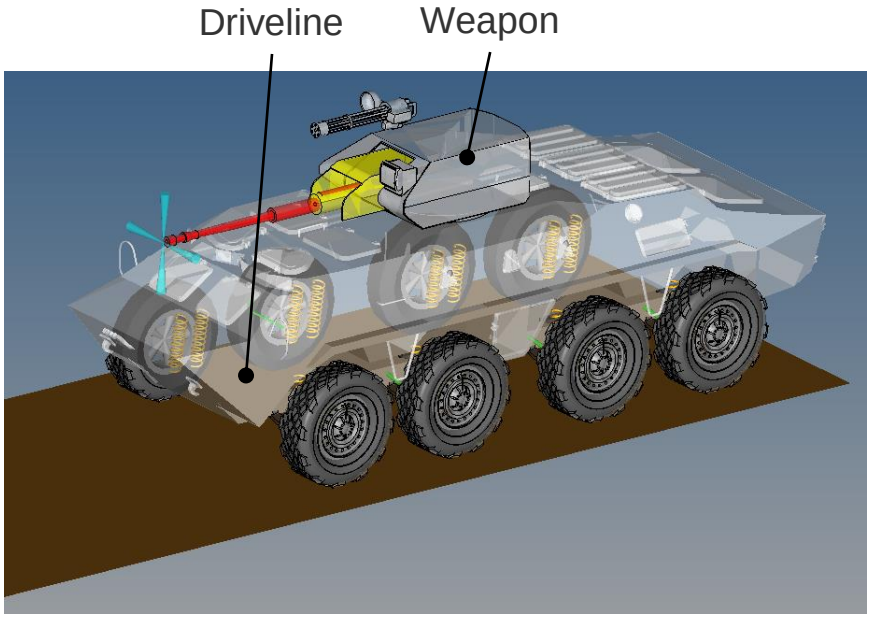
- MotionSolve file is connected
  - Plant inputs and outputs are defined in MotionSolve
  - MotionSolve plant input/output are updated automatically in Activate

