DN

VPELJI V $\vec{p}(t) = (t - \sin t,\ 1 - \cos t,\ 4\sin\frac{t}{2})$ NARAVNI PARAMETER IN POIŠČI $\vec{T}, \vec{N}$ IN $\varkappa$

$$s(t) = \int_0^t \|\dot{\vec{p}}(\tau)\|\, d\tau = \int_0^t 2\, d\tau = 2t \Rightarrow t = \frac{s}{2}$$

$$\dot{\vec{p}}(t) = (1 - \cos t,\ \sin t,\ 2\cos\tfrac{t}{2})$$

$$\|\dot{\vec{p}}(t)\|^2 = 1 - 2\cos t + \cos^2 t + \sin^2 t + 4\cos^2\tfrac{t}{2}$$

$$= 2 - 2\cos t + 4\cos^2\tfrac{t}{2} = 2 - 2\left(\cos^2\tfrac{t}{2} - \sin^2\tfrac{t}{2}\right) + 4\cos^2\tfrac{t}{2}$$

$$= 2 + 2\sin^2\tfrac{t}{2} + 2\cos^2\tfrac{t}{2} = 2 + 2\left(\sin^2\tfrac{t}{2} + \cos^2\tfrac{t}{2}\right) = 4$$

$$\vec{p}(s) = \left(\tfrac{s}{2} - \sin\tfrac{s}{2},\ 1 - \cos\tfrac{s}{2},\ 4\sin\tfrac{s}{4}\right)$$

$$\vec{T}(s) = \vec{p}'(s) = \left(\tfrac{1}{2} - \tfrac{1}{2}\cos\tfrac{s}{2},\ \tfrac{1}{2}\sin\tfrac{s}{2},\ \cos\tfrac{s}{4}\right) =$$

$$= \tfrac{1}{2}\left(1 - \cos\tfrac{s}{2},\ \sin\tfrac{s}{2},\ 2\cos\tfrac{s}{4}\right)$$

$$= \tfrac{1}{2}\left(\cos^2\tfrac{s}{4} + \sin^2\tfrac{s}{4} - \cos^2\tfrac{s}{4} + \sin^2\tfrac{s}{4},\ 2\sin\tfrac{s}{4}\cos\tfrac{s}{4},\ 2\cos\tfrac{s}{4}\right)$$

$$\vec{T}(s) = \left(\sin^2\tfrac{s}{4},\ \sin\tfrac{s}{4}\cos\tfrac{s}{4},\ \cos\tfrac{s}{4}\right)$$

$$\vec{p}''(s) = \tfrac{1}{2}\left(\tfrac{1}{2}\sin\tfrac{s}{2},\ \tfrac{1}{2}\cos\tfrac{s}{2},\ -\tfrac{2}{4}\sin\tfrac{s}{4}\right)$$

$$= \tfrac{1}{4}\left(\sin\tfrac{s}{2},\ \cos\tfrac{s}{2},\ -\sin\tfrac{s}{4}\right)$$

$$\varkappa(s) = \|\vec{p}''(s)\| = \tfrac{1}{4}\sqrt{\sin^2\tfrac{s}{2} + \cos^2\tfrac{s}{2} + \sin^2\tfrac{s}{4}} = \tfrac{1}{4}\sqrt{1 + \sin^2\tfrac{s}{4}}$$

$$\vec{N}(s) = \frac{\left(\sin\tfrac{s}{2},\ \cos\tfrac{s}{2},\ -\sin\tfrac{s}{4}\right)}{\sqrt{1 + \sin^2\tfrac{s}{4}}}$$