

Adding missing hits at end/start of track

2023-12-21

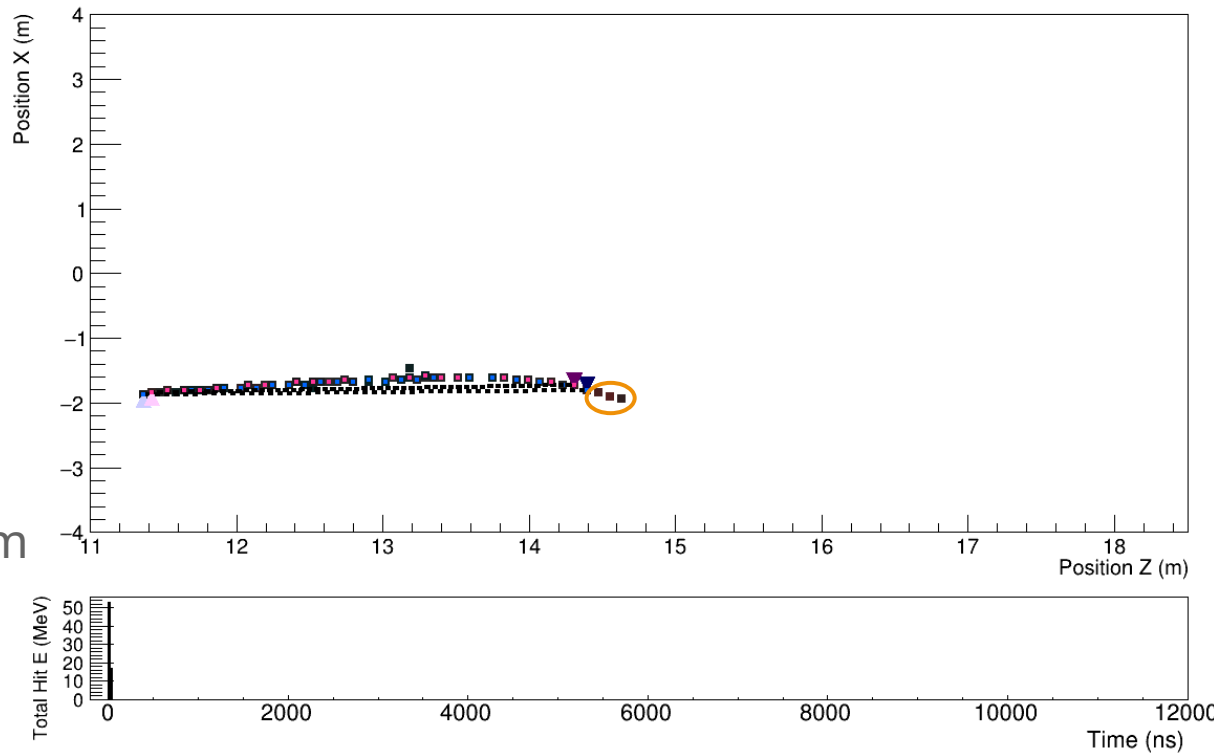
Asa Nehm





Adding hits again? What's the difference?