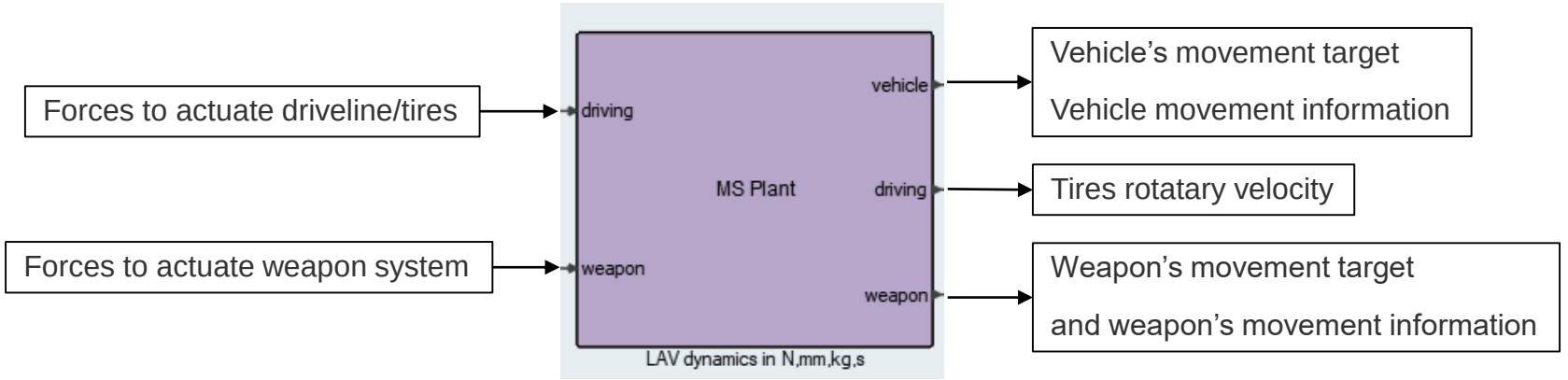




MotionSolve : Interface with Activate

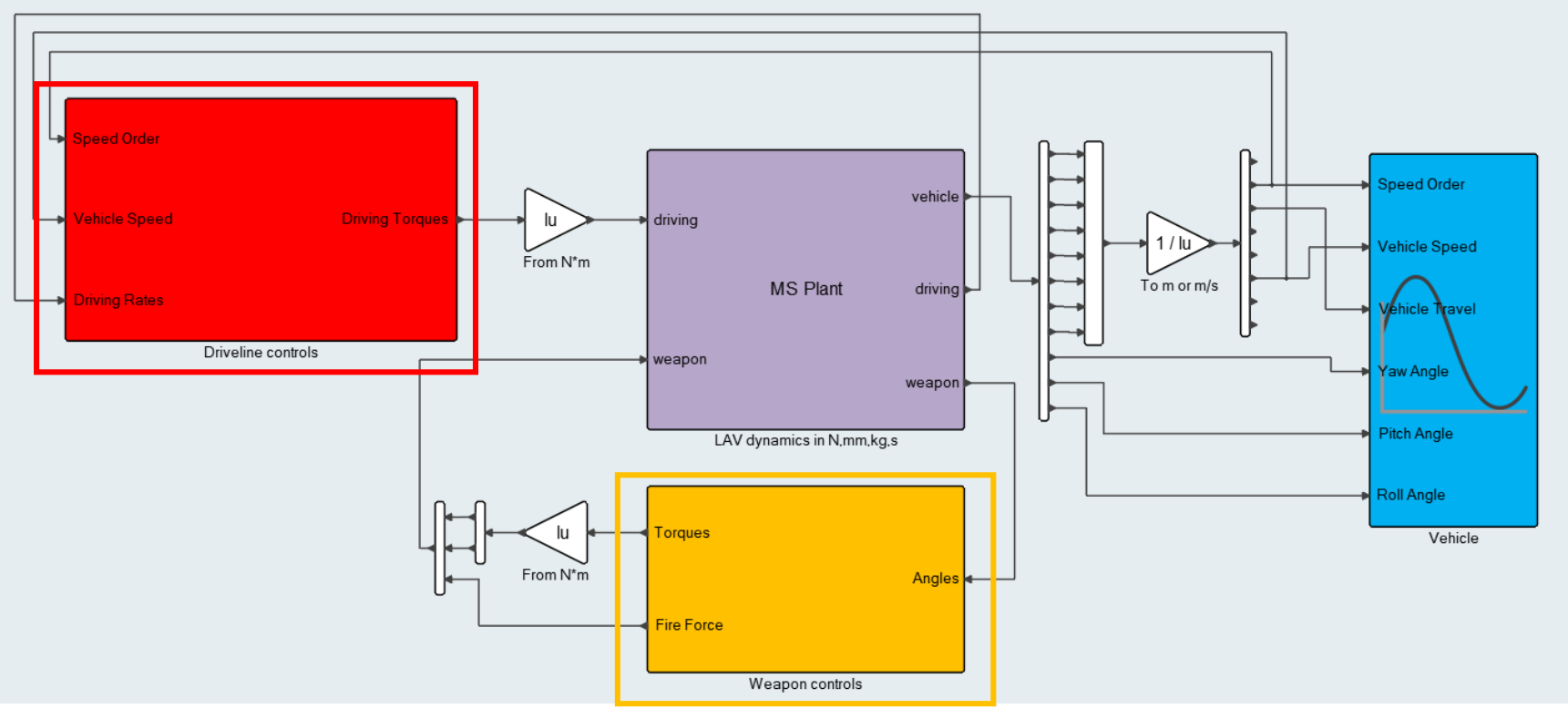
- System Model in Activate



