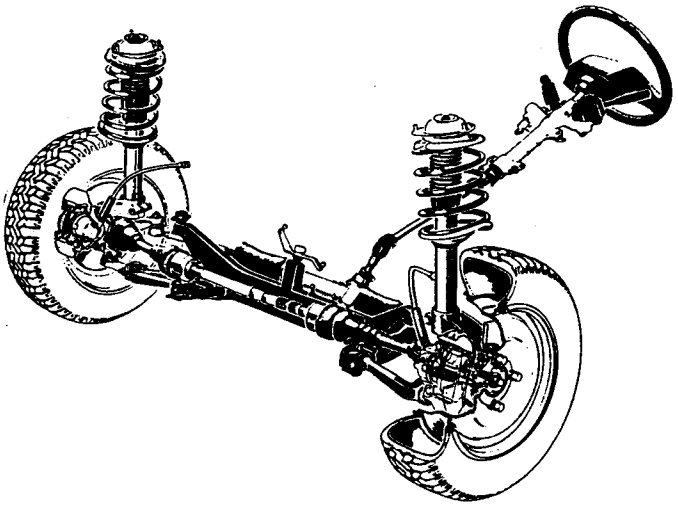
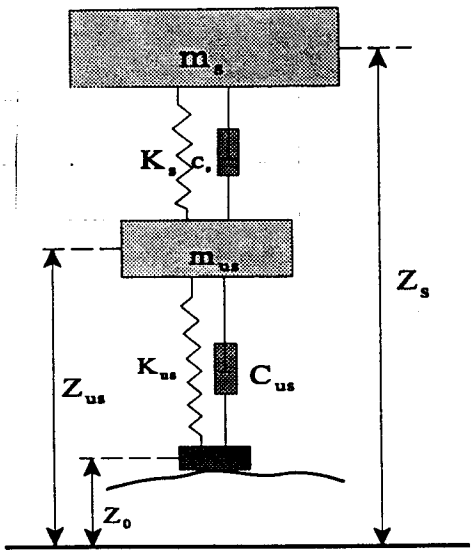
Example: Car suspension



Simple model

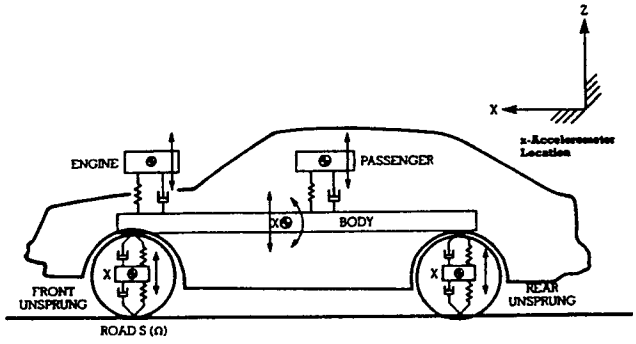


Mathematical model.

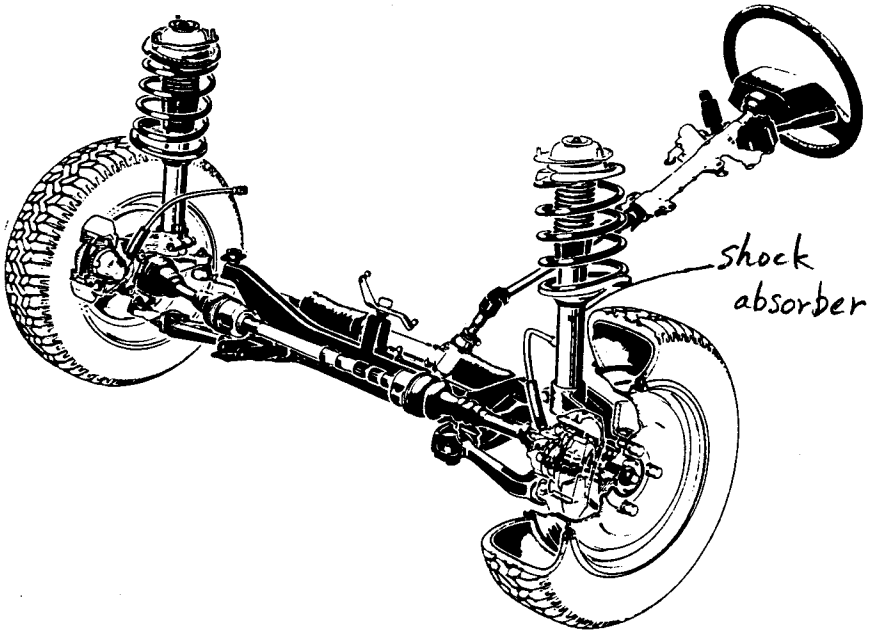
$$m_s\ddot{Z}_s = -K_s(Z_s - Z_{us}) - C_s(\dot{Z}_s - \dot{Z}_{us})$$

