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Track-based Alignment

Complete:

Scope

Track-based alignment can be classified into three use cases:

- **Alignment algorithms** compute corrections to apply to the ideal positions of detector units, based on track residuals.
- **Misalignment tools** allow to misalign the detector with respect to ideal positions according to different scenarios, for later use in misalignment studies.
- **User jobs**, where the ideal geometry is corrected (in case of real data analysis), or misaligned (to study the effect of a misaligned detector on efficiency, fake rates, etc).

How-To

- Using the HIP alignment algorithm for tracker alignment
- Using the MillePede alignment algorithm for tracker alignment
- Using the alignment framework for muon chamber alignment
- Expert guide to misalignment tools
- More data related information or the tracker: TkAlignment (includes TIF How-tos, MC samples, etc.)

Versions

See SWGuideTrackAlignmentVersions for changes between releases and possible tag son top of releases.

User jobs

Alignment corrections are applied by the geometry builders (TrackerGeometryBuilder, DTGeometryBuilder, CSCGeometryBuilder). Once the ideal geometry has been read, the alignment object is parsed and new positions and orientations are sequentially set to all detector units.

Please check the corresponding WorkBook entry for examples on how to apply alignment corrections in a normal job.

Alignments object

The alignment object `Alignments` is the database object provided by all alignment inputs (survey, laser, algorithms and misalignment scenarios). It contains a vector of `AlignTransform` of all the active detector units (i.e. those used by the reconstruction). The `AlignTransform` consists of the global position (3 coordinates) and global orientation (3 angles), as well as the global detector ID.

The alignment error object `AlignmentErrors` contains a vector of `AlignTransformError` corresponding to all the `AlignTransform`. An `AlignTransformError` is a symmetrical matrix. *At present it only includes global errors on the position. Work is ongoing to make the errors **local**, as well as including errors on the angles.*

The `Alignment(Error)s` vectors are ordered by increasing detector ID before storage to the database.

Derived alignment constants

- Run 3 alignment constants
- Run-II alignment constants
- Run-I alignment constants

Review Status

Editor/Reviewer and date	Comments
FredericRonga - 03 Oct 2007	Added link to MillePede how-to
FredericRonga - 19 Apr 2007	Added links to child topics
Main.flucke - 11 Jun 2007	Added link to MC data set page
FredericRonga - 21 Sep 2007	Add reference to DPG page (more data-oriented)
GeroFlucke - 06 Feb 2009	link to versions

Responsible: AndreasMussgiller
Last reviewed by: Reviewer

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