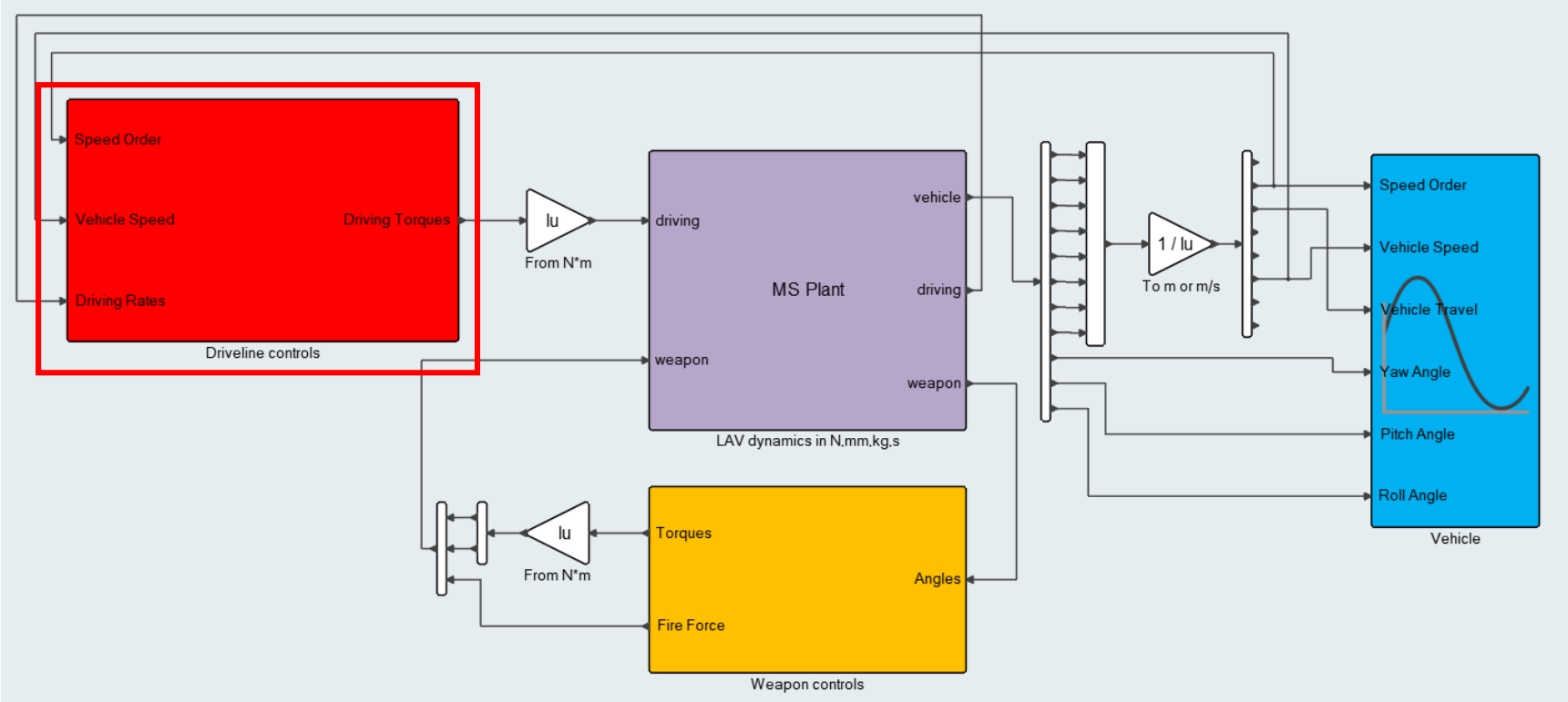


Activate Modeling

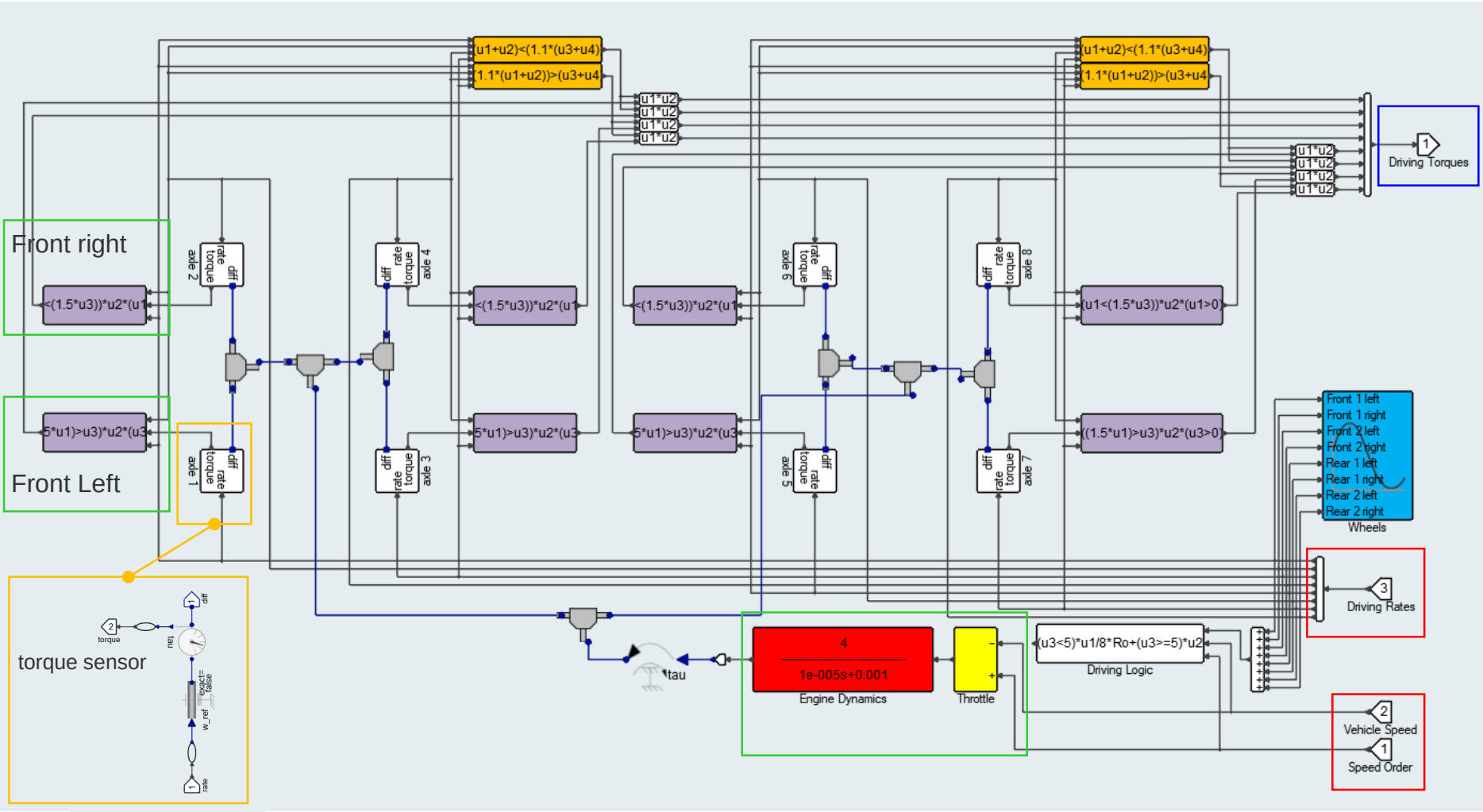
Activate System Modeling



Driving forces control model

