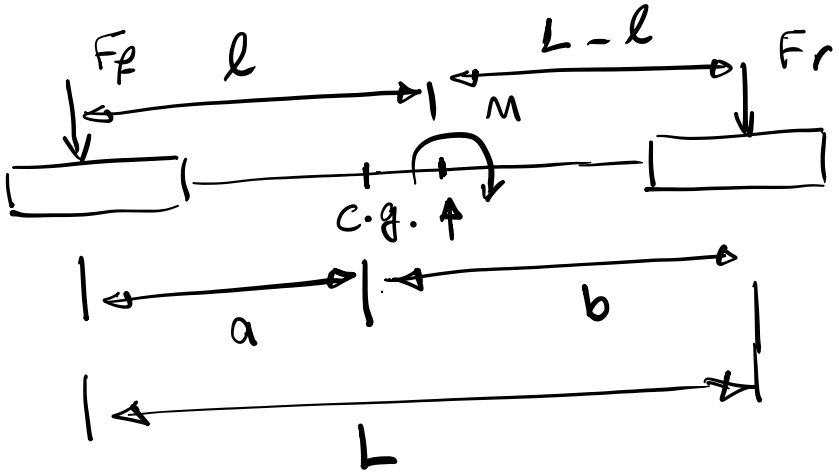
Module 11 - Neutral steer point

This is the position along the vehicle axis at which an applied lateral force produces sideslipe without Yaw.

The distance is measured from the front of the vehicle.

since the tire forces which result are generated with equal slip angles of front and rear, $\alpha_f = \alpha_r$

For no Yaw $\Sigma M_z = 0$



$$C_{\alpha f}\alpha_f \cdot l - C_{\alpha r}\alpha_r (L-l) = 0$$

$$-L\,C_{\alpha r}\alpha_r + l(C_{\alpha f}\alpha_f + C_{\alpha r}\alpha_r) = 0$$

$$l = L\,\frac{C_{\alpha r}\alpha_r}{C_{\alpha r}\alpha_f + C_{\alpha r}\alpha_r} = L\,\frac{C_{\alpha r}}{C_{\alpha f}+C_{\alpha r}} \qquad (\alpha_f = \alpha_r)$$

Static Margin is the distance of the neutral point behid the c.g. : $S.M. = l - a$ $(L = a+b)$

$$= L\,\frac{C_{\alpha r}}{C_{\alpha f}+C_{\alpha r}} - a$$

$$S.M. = \frac{b\,C_{\alpha r} - a\,C_{\alpha f}}{C_{\alpha f}+C_{\alpha r}}$$

$SM = 0$ neutral steer

$SM > 0$ understeer (neutral point behind the c.g.)

$SM < 0$ oversteer (neutral point ahead of c.g.)

For more stable vehicle.