Assignment in Computer Graphics II

– Assignment 14 –

Computer Graphics and Multimedia Systems Group

David Bulczak, Christoph Schikora

Assignment 1 [1 Point] Form Control

Given the following Ease-function:

$$\text{ease}_{\text{exp}}(t) = \begin{cases} \dfrac{e^{2t} - 2t - 1}{2e - 4} & t \in [0, \frac{1}{2}] \\ 1 - \left(\dfrac{e^{2(1-t)} + 2t - 3}{2e - 4}\right) & t \in [\frac{1}{2}, 1] \end{cases}$$

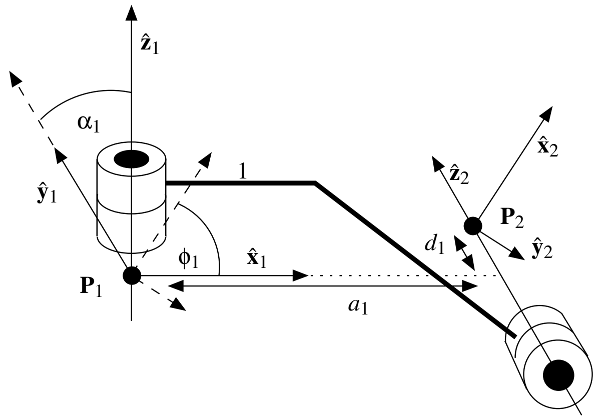
1. Which velocity curve results from this Ease-function?
2. Let v_0 be a speed. Determine an Ease-function of the form

$$\text{ease}^{v_0}_{\text{exp}}(t) = c \cdot \text{ease}_{\text{exp}}(t),$$

which obtains an acceleration of 0 to v_0 in the time $t = 0$ to $t = \frac{1}{2}$, where c is a sought (gesuchter) constant term.
Note: It is sufficient to consider the definition on the interval $t \in [0, \frac{1}{2}]$.

Assignment 2 [1 Point] Denavit-Hardenberg

Given the imaged three-dimensional model with the values $a_1 = 4, \quad \alpha_1 = -\frac{\pi}{2}, \quad d_1 = 1, \quad \phi_1 = -\frac{\pi}{3}$.



1. Determine a transformation matrix that maps points in the coordinate system $\{P_2, \hat{\mathbf{x}}_2, \hat{\mathbf{y}}_2, \hat{\mathbf{z}}_2\}$ on points relative to the base $\hat{\mathbf{x}}_1 = (1,0,0)^T, \hat{\mathbf{y}}_1 = (0,1,0)^T, \hat{\mathbf{z}}_1 = (0,0,1)^T$.
   Note: Calculate to do this the following matrices:
   $R((1,0,0)^T, \alpha_1)$: Map $\hat{\mathbf{z}}_1$ to $\hat{\mathbf{z}}_2$ ab
   $T(a_1, 0, d_1)$: Move $\mathbf{P}_1$ to $\mathbf{P}_2$
   $R((0,0,1)^T, \phi_1)$: Map $\hat{\mathbf{x}}_1$ to $\hat{\mathbf{x}}_2$ ab.

2. Determine the unit vectors $\hat{\mathbf{x}}_2$, $\hat{\mathbf{y}}_2$, $\hat{\mathbf{z}}_2$ using the previously calculated matrix.
   Note: Check the result based on the sketch.

Submission: 29.1.2015, before/at the beginning of the exercise.