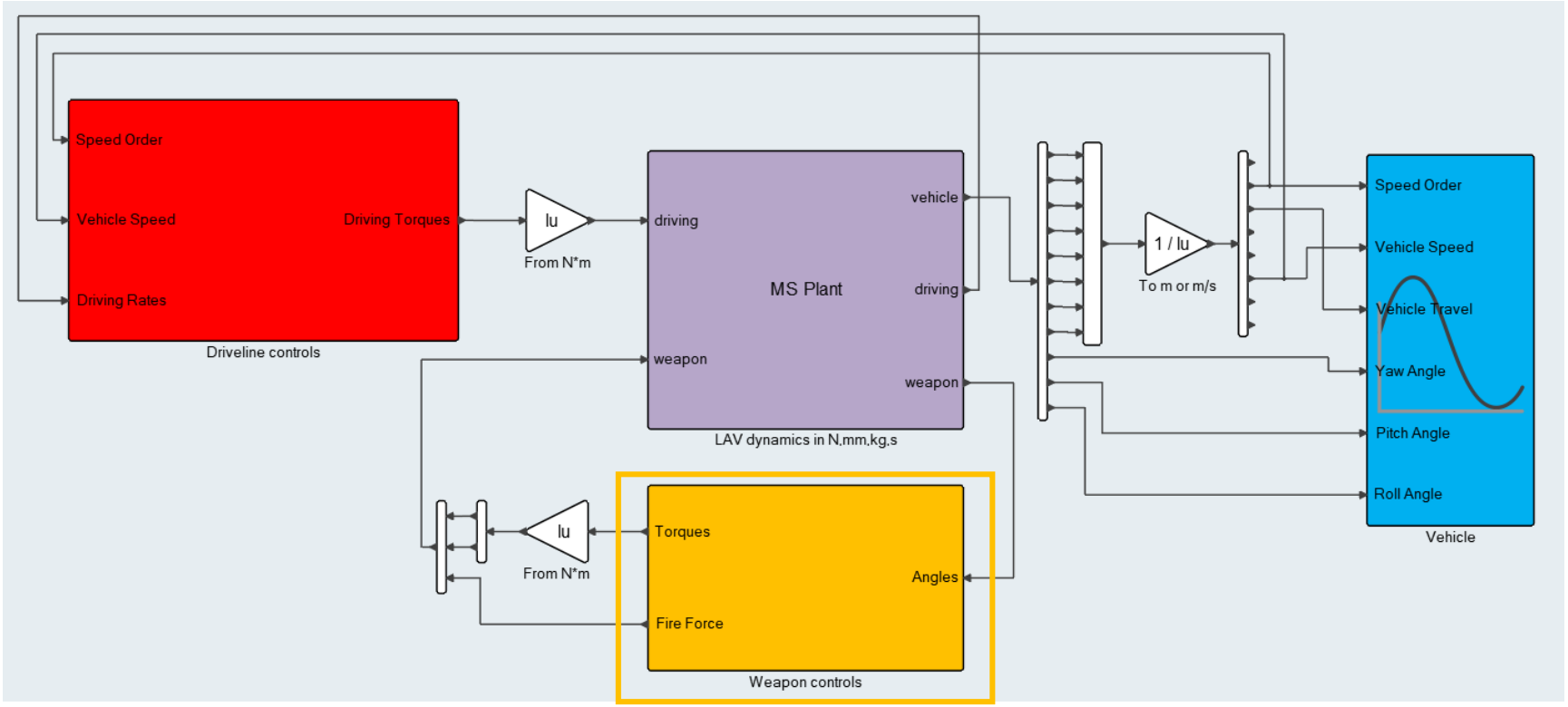


Driving forces control model



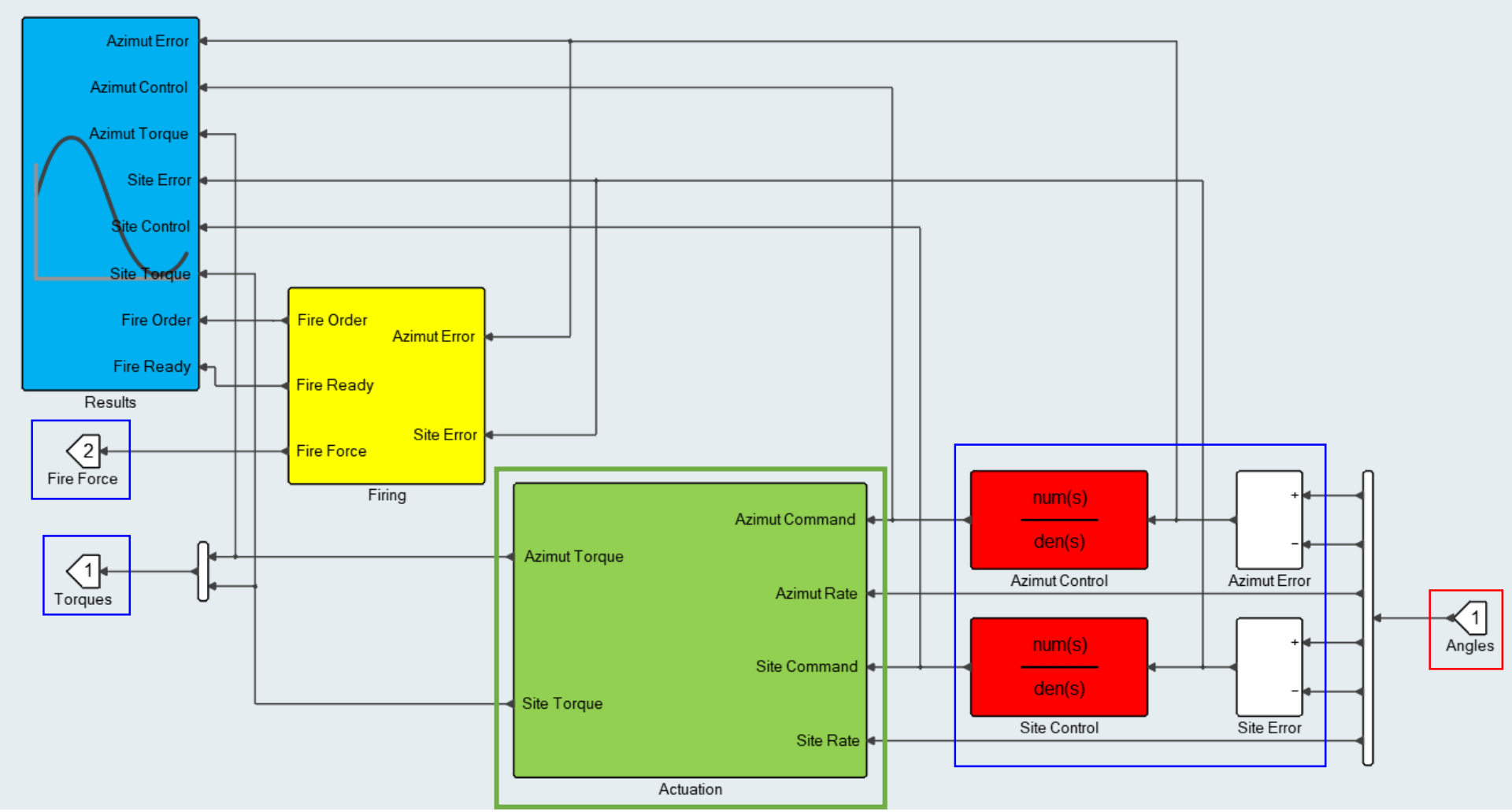
Activate System Modeling

