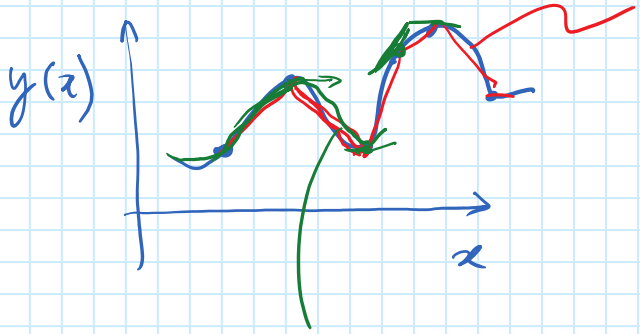
Interpolation

March 25, 2022 11:15 AM

§ Functions of 1 variable

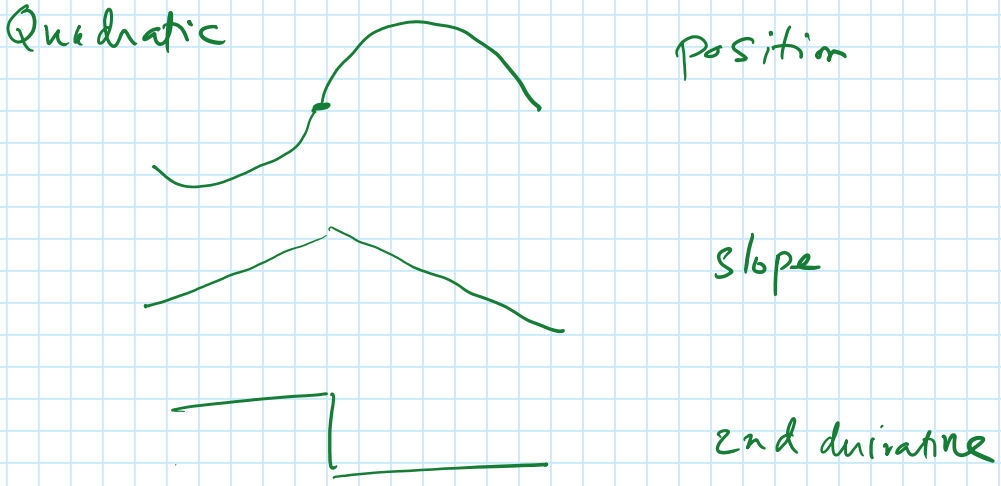


Linear interpolation

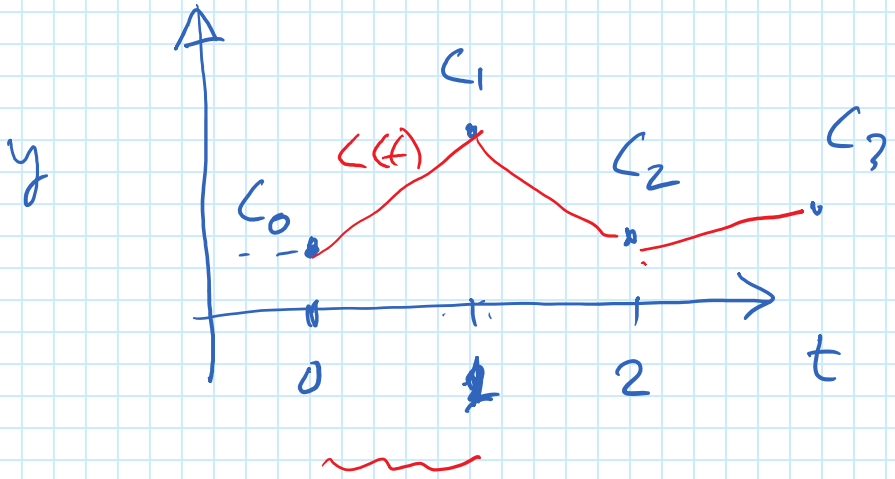
linear pw. slope of the

Smooth interpolation

first derivative
second derivative
} Continuous



§ Linear Interpolation



What is the equation of the piece of the curve in this interval?

$$C(t) = at + b$$

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Data: $C_0 = a \cdot 0 + b = b$

$C_1 = a \cdot 1 + b \Rightarrow a = C_1 - C_0$

$\therefore \quad C(t) = (C_1 - C_0)\,t + C_0$

Rewrite this

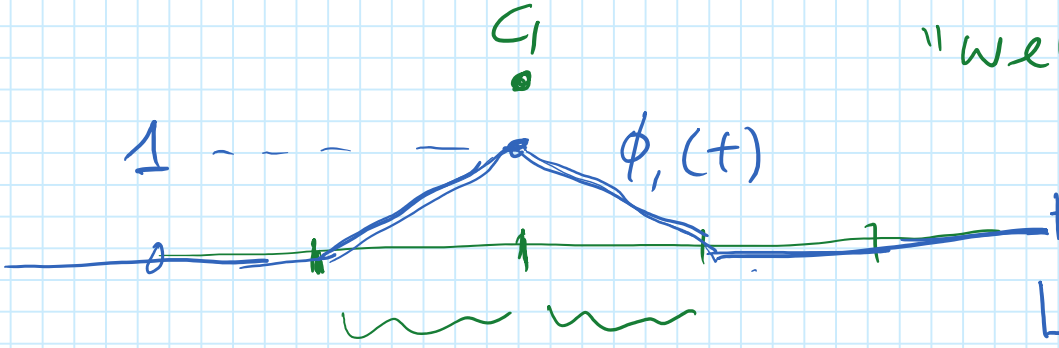
$$C(t) = C_0\,(1-t) + C_1\,t$$

Data

Prior knowledge or requirement

"Blending fn"

"weight"



$$C(t) = \sum_{i=0}^{n-1} C_i\,\phi_i(t)$$

Generalizations

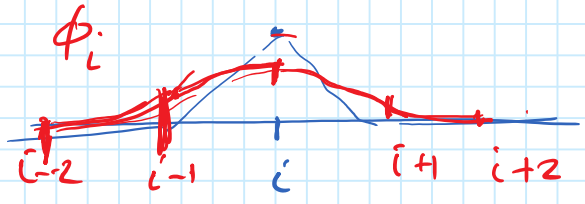
- Higher dimension: Easy!!
  Just apply to each coordinate

- Key frame animation:
  Just a high dimensional "pose space"

- Smoother interpolation

  Replace ϕ_i with smoother functions

  eg. Piecewise polynomials



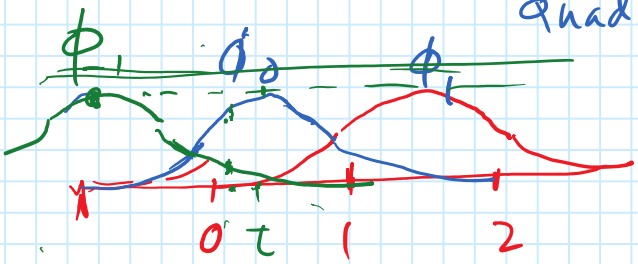
As long as $\sum_{i=0}^{n} \phi_i(t) = 1$ for all t

$C(t)$

check:

linear $(1-t) + t = 1$

quadratic



$\phi_{-1}(t) + \phi_0(t) + \phi_1(t)$