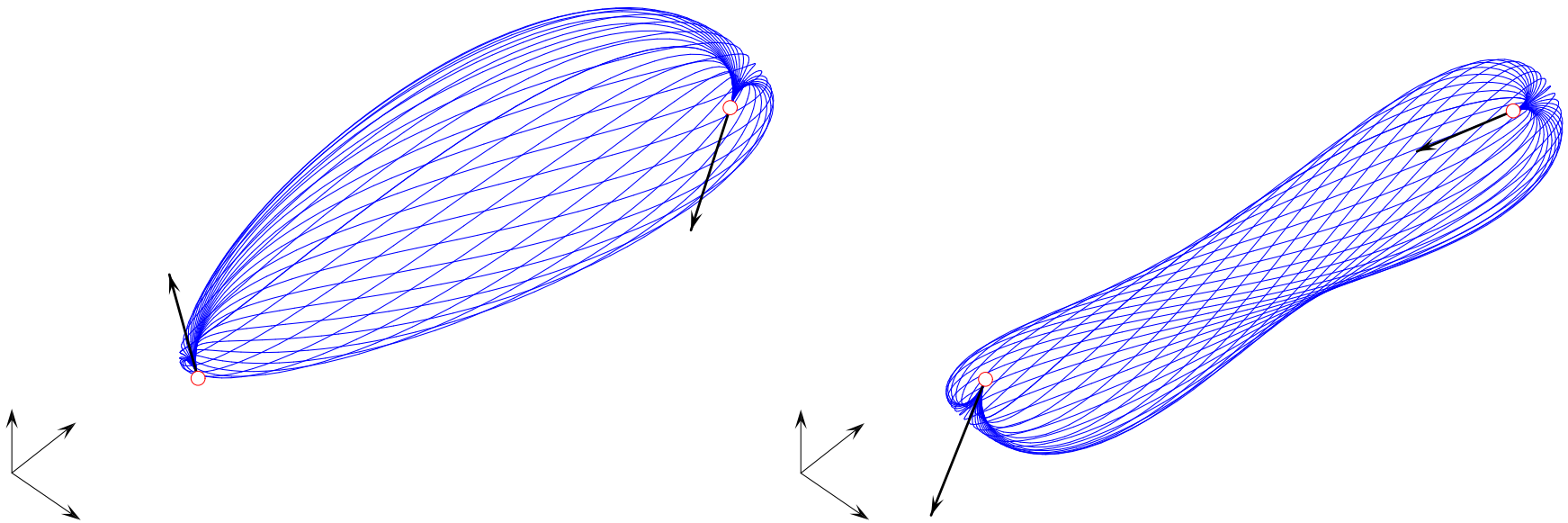
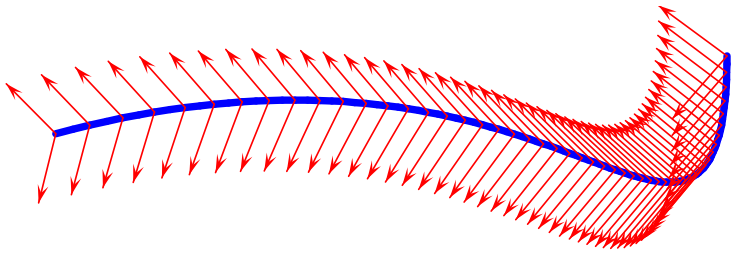


One–parameter families of spatial PH quintic interpolants, of identical arc length, defined by keeping $\phi_2 - \phi_0$ constant, and varying only $\frac{1}{2}(\phi_0 + \phi_2)$

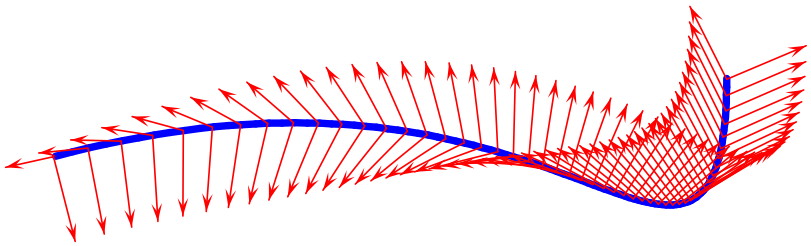
rational rotation–minimizing frame (RRMF) curves

