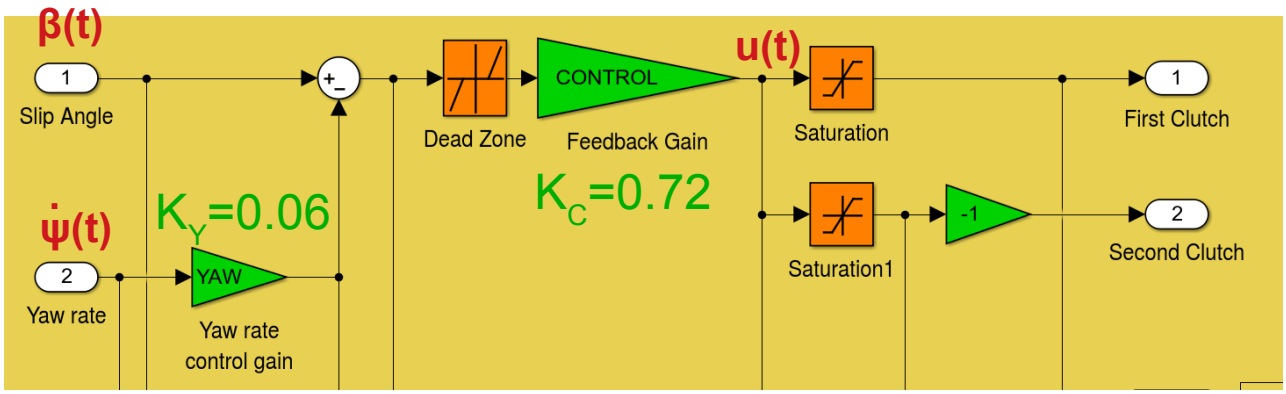
KN Yaw Control implementation in CarSim 2019.0

- References:
  - Dataset "*Yaw Control Diff., DLC w/ Low Mu*" from *Simulink and LabVIEW Models* subset

CarSim original Yaw Control



$$u(t) = K_C \beta(t) - K_C K_Y \dot{\psi}(t)$$

KN Yaw Control

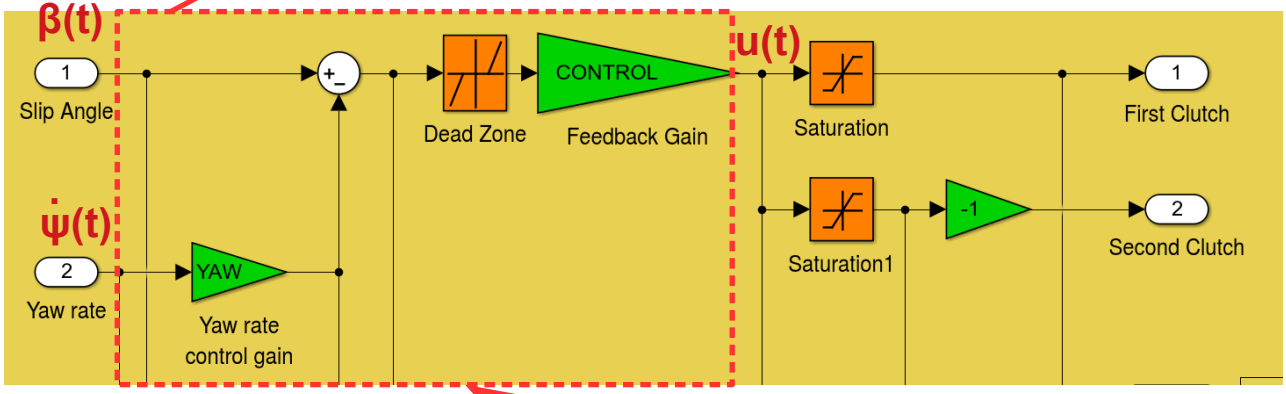
- KN control to be implemented

$$u(t) = K_\beta \left[\beta_{ref}(t) - \beta(t) \right] + K_\psi \left[\dot{\psi}_{ref}(t) - \dot{\psi}(t) \right]$$

- Parameters to be tuned in sign and value:
  - gains K_β and K_ψ
- Because $V_{CoG,ref}$ is not defined, suppose $K_{VCoG} = 0$

CarSim control modification

$$u(t) = K_C \beta(t) - K_C K_Y \dot{\psi}(t)$$



- Substitute with:

$$u(t) = K_\beta \left[\beta_{ref}(t) - \beta(t) \right] + K_\psi \left[\dot{\psi}_{ref}(t) - \dot{\psi}(t) \right]$$

KN control tuning

- Use polynomial identity to guess a starting value for gains K_β and K_ψ

$$
\begin{aligned}
u_{CS}(t) &= +K_C\,\beta(t) - K_C K_Y\,\dot{\psi}(t) \\
u_{KN}(t) &= -K_\beta\,\beta(t) - K_{\dot{\psi}}\,\dot{\psi}(t) + \\
&\quad + K_\beta \beta_{ref}(t) + K_{\dot{\psi}}\,\dot{\psi}_{ref}(t)
\end{aligned}
$$