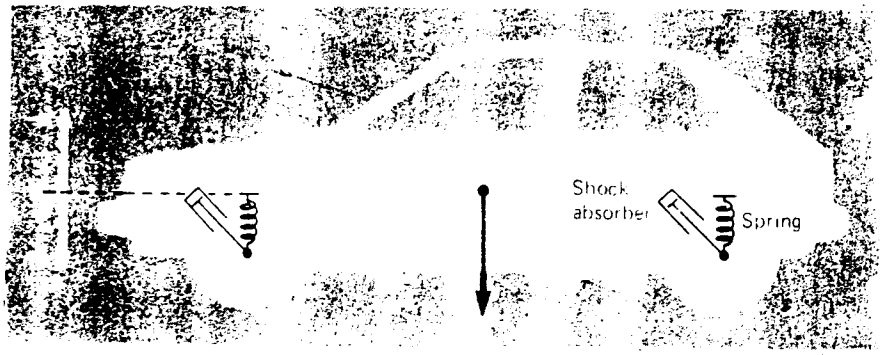
$$m_{us}\ddot{Z}_{us} = -K_{us}(Z_{us} - Z_o) - C_{us}(\dot{Z}_{us} - \dot{Z}_o) + K_s(Z_s - Z_{us}) + C_s(\dot{Z}_s - \dot{Z}_{us})$$

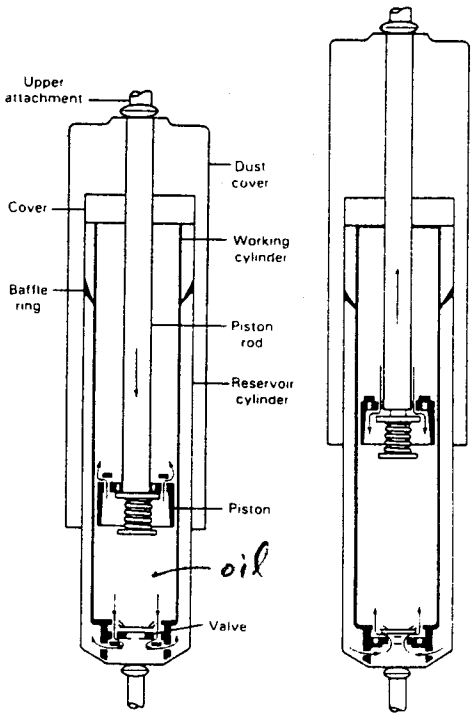
Complex modeling of suspension system



Case Study: Automobile suspension

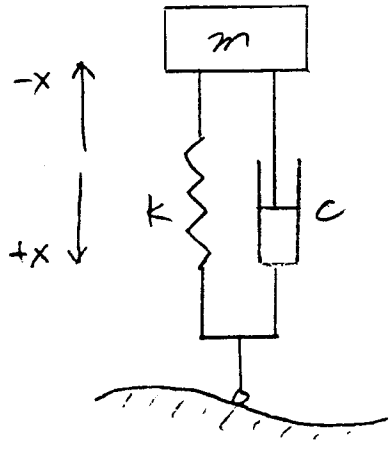






Shock absorber

Simplest model (a quarter-car model)



x: distance from equilibrium