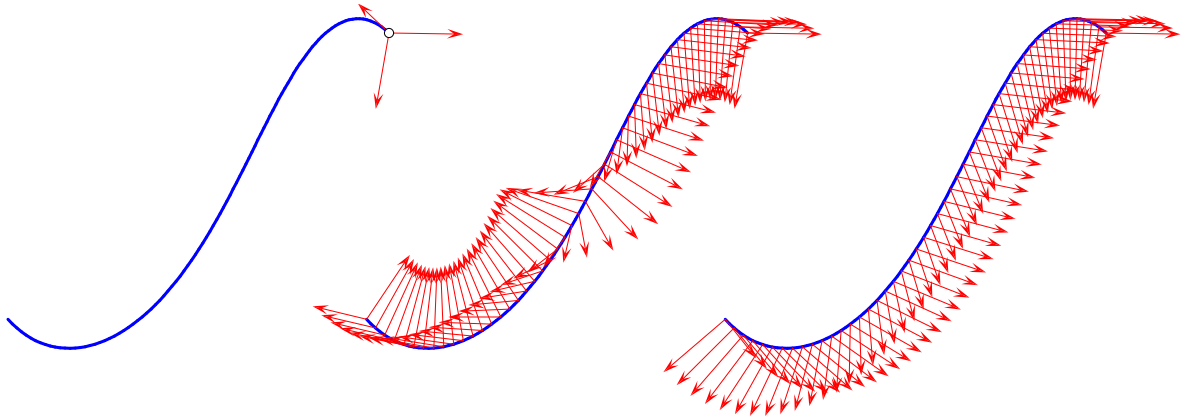
rational frames $(\mathbf{t}, \mathbf{u}, \mathbf{v})$ with angular velocity satisfying $\boldsymbol{\omega} \cdot \mathbf{t} \equiv 0$



