Global Reconstruction Merge

Peter Lane
Illinois Institute of Technology

Content Preview

- Framework Overview
- What's already in the trunk?
- What's soon to be in the trunk?
- Next steps.

Framework

- Transfer Map
  - Operates on phase space vectors to transport them from one z position to another.
  - Does not have to be a matrix!
- Optics Model
  - Creates transfer maps between the configured set of z positions
- Track Fitter
  - Fits raw track data using an optics model

What's already in the trunk?

- Data Structure
- Framework interfaces
  - TransferMap, OpticsModel, TrackFitter
- Interface implementations
  - LinearApproximationTransferMap, PolynomialTransferMap
  - LinearApproximationOpticsModel, PolynomialOpticsModel

What's already in the trunk?

- Maths classes based on GSL C library
  - Matrix, SymmetricMatrix, HermitianMatrix, Vector
  - Complex
- Optics classes
  - CovarianceMatrix, PhaseSpaceVector
- Reconstruction helper classes
  - Detector, Particle
- Unit tests

What's soon to be in the trunk?

- Interface implementations
  - MinuitTrackFitter
- Reconstruction helper classes
  - DataStructureHelper
- Reconstruction workflow (mappers)
  - MapCppGlobalRawTracks, MapCppGlobalTrackReconstructor
- Unit tests for all but mappers

Next Steps

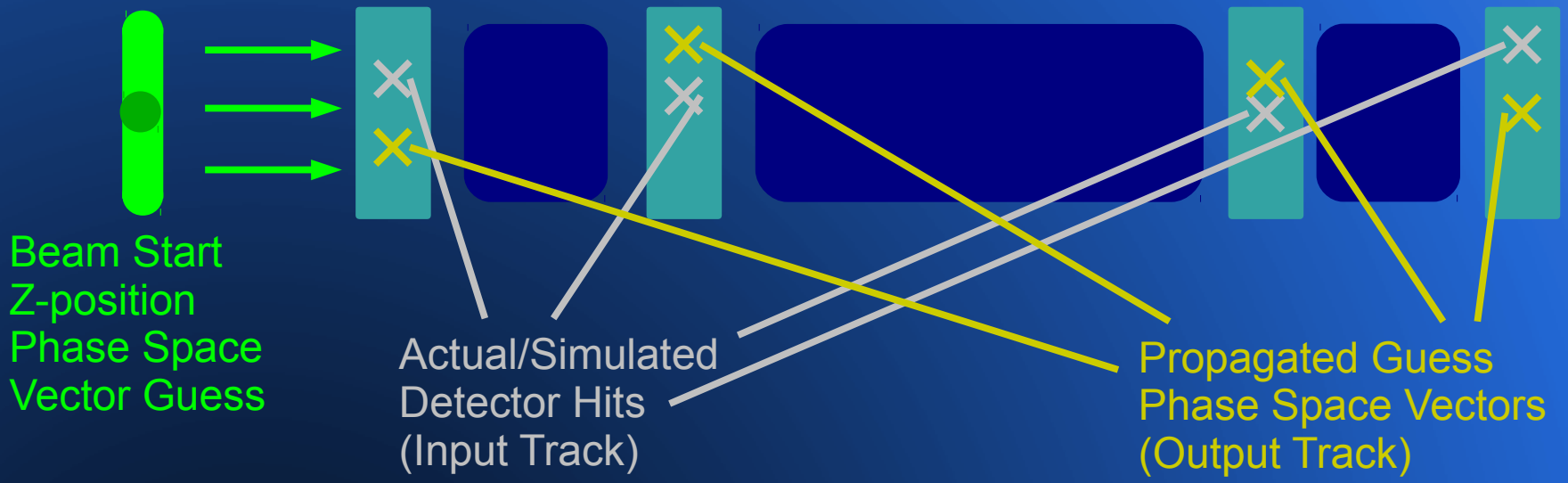
- Simplified beam tests to isolate issues with track fitting
  - Monochromatic beam
  - Paraxial approximation only beam
- Integration tests

Extra Slides

Polynomial Transfer Map

- Propegates 6D phase space vector (t,E,x,Px,y,Py) from the start z-position to some z-position downstream.
- Created by fitting a multidimensional polynomial in the initial phase space coordinates for each final phase space coordinate
  - i.e. $t_f(t_i, E_i, x_i, Px_i, y_i, Py_i) = 1+c_1 t_i+c_2 E_i+...$

Track Fitting Algorithm



- Find initial phase space vector that minimizes χ^2 -- the sum of the squares of the differences between the propagated guesses (potential outputs) and the detector hits (raw track point inputs).
  - weighted by the detectors' measurement uncertainties