Mechanical Engineering Dynamics System

Vehicle Engineering

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Research Field

- **Interaction between off-road vehicles and ground**
  To establish the relationship between kinematical variables and interactive forces of ground and running gears (tire, crawler, rigid wheel, etc) as numerical models and to utilize them to improve performance of off-road vehicles.

- **Modeling of off-road vehicles and motion analysis**
  To establish vehicle models for motion analysis on various ground and to apply them to estimation of vehicle performance, control of autonomous vehicles, and others.
Research topic 1

- Wheel trafficability on soft ground
- Approach with both numerical method and experiment

Numerical simulation with ALE FEM (Total strain norm)
Research topic 2

- Effect of wheel tread shape on trafficability
- Find the optimal tread shape to reduce sinkage on soft ground

Wheels with three different tread shapes

Sinkage of wheels on travel

Slip ratio on travel
Research topic 3

- Construction of tire models for vehicles traveling on dry sand

- Longitudinal and lateral forces on tire and slip directions

- Norm of tire force and slip ratio (Experiment and numerical model)
Vehicle model and motion analysis

To construct numerical models of various off-road vehicles to simulate their motion

\[ X_{II} = f(X_1) \]

\[ x_{c2} x_{c1} \theta_1 \phi_2 \]

\[ X_c \]

\[ V_C \]

\[ X_1 \]

\[ X_2 \]

\[ X_{11} \]

\[ X_{11} = f(X_1) \]

