GRIDZ

$\vec{S} = [s^3\ s^2\ s\ 1]$

$d\vec{S} = [3s^2\ 2s\ 1\ 0] = \frac{d}{ds}(\vec{S})$

$dd\vec{S} = [6s\ 2\ 0\ 0] = \frac{d^2}{ds^2}(\vec{S})$

$\vec{t} = [t^3\ t^2\ t\ 1]$

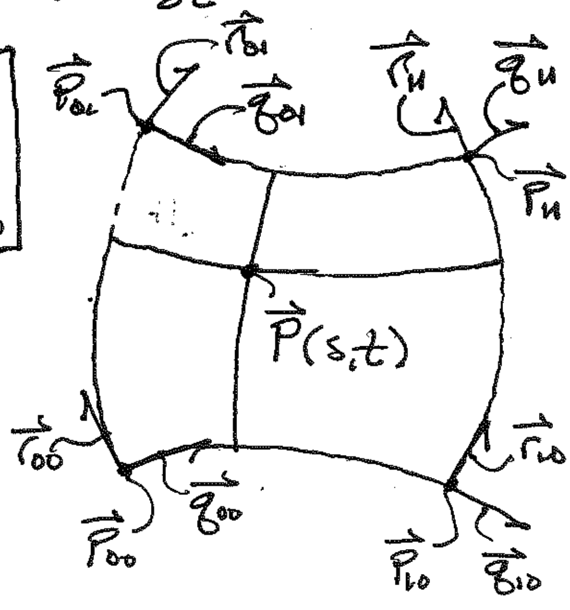
$d\vec{t} = [3t^2\ 2t\ 1\ 0] = \frac{d}{dt}(\vec{t})$

$dd\vec{t} = [6t\ 2\ 0\ 0] = \frac{d^2}{dt^2}(\vec{t})$

HOLD TANGENTS ORTHOGONAL

$$\mathbb{M} = \begin{bmatrix} 2 & -2 & 1 & 1 \\ -3 & 3 & -2 & -1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

$$\mathbb{G} = \begin{bmatrix} \vec{p}_{00} & \vec{p}_{01} & \vec{r}_{00} & \vec{r}_{01} \\ \vec{p}_{10} & \vec{p}_{11} & \vec{r}_{10} & \vec{r}_{11} \\ \vec{q}_{00} & \vec{q}_{01} & 0 & 0 \\ \vec{q}_{10} & \vec{q}_{11} & 0 & 0 \end{bmatrix}$$



$\mathbb{C}_s = \begin{bmatrix} S_{00} & S_{01} \\ S_{10} & S_{11} \end{bmatrix}$ $\quad \mathbb{C}_t = \begin{bmatrix} T_{00} & T_{01} \\ T_{10} & T_{11} \end{bmatrix} \sim |q_{mn}|, |r_{mn}|$

MAG

GRIDZ

$$\vec{P}_A = \vec{S}\,\mathbb{M}\begin{bmatrix}\vec{P}_{00}\\ \vec{P}_{10}\\ \vec{q}_{00}\\ \vec{q}_{10}\end{bmatrix}, \quad \vec{P}_{AS} = d\vec{S}\,\mathbb{M}[\,''\,]$$

$$\vec{P}_{ASS} = dd\vec{S}\,\mathbb{M}[\,''\,]$$

$$\vec{P}_B = \vec{S}\,\mathbb{M}\begin{bmatrix}\vec{P}_{01}\\ \vec{P}_{11}\\ \vec{q}_{01}\\ \vec{q}_{11}\end{bmatrix}, \quad \vec{P}_{BS} = d\vec{S}\,\mathbb{M}[\,''\,]$$

$$\vec{P}_{BSS} = dd\vec{S}\,\mathbb{M}[\,''\,]$$

$\vec{P}_C = \begin{bmatrix}\vec{P}_{00}\\ \vec{P}_{01}\\ \vec{t}_{00}\\ \vec{t}_{01}\end{bmatrix}^T \mathbb{M}^T \vec{t}^T$, $\vec{P}_{Ct} =$ [redacted] $[\,''\,]^T \mathbb{M}^T d\vec{t}$

$\vec{P}_{Ctt} =$ [redacted] $[\,''\,]^T \mathbb{M}^T dd$

$$\vec{P}_D = \begin{bmatrix}\vec{P}_{10}\\ \vec{P}_{11}\\ \vec{t}_{10}\\ \vec{t}_{11}\end{bmatrix}^T \mathbb{M}^T \vec{t}^T, \quad \vec{P}_{Dt} = [\,''\,]^T \mathbb{M}^T d\vec{t}^T$$

$$\vec{P}_{Dtt} = [\,''\,]^T \mathbb{M}^T dd\vec{t}^T$$

$$C_A = \vec{S}\,\mathbb{M}\begin{bmatrix}T_{00}\\ T_{10}\\ 0\\ 0\end{bmatrix}, \quad C_B = \vec{S}\,\mathbb{M}\left.\begin{bmatrix}T_{01}\\ T_{11}\\ 0\\ 0\end{bmatrix}\right\}\text{COULD VARY}$$

$$C_C = \begin{bmatrix}S_{00}\\ S_{01}\\ 0\end{bmatrix}^T \mathbb{M}^T \vec{t}^T, \quad C_D = \begin{bmatrix}S_{10}\\ S_{11}\\ 0\end{bmatrix}^T \mathbb{M}^T \vec{t}^T$$

