Zweitoraussteuerung einer quadratischen Kennlinie (I.2.6)

$i = g(u) = g_1 u + g_2 u^2$

$u(t) = \hat{u}_1 \cdot \cos(\omega_1 t) + \hat{u}_2 \cdot \cos(\omega_2 t) \qquad \rightarrow \qquad$ (einfaches Signal!)

$$\begin{aligned} i(t) &= g_1\Big(\hat{u}_1\cos(\omega_1 t) + \hat{u}_2\cos(\omega_2 t)\Big) + g_2\Big(\hat{u}_1\cos(\omega_1 t) + \hat{u}_2\cos(\omega_2 t)\Big)^2 \\ &= g_1\Big(\hat{u}_1\cos(\omega_1 t) + \hat{u}_2\cos(\omega_2 t)\Big) + g_2\Big(\hat{u}_1^2\cos(\omega_1 t)^2 + 2\hat{u}_1\hat{u}_2\cos(\omega_1 t)\cos(\omega_2 t) + \hat{u}_2^2\cos(\omega_2 t)^2\Big) \end{aligned}$$

Additionstheoreme: $\cos(\alpha)^2 = \frac{1}{2} + \frac{1}{2}\cos(2\alpha)$, $\cos(\alpha)\cos(\beta) = \frac{1}{2}\Big(\cos(\alpha-\beta) + \cos(\alpha+\beta)\Big)$

$$\begin{aligned} i(t) = {} & g_1\hat{u}_1\cos(\omega_1 t) + g_1\hat{u}_2\cos(\omega_2 t) + \frac{g_2}{2}\hat{u}_1^2 + \frac{g_2}{2}\hat{u}_1^2\cos(2\omega_1 t) \\ & + \frac{g_2}{2}\hat{u}_2^2 + \frac{g_2}{2}\hat{u}_2^2\cos(2\omega_2 t) \underbrace{+g_2\hat{u}_1\hat{u}_2\cos(\omega_1-\omega_2)t + g_2\hat{u}_1\hat{u}_2\cos(\omega_1+\omega_2)t}_{Summen-und\ Differenzenfrequenz(Intermodulation)} \end{aligned}$$

Anwendung: Modulator/Demodulator