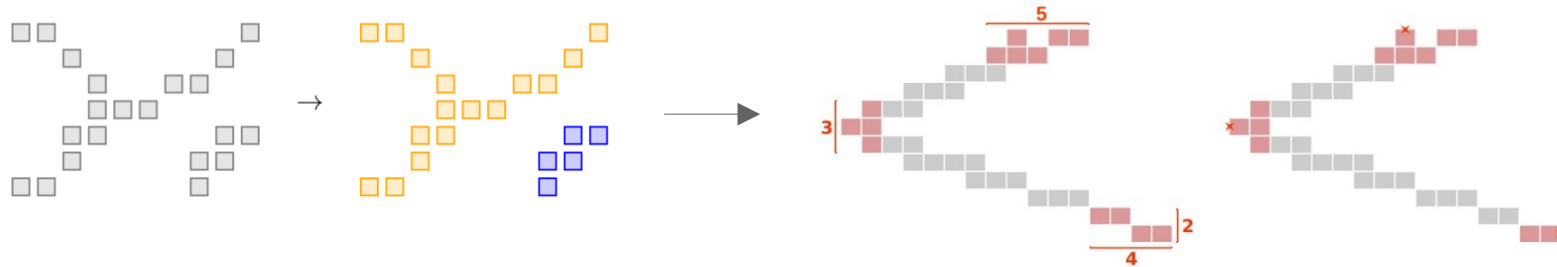
- Missing hits in tracks now solved
- Now seeing that hits and end/start of tracks are missing
- Hough transform only hits that are within ± 1 bar width to the Hough line
- A* connects only in between first and last hit from Hough transform
- New feature required that looks at additional hits





How to do this?

- Multiple options for adding hits
 - Group hits into groups and then run edge detection (most up-/downstream)



All plots from T2K Tech Note 236

- Extrapolate hits from start and end of tracks

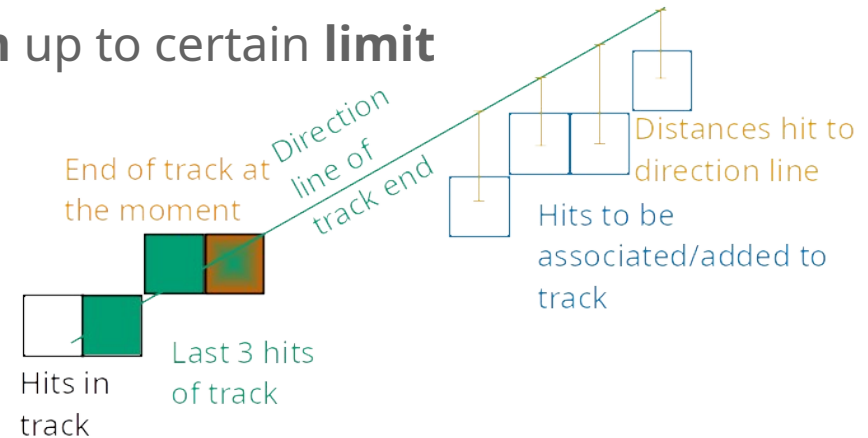


- The second one is less effort to implement at the moment → went for it



How to do it in detail?

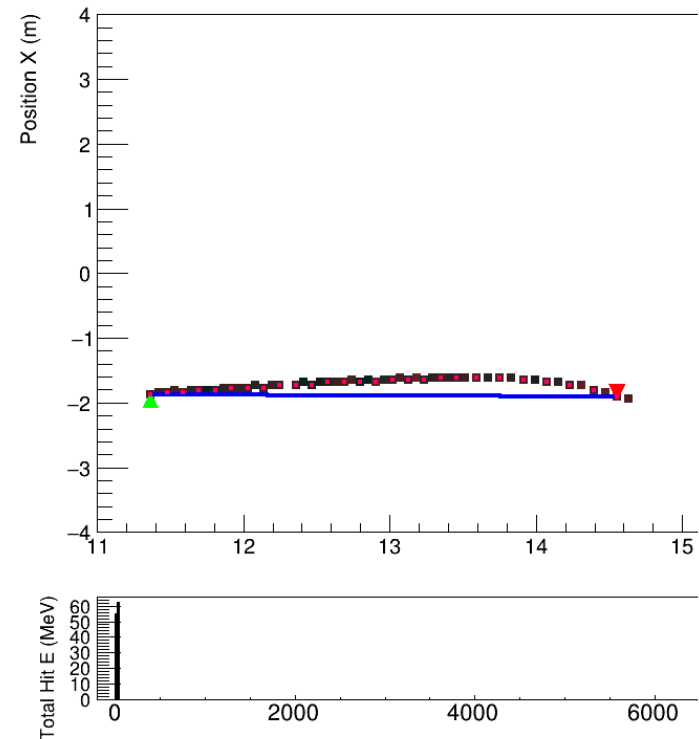
- Use **heuristic cost** for determination of how far hit is away from end of track
- Use only hits that are **within ± 2 bar widths** away from direction line to be added
- If suitable hit found, connect with **A* algorithm** up to certain **limit** (ExtrapolateLimit)
 - **Higher z** than end of track at the moment for direction and **within certain distance from end of track** a.t.m. (ExtrapolateDist)
 - Hit **within ± 2 bar widths** from direction line
 - **Up to** ExtrapolateDist + ExtrapolateLimit
- Push newly found track into existing track





