Physics model

# State space formulation

Source: ME 597c lecture, Modelling III, p. 22

This will allow prediction of state variables based on control variables, forming the basis of the physics model.

Control and state variables:

: Vehicle speed [m/s]

: Rotation around z-axis, relative to x-axis [rad]

: Front wheel drive torque [N-m]

: Front wheel drive force [N]

: Steering angle, [rad] (+ve = left, -ve = right)

: Direction of motion for COG [rad]

Vehicle design parameters:

: Frontal vehicle area [m2]

: Coefficient of drag

: Rolling friction force for wheel ; for front wheel, for rear wheel [N]

: Length between rear and front wheel axes [m]

: Distance between rear wheel axis and COG [m]

: Vehicle mass [kg]

: Axle coefficient of friction for wheel ; for front wheel, for rear wheel

: Wheel radius

Other constants:

: Acceleration of gravity [m/s2]