- Weapon's fire and forces control model



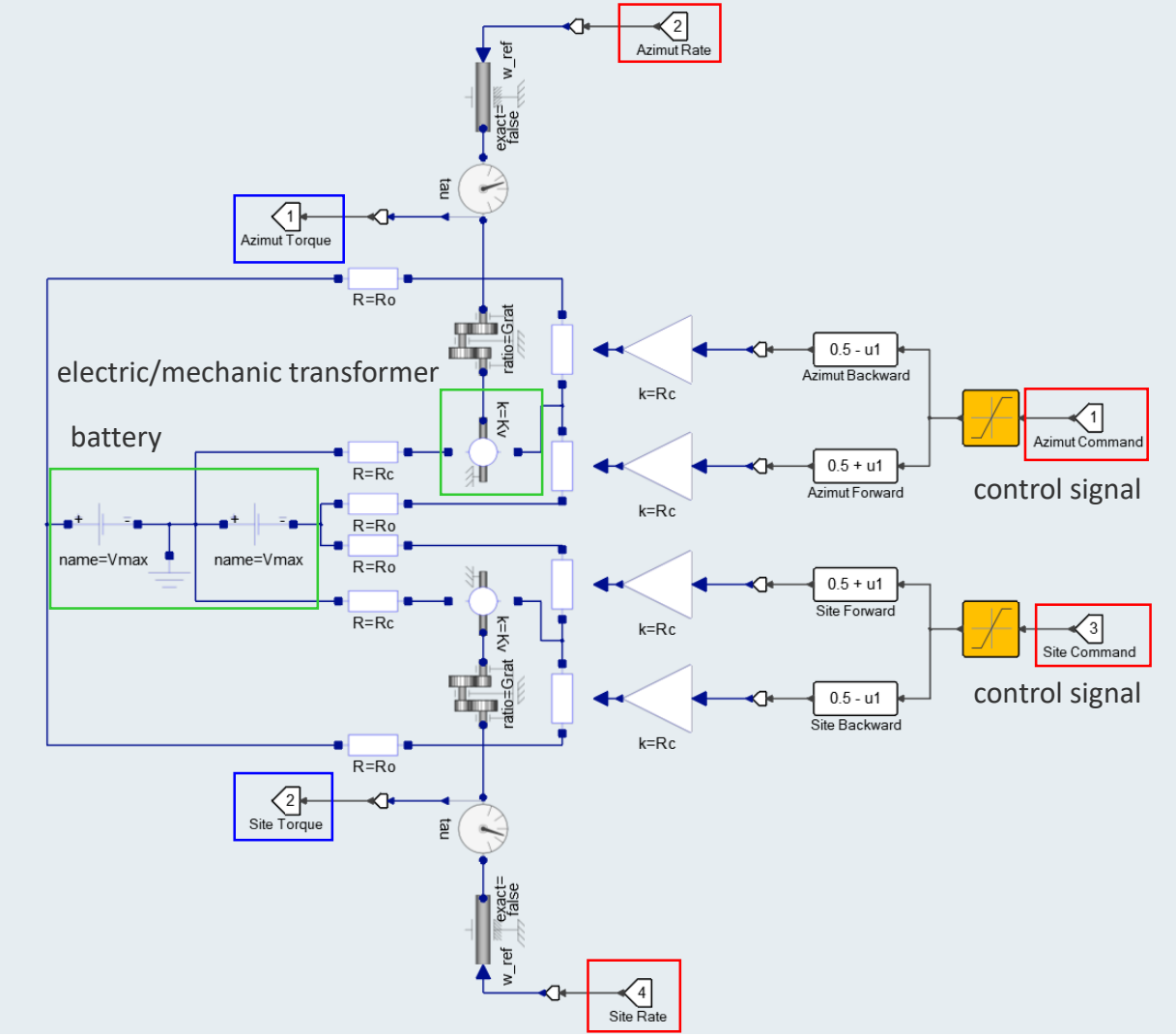
Weapon's fire and forces control model