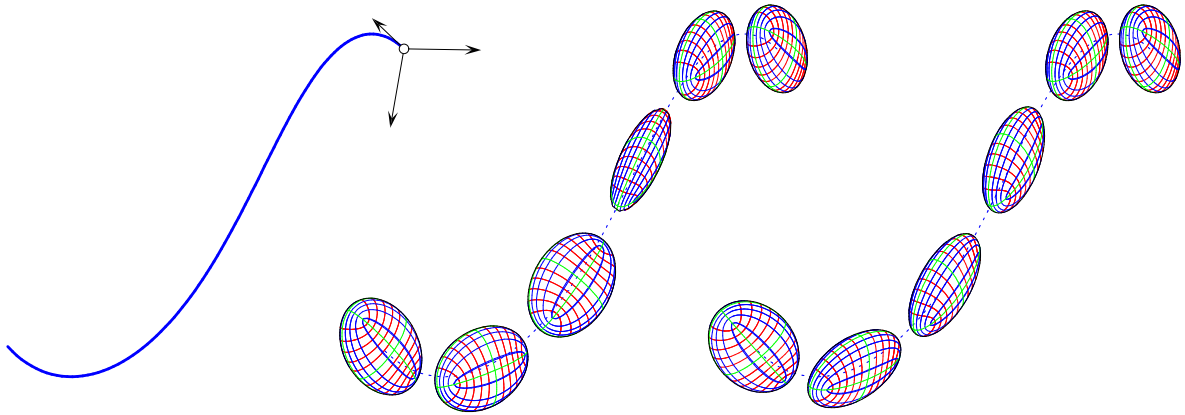
RMF

Frenet

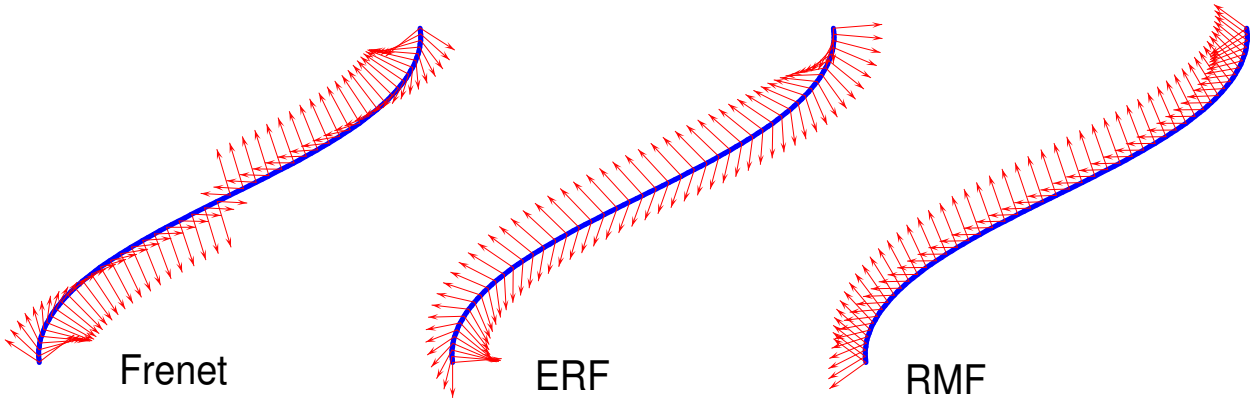




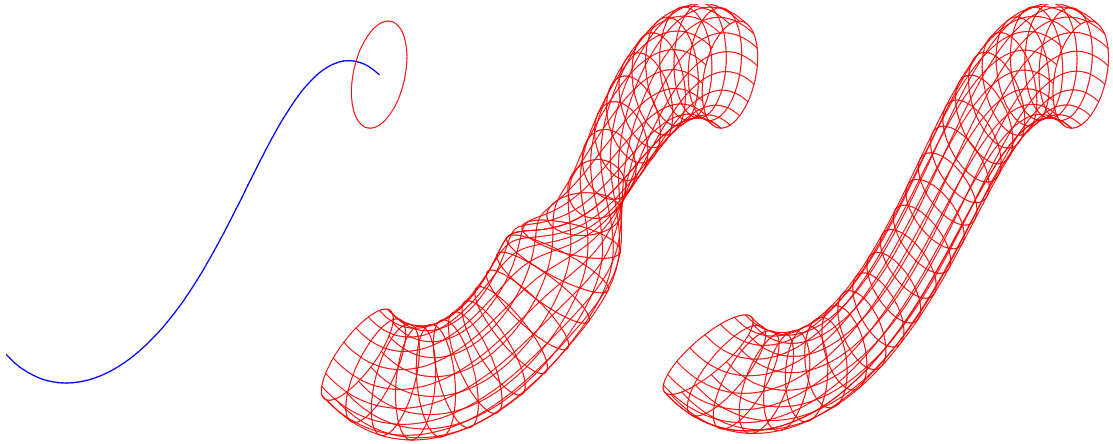
Frenet frame (center) & rotation-minimizing frame (right) on space curve



