A phase angle $\vartheta(t)$ is computed by utilizing thigh angular position $\phi(t)$ and its integral $\Phi(t) = \int_0^t \phi(\tau) d\tau$in the following way:

$$\vartheta(t) = \mathrm{atan2}((\Phi(t) + \Gamma)z, (\phi(t) + \gamma))$$

where the scale factor z, the thigh angle shift γ, and the thigh integral shift Γ are given by

$$z = \frac{|\phi_{\max} - \phi_{\min}|}{|\Phi_{\max} - \Phi_{\min}|},$$
$$\gamma = -\left(\frac{\phi_{\max} + \phi_{\min}}{2}\right), \quad \Gamma = -\left(\frac{\Phi_{\max} + \Phi_{\min}}{2}\right).$$

> **Fig. 3.**
> Phase plane of the thigh angle ϕ(t) vs. its integral Φ(t) during prosthetic leg experiments (see Section IV). The phase plane has been scaled by z and shifted by (γ,Γ) to achieve a circular orbit across the stride, which improves the linearity of the phase variable ϑ(t).