- Weapon's fire and forces control model



Weapon's fire and forces control model

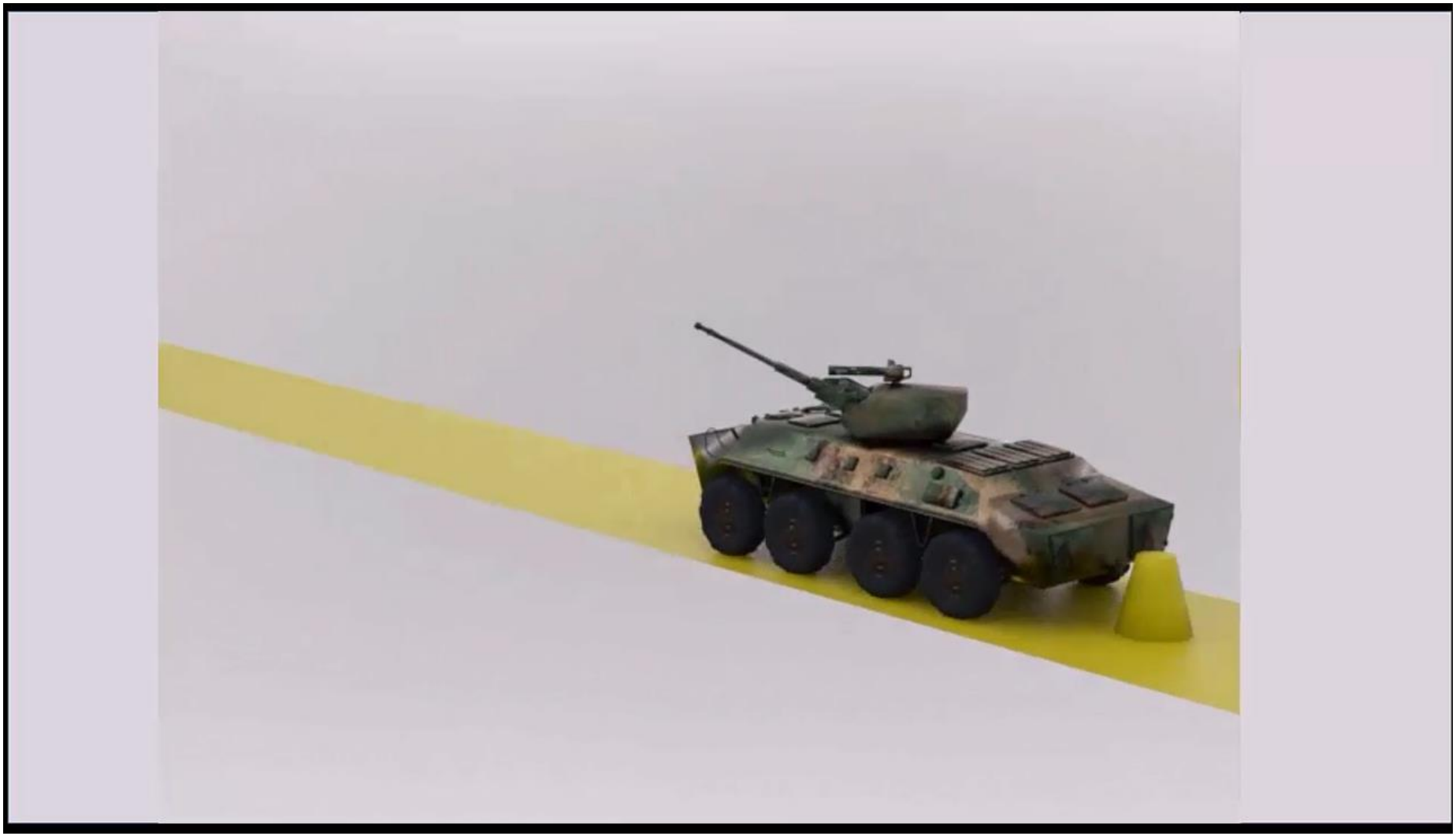
- Use battery power to actuate weapon system