Implementation and result

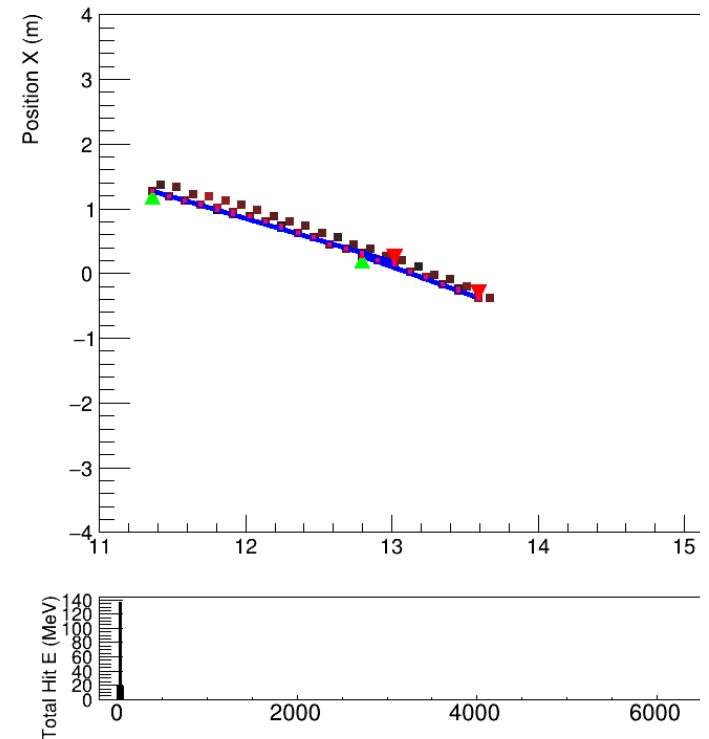
- Created new feature branch and implemented on main branch status (no separation yet)
- Implemented direction calculation for front and back of track
- Implemented extrapolation in back and front of track





Implementation and result

- Created new feature branch and implemented on main branch status (no separation yet)
- Implemented direction calculation for front and back of track
- Implemented extrapolation in back and front of track
- **TODO:** fix track merging
- This should have influence also on **track length/momentum** things
- Will once finished merge this into main branch and implement in separated branch as well → 3D reconstruction