GRIDZ

$$C_{AS} = \vec{\partial S}\,\mathbb{M}\begin{bmatrix}T_{00}\\T_{10}\\0\\0\end{bmatrix}, \quad C_{BS} = \vec{\partial S}\,\mathbb{M}\begin{bmatrix}T_{01}\\T_{11}\\0\\0\end{bmatrix}$$

$$C_{Ct} = \begin{bmatrix}S_{00}\\S_{01}\\0\\0\end{bmatrix}^T \mathbb{M}^T \vec{\partial E}^T, \quad C_{Dt} = \begin{bmatrix}S_{10}\\S_{11}\\0\\0\end{bmatrix}^T \mathbb{M}^T \vec{\partial E}^T$$

$$\mathbb{R} = \begin{bmatrix}0 & -1\\1 & 0\end{bmatrix} \sim \frac{\pi}{2}\text{ ROTATION MATRIX}$$

$$P_{AS} = \sqrt{\vec{P}_{AS}\cdot\vec{P}_{AS}} \quad P_{BS} = \sqrt{\vec{P}_{BS}\cdot\vec{P}_{BS}}$$

$$P_{Ct} = \sqrt{\vec{P}_{Ct}\cdot\vec{P}_{Ct}} \quad P_{Dt} = \sqrt{\vec{P}_{Dt}\cdot\vec{P}_{Dt}}$$

$$P_{ASS} = \frac{\vec{P}_{AS}\cdot\vec{P}_{ASS}}{P_{AS}}, \quad P_{BSS} = \frac{\vec{P}_{BS}\cdot\vec{P}_{BSS}}{P_{BS}}$$

$$P_{Ctt} = \frac{\vec{P}_{Ct}\cdot\vec{P}_{Ctt}}{P_{Ct}} \quad P_{Dtt} = \frac{\vec{P}_{Dt}\cdot\vec{P}_{Dtt}}{P_{Dt}}$$

GRID2

$$\vec{P}(s,t) = \begin{bmatrix} \vec{P}_A \\ \vec{P}_B \\ C_A \dfrac{\mathbb{R}\vec{P}_{AS}}{P_{AS}} \\ C_B \dfrac{\mathbb{R}\vec{P}_{BS}}{P_{BS}} \end{bmatrix}^T \mathbb{M}^T \vec{t}^T + \cdots$$

$$\cdots + \vec{s}\,\mathbb{M} \begin{bmatrix} \vec{P}_C \\ \vec{P}_D \\ C_C \dfrac{\mathbb{R}^T\vec{P}_{Ct}}{P_{Ct}} \\ C_D \dfrac{\mathbb{R}^T\vec{P}_{Dt}}{P_{Dt}} \end{bmatrix} - \cdots$$

$$\cdots - \vec{s}\,\mathbb{M}\mathbb{G}\mathbb{M}^T\vec{t}^T$$

GRID Z

$$\vec{P}_S = \begin{bmatrix} \vec{P}_{AS} \\ \vec{P}_{BS} \\ C_{AS}\dfrac{\mathbb{R}\vec{P}_{AK}}{P_{AS}} + C_A \dfrac{P_{AS}\mathbb{R}\vec{P}_{ASS} - \mathbb{R}\vec{P}_{AK} P_{ASS}}{P_{AK}^2} \\ C_{BS}\dfrac{\mathbb{R}\vec{P}_{BS}}{P_{BS}} + C_B \dfrac{P_{BS}\mathbb{R}\vec{P}_{BSS} - \mathbb{R}\vec{P}_{BS} P_{BSS}}{P_{BS}^2} \end{bmatrix}^T \mathbb{M}^T$$

$\ldots$

$$+ \quad d\vec{s}\,\mathbb{M} \begin{bmatrix} \vec{P}_C \\ \vec{P}_D \\ C_C \dfrac{\mathbb{R}^T \vec{P}_{Ct}}{P_{Ct}} \\ C_D \dfrac{\mathbb{R}^T \vec{P}_{Dt}}{P_{Dt}} \end{bmatrix} \quad - \ldots$$

$$\ldots - \; d\vec{s}\,\mathbb{M}\,\mathbb{G}\,\mathbb{M}^T \vec{t}^T$$

GRIDZ

$\vec{P_t} = ???$

$h_s = ???$

$h_t = ???$

VARY SCALING COEFFICIENTS
{AND $\overset{\text{S.C.}}{\text{TANGENTS}}$} AND MINIMIZE
ON $\sum_i \sum_j \vec{P_s} \cdot \vec{P_t}$ TO CREATE

A MOBIUS X-FORM APPROXIMATION.

SOLVE POTENTIAL FUNC USING
FINITE DIFFERENCES. USE FOR
VARIOUS COMPUTATIONAL PHYSICS
PROBLEMS. R-D|D-D|D-R → GEO ON SEAM

OPTIMIZE: • 2-D NEWTON - F.D. APPROX
ALTERNATING PAIRS OF COEFFS
• MONTE - CARLO