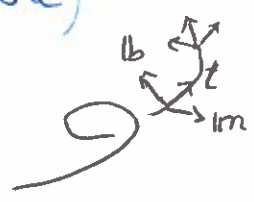


Differential Geometry (Part 1: 1 variable)

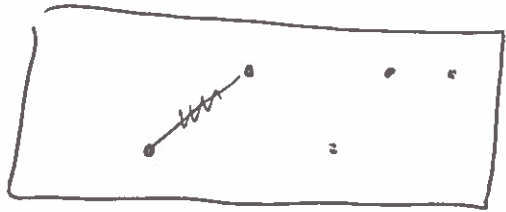
arclength

$$\begin{pmatrix} t' \\ m' \\ b' \end{pmatrix} = \begin{pmatrix} 0 & \kappa & 0 \\ -\kappa & 0 & \tau \\ 0 & -\tau & 0 \end{pmatrix} \begin{pmatrix} t \\ m \\ b \end{pmatrix}$$



coord system = Frenet frame

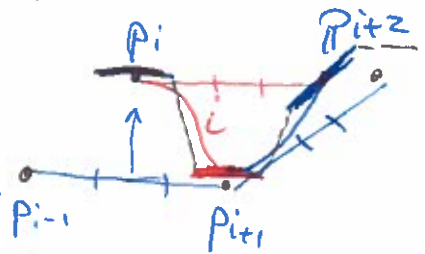
Interpolation



want: smooth and low degree

"poor man's interpolant"
piecewise degree 3

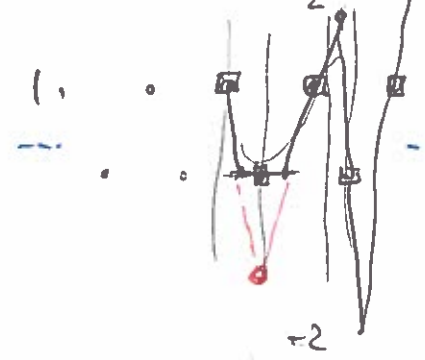
Hermite Interpolation



curve segment i

$$\begin{aligned} C_0 &= P_i & C_1 &= P_i + \frac{1}{3}(P_{i+1} - P_i) \\ C_2 &= P_{i+1} - \frac{1}{3}(P_{i+2} - P_i) & C_3 &= P_{i+1} \end{aligned}$$

Ex degree 2 data 010101...



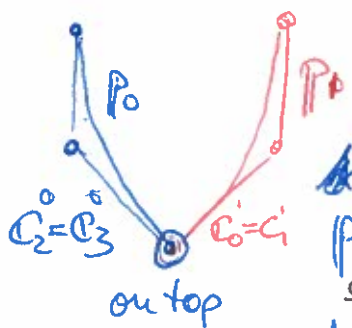
Rule:

do not interpolate with even degree
uniform splines at knots

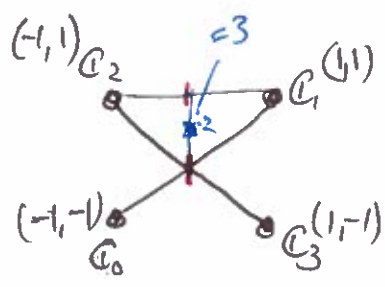
do interpolate with odd degree

u s at knots

Geometric Continuity \neq parametric continuity



$P_0'(1) = P_1'(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$
same derivative
... not regular!



$$C_2^L = C_3^L = C_0^R = C_1^R$$

CUSP

$$C_1^L = C_2^R$$