motion of an ellipsoid oriented by Frenet & rotation-minimizing frames



sudden reversal of Frenet frame through an inflection point

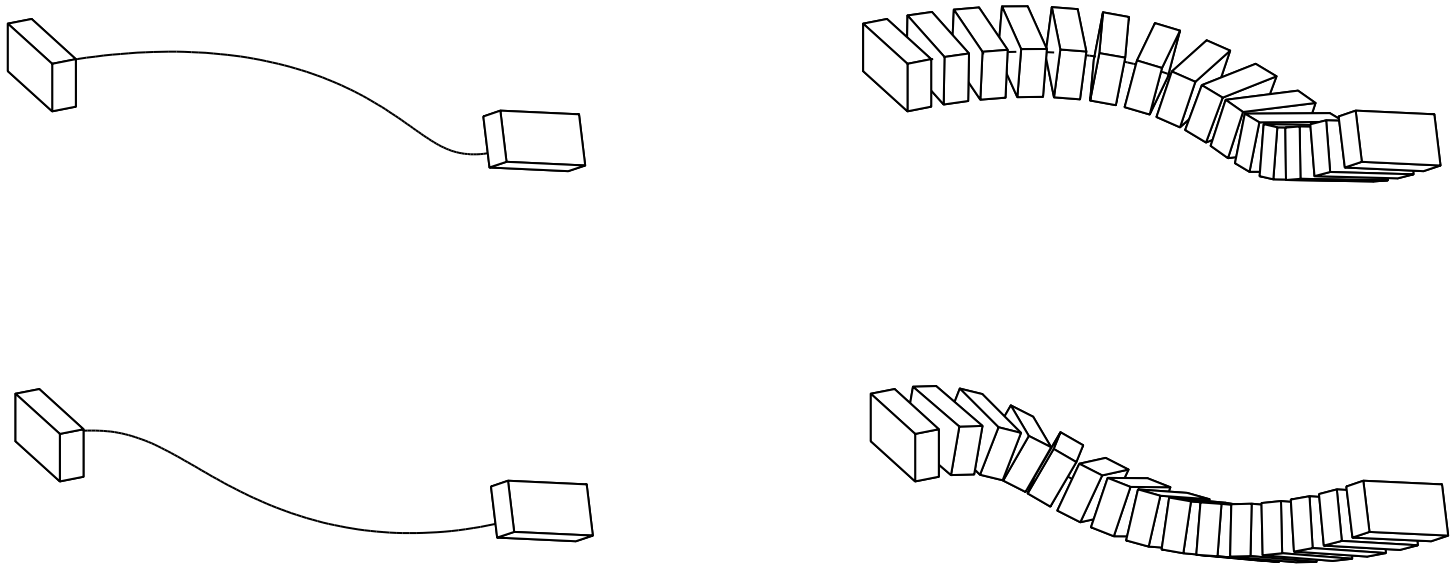


surface constructed by sweeping an ellipse along a space curve
using Frenet frame (center) & rotation-minimizing frame (right)

Hermite interpolation by quintic RRMF curves

given initial, final positions & frames $\mathbf{p}_i$ & $(\mathbf{t}_i, \mathbf{u}_i, \mathbf{v}_i)$ and $\mathbf{p}_f$ & $(\mathbf{t}_f, \mathbf{u}_f, \mathbf{v}_f)$

compute RRMF quintic $\mathbf{r}(\xi)$ & frame $(\mathbf{t}(\xi), \mathbf{u}(\xi), \mathbf{v}(\xi))$ interpolating data

