

## uBooNE Reconstruction - Task #13473

Milestone # 13399 (New): Parent reconstruction milestones/tasks for reconstruction necessary for MCC8 and reconstruction "v6"

Milestone # 13400 (New): MCC8 and "v6" reconstruction development

Milestone # 13405 (New): Shower Reconstruction

Task # 13420 (New): Shower Reconstruction - Pandora tasks

### Particle (esp. shower) merging

08/08/2016 07:34 AM - John Marshall

<b>Status:</b>	New	<b>Start date:</b>	08/08/2016
<b>Priority:</b>	Normal	<b>Due date:</b>	10/01/2016
<b>Assignee:</b>	John Marshall	<b>% Done:</b>	80%
<b>Category:</b>		<b>Estimated time:</b>	0.00 hour
<b>Target version:</b>			

#### Description

This is a rather broad issue encompassing:

- i). Merging existing Particles together to increase (most likely) shower completeness.
- ii). Merging remnants with existing Particles to increase completeness.
- iii). Bringing remnants into existence as their own Particles.

Speculative, longer-term: experiment with moving the shower branch growing into a 3x2D operation, with branch additions considered from all view at same time (currently additions are made completely independently).

#### History

##### #1 - 11/02/2016 12:25 PM - Lorena Escudero sanchez

- % Done changed from 0 to 30

##### #2 - 11/04/2016 11:11 AM - John Marshall

- % Done changed from 30 to 80

Key issues affecting completeness of reconstructed showers:

1. Elements of sparse shower excluded - Appear as separate 3D Particles, or Remnant 2D Clusters (not in Particles)
2. Event Slicing (to tackle left-over cosmic rays) splits shower into multiple slices.

Use sliding linear fits to 3D Shower Clusters to define 3D cones:

- Use cones to aid collection of downstream fragments.
- Can use neutrino interaction vertex to define/choose cone direction.
- Need to be rather "generous" to collection most/all fragments.

-3D linear fit provides an axis; divide into layers. Assign Hits to layers and calculate layer "fit contributions".

-By sliding/summing along nearby n layers, can obtain a local linear fit position and direction.

-Now exploit sliding 3D fit results to define cones:

- Fit position in chosen layer can provide cone apex
- Mean fit direction for next m layers defines direction
- Hit positions/algorithm chooses angle and length.

Exploit reusable 3DslidingConeFit functionality in a number of algorithms and tools in reconstruction:

1. 3D Event Slicing: use cones to collect 3D Hits for more complete slices.
2. 3D Particle → 3D Particles: shower cone fits pick up downstream 3D fragment Particles.
3. 3D Particle → 2D Clusters: project cone fits, pick up downstream 2D remnant Clusters.

Also add simple backstop alg to assign any left-over "isolated" Clusters to nearest Particle within range.

Associated pattern recognition performance shown at MicroBooNE collaboration meeting.