What comes next in TKR alignment?

• Latest review - Michael at IAWS6:

• Executive summary
  – Intra-tower alignment code is there and working
    • ROOT based packages
      RootAnalysis/LeaningTower+users/kuss/LeaningTowerTools
    • own geometry
    • iterative procedure to correct for x,y,z displacements of each tray in each tower, plus rotation of each tray around z
  – Inter-Tower alignment code is not there yet:
    • a first attempt written in C++, deals only with 2 towers at a time
    • uses minuit to refit the part of the track in the tower to be realigned (with the other tower as a reference)
    • big black box (minuit), plus as is algorithm not functional for the LAT

Strategies?
System solver: going for accumulation

• After some discussion between JCT, Tracy and Leon:
  – Try to work out an explicit inversion scheme, that would allow a C++ code to accumulate sums of “moments” of the track parameters
  – Solving is done in the end: runnable in parallel mode
  – Use the official geometry and the covariance matrix of each event

• The obvious illustration: linear regression

\[
\begin{pmatrix}
\sum x^2 & \sum x \\
\sum x & \sum 1
\end{pmatrix}
\begin{pmatrix}
m \\
b
\end{pmatrix}
=
\begin{pmatrix}
\sum xy \\
\sum y
\end{pmatrix}
\]

• The code will be (should be?) easy to write..... once the equations have been written down!
  – Need to define the chi2, Probably need to apply constraint

• take the 2 stubs, separately fitted. Propagate the track parameters to a common region (nominal middle between 2 towers?)

• minimize the difference in point coordinates and slope values
Near Future

- Start with translation...
- Gather information about the metrology results: might constrain the LAT to such extent that nothing is needed!! 😐
- First I would like to apply Tracy's current code to a 2 tower system like the CU.... Code is currently broken due to new extlibs merge.
- Note that this procedure could be applied to the intra-tower alignment as well (though need to iterate there, because of the large number of parameters per tower).