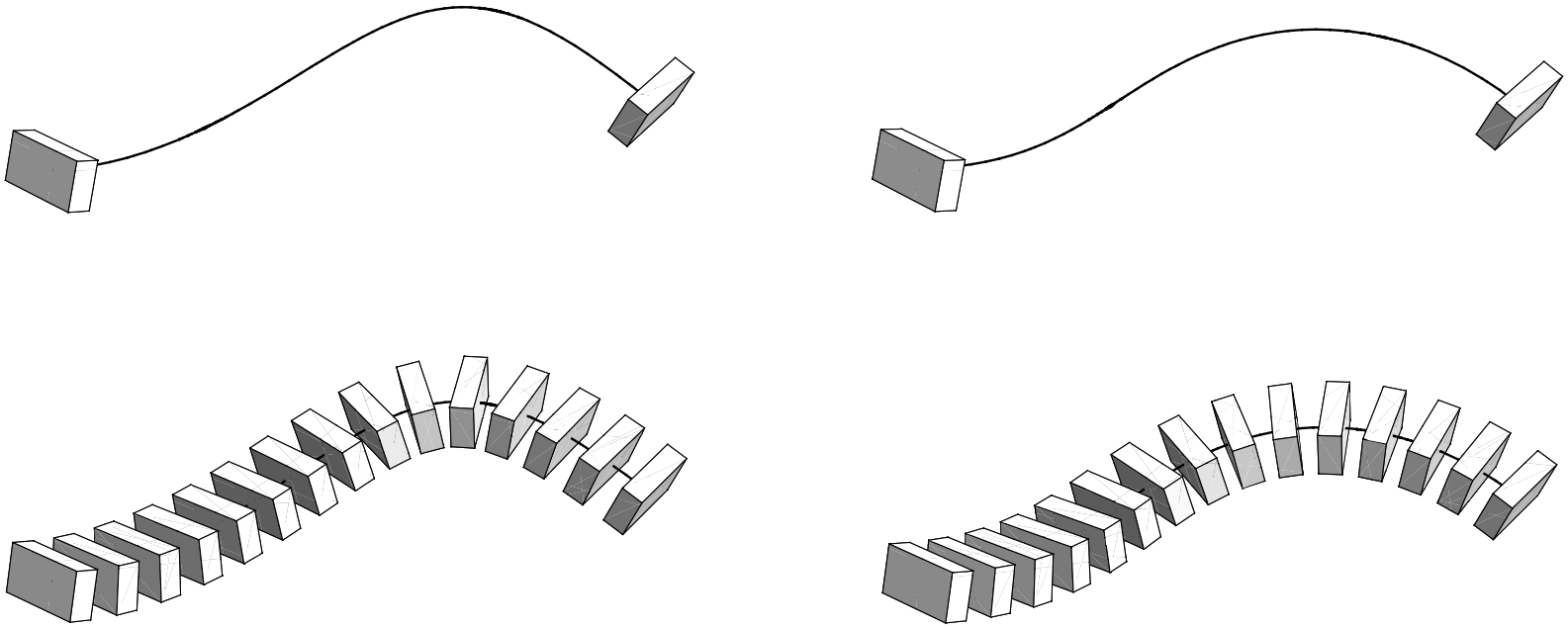


two distinct rational rotation–minimizing motions interpolating given data

Hermite interpolation by degree 7 RRMF curves

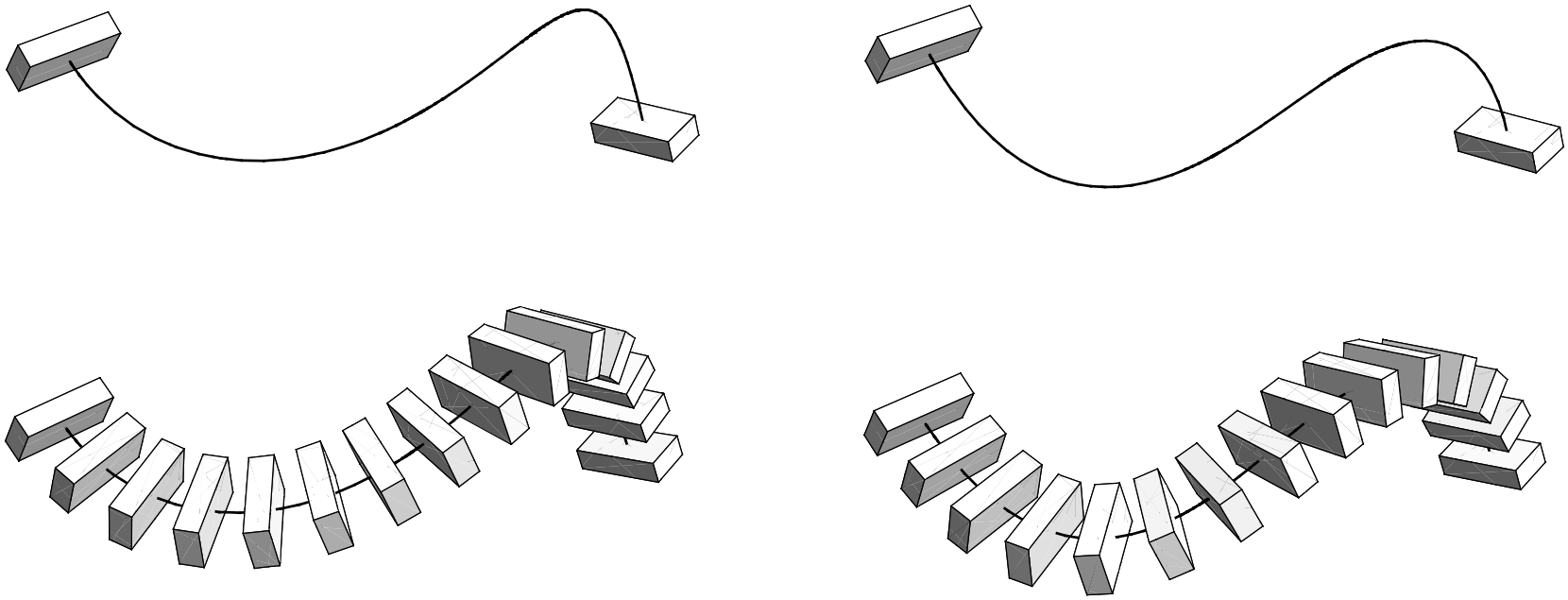
given initial, final positions & frames $\mathbf{p}_i$ & $(\mathbf{t}_i, \mathbf{u}_i, \mathbf{v}_i)$ and $\mathbf{p}_f$ & $(\mathbf{t}_f, \mathbf{u}_f, \mathbf{v}_f)$

find degree 7 RRMF curve $\mathbf{r}(\xi)$ & frame $(\mathbf{t}(\xi), \mathbf{u}(\xi), \mathbf{v}(\xi))$ matching data



two distinct degree 7 PH curves with ERF = RMF interpolating given data

further example with degree 7 RRMF curves



two distinct degree 7 PH curves with ERF = RMF interpolating given data

shapes optimized with respect to two residual free parameters w_i, w_f