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PLAN TO ADD TO CALCULATIONS TO CALORIMETRY

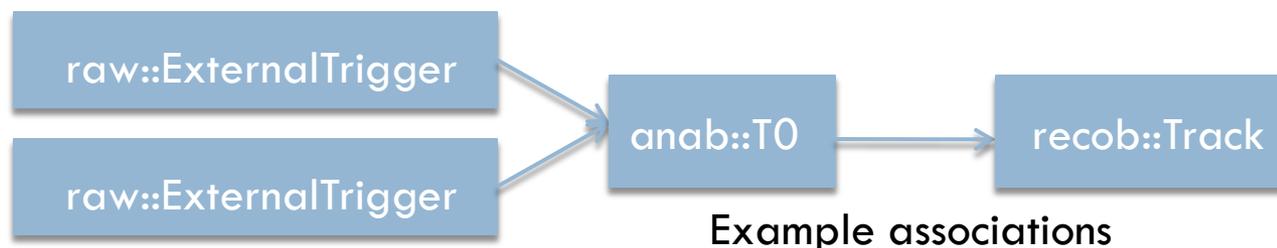
Karl Warburton, guidance from Tingjun Yang

T0 data product

- Gave a talk about a month ago about introducing a new data product T0.
- Have added this functionality to calorimetry alg so that it can be used to correct x position in calorimetry calculations (dEdx, residual range etc).
- Resides on feature branch in larana, lardata;
 - ▣ feautre/php13tkw_CaloT0
 - ▣ https://cdcvns.fnal.gov/redmine/projects/lardata/repository/show/AnalysisAlg?utf8=%E2%9C%93&rev=feature%2Fphp13tkw_CaloT0
 - ▣ https://cdcvns.fnal.gov/redmine/projects/larana/repository/show/Calorimetry?utf8=%E2%9C%93&rev=feature%2Fphp13tkw_CaloT0

Structure of the data product - reminder

- T0 has been written to have associations with;
 - Recob::Track,
 - Recob::Shower,
 - Recob::OpFlash, (Photon detectors)
 - Raw::ExternalTrigger (External muon counters)
- Accessed with anab::T0
- Filling anab::T0s using MCTruth or counter information is underway in 35t.



Changes to the algorithms

- Calorimetry_module has lots of algorithms all of which use initial interaction time as set by TFS.
- Purpose of T0 product is to be able to change this on event by event basis, so added additional argument to functions - T0 (defaulted to 0 if not specified).
 - ▣ This in larana – calorimetry_module.cc
- So that it doesn't effect any existing analyses this additional correction is only done right at the end (LifetimeCorrection calculation where a correction is already caluclated).
 - ▣ This is in lardata (also changed declarations of algs).



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PLAN TO ADD A NEW MUON GENERATOR

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Gaissers Parameterisation

- Offers another way of simulating muon flux (other than CRY), and gives a better estimation of flux.
- This parametisation is for surface muons – working on incorporating MUSUN for underground muons.
- A modified parameterisation is used to better simulate low energy muons.
- Expression of interest in use from people working on LAr1-ND.
- <https://books.google.com/books?id=qJ7Z6oIMqeUC&pg=PA233&lpg=PA233&dq=modified+gaisser+parameterization&source=bl&ots=lyenJAHzVq&sig=5rEk7qhzuAhgdHPIWr39f09b8x4&hl=en&sa=X&ei=yZ9HVαWFBYrQtQXHtYD4Dw&ved=0CFIQ6AEwBw#v=onepage&q=modified%20gaisser%20parameterization&f=false>

The module

- Generates PDF's for energy and zenith angle.
 - ▣ Both tuneable, energy range is split into two regions which need to be of reasonable sizes for accurate binning. Theta between 0 and $\pi/2$.
 - ▣ Have example fcl files for low, medium and high energy ranges.
- Tuneable surface area of particle generation (larger energies require larger generation areas), centred about detector centre.
- Will write a document describing best methods of use.

Module status

- Currently residing on a feature branch in larsim;
 - ▣ feature/php13tkw_GaisserParam
 - ▣ https://cdcvcs.fnal.gov/redmine/projects/larsim/repository/show/EventGenerator/GaisserParam?rev=feature%2Fphp13tkw_GaisserParam
- Discuss saving of PDF's...possibility of common store?
- Ready to be published.
- Further questions please contact;
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