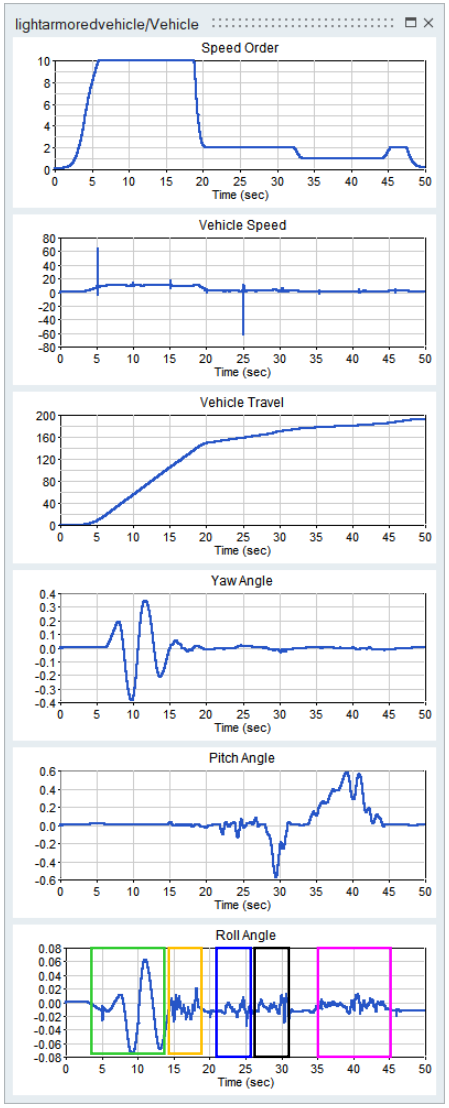
Analysis Results

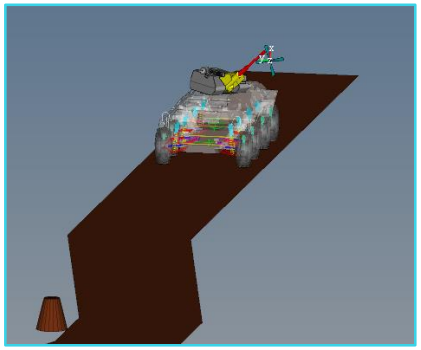
How it works

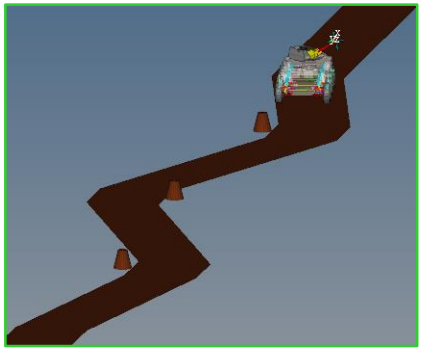
- How the clutch system work

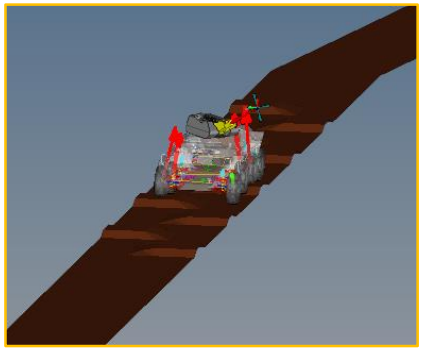


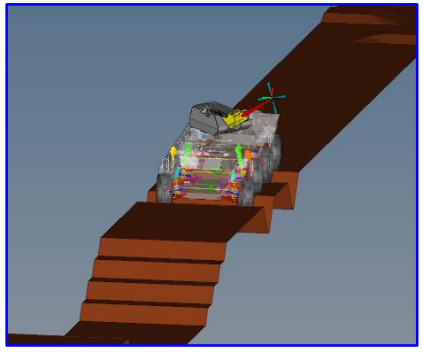
Vehicle results

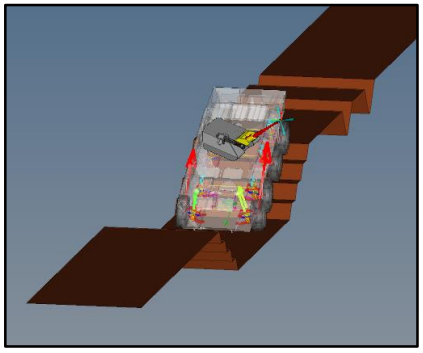


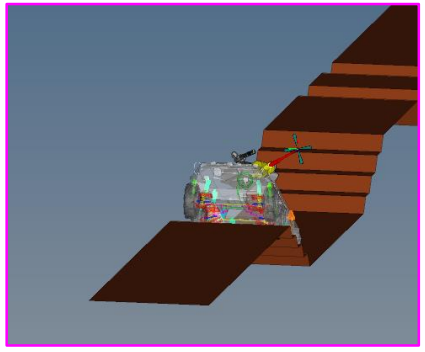




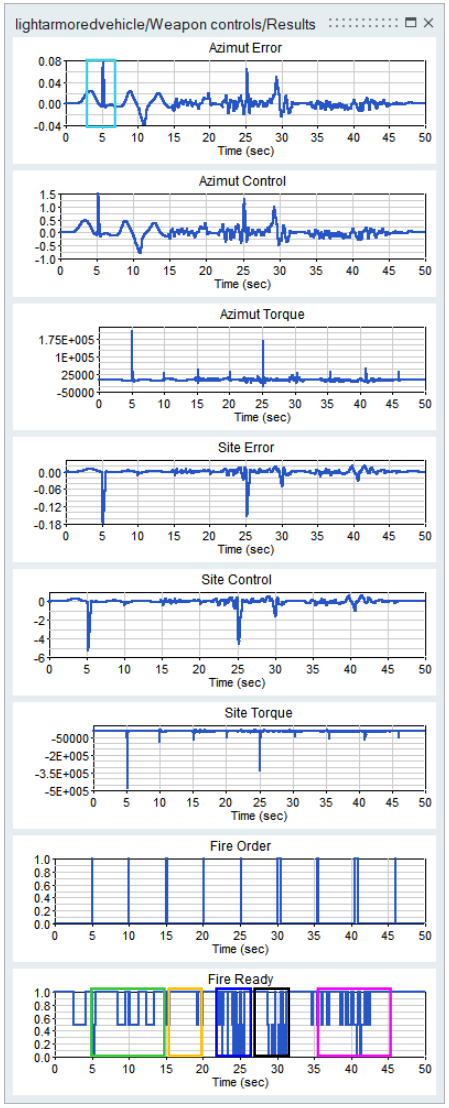


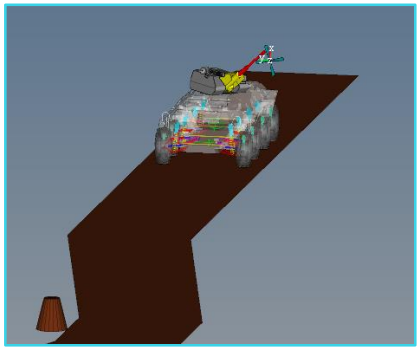


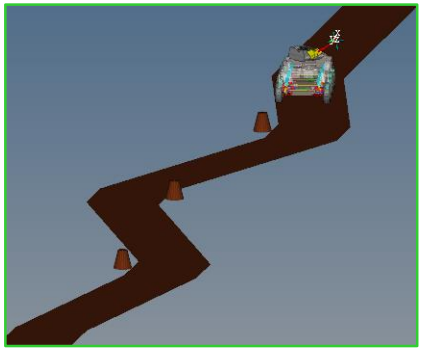