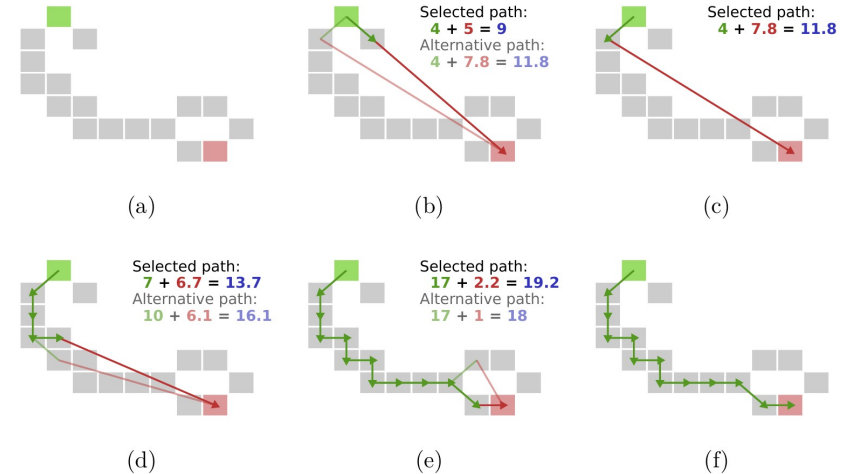


Backup



Quick insert: A* algorithm

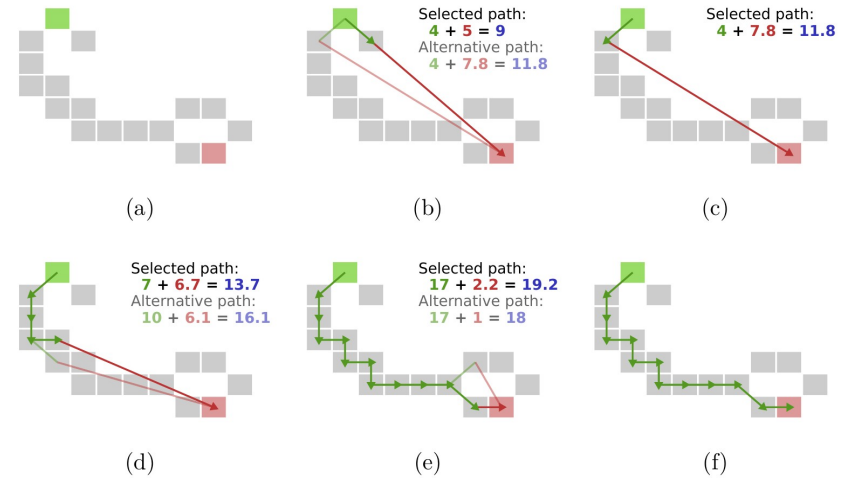
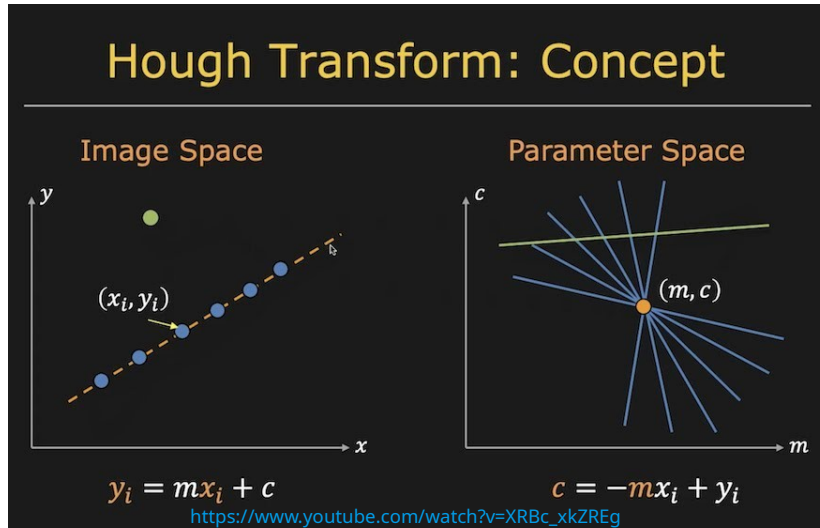
- Two costs to determine most efficient path from start to end
 - **Heuristic cost:** 'how far is end away?'
 - **Connection/Ground cost:** 'how far is next potential cell away?'
- Each cell has inherent heuristic cost
- For each connection the connection/ground cost is calculated
- Choose connection with lowest **sum of both costs**



T2K Tech Note 236



Difference Hough trafo and A* algorithm



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Hough Transform

- Uses **coordinates** of hit position (x and z)
- Coordinates also used in plotting of events/spills

A* algorithm

- Uses **nodes** indicated by bar (x) and plane (z) number of hit
- Bar number and plane number determined by geometry files