

Alignment Update

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Hierarchical Alignment

- Change in residuals w.r.t. larger structure parameters

$$\frac{df_{u/v}}{d\Delta\mathbf{p}_l} = \frac{d\Delta\mathbf{p}_s}{d\Delta\mathbf{p}_l} \cdot \frac{df_{u/v}}{d\Delta\mathbf{p}_s},$$

- Constraints given to solution program for larger structures. For each parameter of larger structure, the effects from all smaller structures should sum to 0.

$$\sum_i^{\text{components}} \left[\frac{d\Delta\mathbf{p}_{s,i}}{d\Delta\mathbf{p}_l} \right]^{-1} \cdot \Delta\mathbf{p}_i = 0,$$

Hierarchical Alignment

- I have derived Matrices for change in smaller structure parameters w.r.t. larger structure parameters.
- Testing if we can recover shifts in large structures (FST halves)
- Currently testing with ideal simulation.
 - mcSeed momentum and perfect track finding.
- Problem is at the actual alignment stage, there is a rank deficit reported in matrix equation. A small portion of parameters are not properly constrained.
 - Trying to pinpoint issue.
 - Contact Millepede developers if I cannot resolve issue soon.

Outlook

- Pinpoint issue in last stage where alignment is calculated.
- Hopefully, resolve shifts in larger component parameters using ideal conditions soon.
- We should be ready to apply alignment to data once I confirm this is working.
- We will probably need TPC vertex and survey measurement input to properly apply to data.