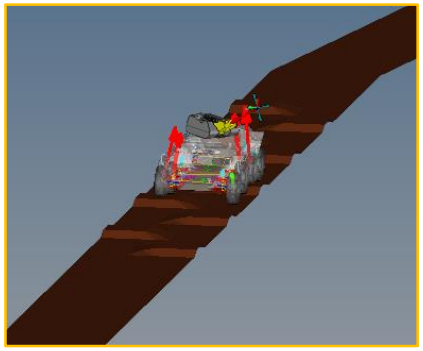


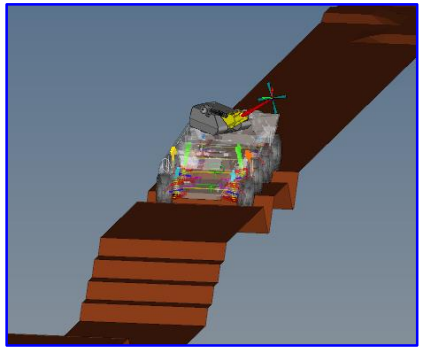
Weapon results

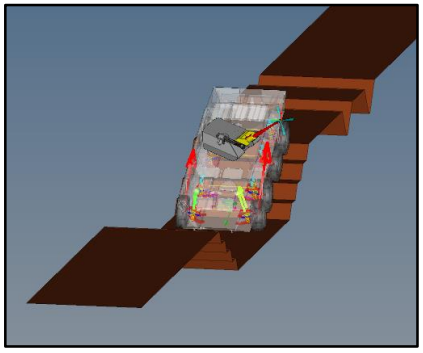


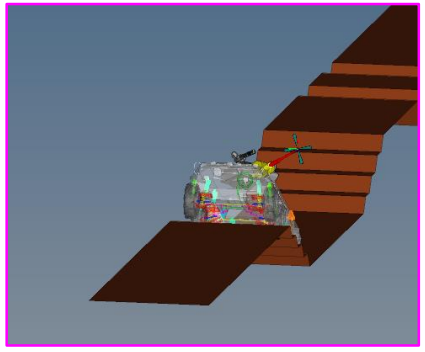




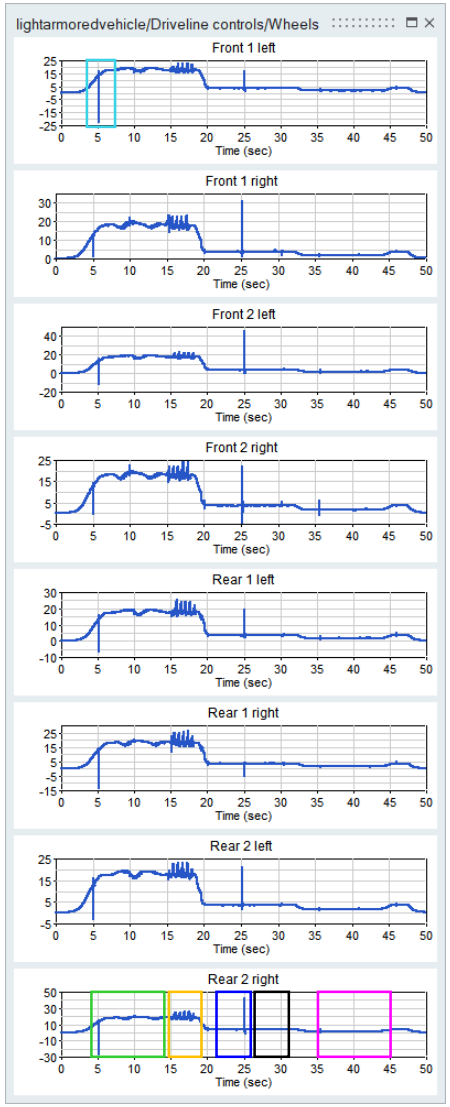


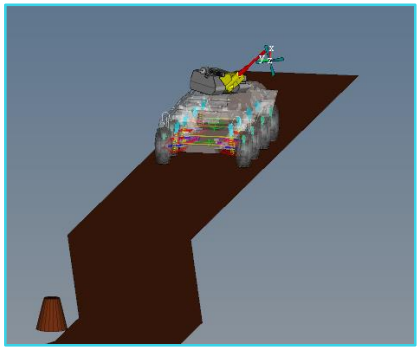


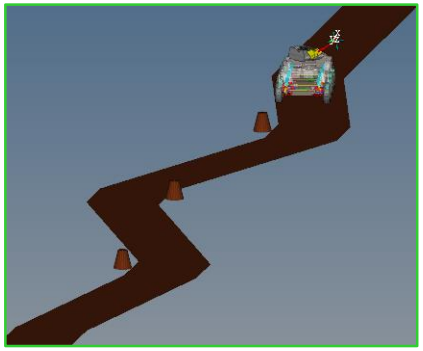


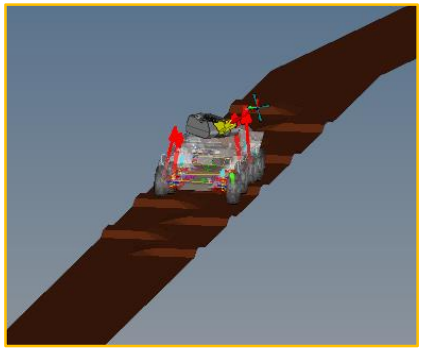


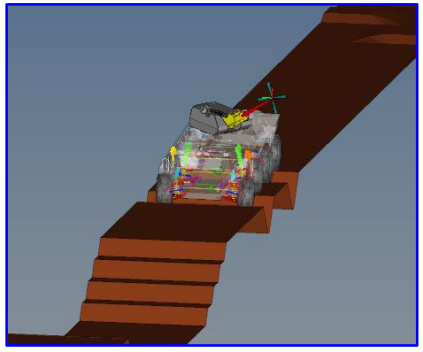
Driveline(Wheel) results

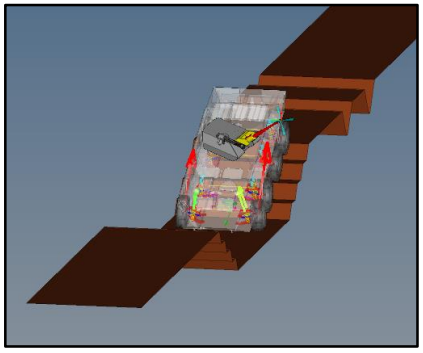


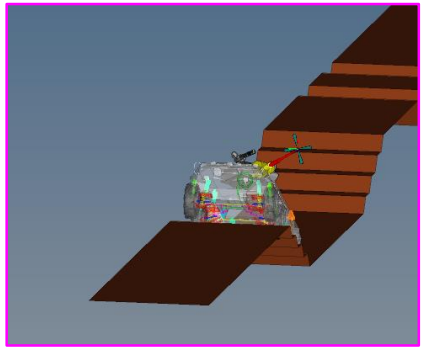












Thank you