List of coefficients

1. **Mass matrix**

Name	Expression	Multiplies matrix term	Multiplies acceleration variable	Associated speeds (Kinetic energy)	Index in matrix
σ_1	$m + m_p$	1	$\ddot{x}$	$\dot{x}^2$	1,1
			$\ddot{y}$	$\dot{y}^2$	2,2
σ_2	$2l_1 m_w - m_b x_G$	$s_{\alpha-\varphi_p}$	$\ddot{\alpha}$	$\dot{x}\dot{\alpha}$	1,3
		$c_{\alpha-\varphi_p}$	$\ddot{\varphi}_p$	$\dot{y}\dot{\varphi}_p$	2,6
	$-2l_1 m_w + m_b x_G$	$c_{\alpha-\varphi_p}$	$\ddot{\alpha}$	$\dot{y}\dot{\alpha}$	2,3
		$s_{\alpha-\varphi_p}$	$\ddot{\varphi}_p$	$\dot{x}\dot{\varphi}_p$	1,6
σ_3	$-m_p x_F$	s_α	$\ddot{\alpha}$	$\dot{x}\dot{\alpha}$	1,3
	$m_p x_F$	c_α	$\ddot{\alpha}$	$\dot{y}\dot{\alpha}$	2,3
σ_4	$-m_p y_F$	c_α	$\ddot{\alpha}$	$\dot{x}\dot{\alpha}$	1,3
		s_α	$\ddot{\alpha}$	$\dot{y}\dot{\alpha}$	2,3
σ_5	$-m_b y_G$	$c_{\alpha-\varphi_p}$	$\ddot{\alpha}$	$\dot{x}\dot{\alpha}$	1,3
		$s_{\alpha-\varphi_p}$	$\ddot{\alpha}$	$\dot{y}\dot{\alpha}$	2,3
	$m_b y_G$	$c_{\alpha-\varphi_p}$	$\ddot{\varphi}_p$	$\dot{x}\dot{\varphi}_p$	1,6
		$s_{\alpha-\varphi_p}$	$\ddot{\varphi}_p$	$\dot{y}\dot{\varphi}_p$	2,6
σ_6	$2I'_t + I'_b$	1	$\ddot{\varphi}_p$	${\dot{\varphi}_p}^2$	6,6
			$\ddot{\alpha}$	$\dot{\alpha}^2$	3,3
	$-2I'_t - I'_b$	1	$\ddot{\varphi}_p$	$\dot{\alpha}\dot{\varphi}_p$	3,6
σ_7	I'_p	1	$\ddot{\alpha}$	$\dot{\alpha}^2$	3,3
σ_8	I_a	1	$\ddot{\varphi}_r$	${\dot{\varphi}_r}^2$	4,4
			$\ddot{\varphi}_l$	${\dot{\varphi}_l}^2$	5,5

$$m = m_b + 2m_w$$

$$I'_t = I_t + m_w\left({l_1}^2 + {l_2}^2\right)$$

$$I'_p = I_p + m_p({x_F}^2 + {y_F}^2)$$

$$I'_b = I_b + m_b({x_G}^2 + {y_G}^2)$$