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Subject: vertex reconstruction without fitting?

Posted by [AnnaSkachkova](#) on Fri, 07 Nov 2014 18:12:21 GMT

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Dear colleagues,

could anybody tell me - is it possible in PandaRoot to determine the production vertexes of the final particles (for example electrons and muons in the future) without the reconstruction of the full tree chain of their parents? It is needed for the background study when we do not care about the parents of the final particles, but just of their characteristics.

Could you please give the example of such a code?

Thank you in advance,

Anna

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Subject: Re: vertex reconstruction without fitting?

Posted by [Ralf Kliemt](#) on Fri, 07 Nov 2014 19:29:14 GMT

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Hello Anna,

This is quite straightforward and nothing special. You need to create a composite candidate with your part of the charged (!) final state particles. Then feed it to the fitter or POCA calculator, just as you "always do".

```
theAnalysis->FillList(muplus, "MuonAllPlus");
theAnalysis->FillList(muminus, "MuonAllMinus");

// *** combinatorics for J/psi -> mu+ mu-
jpsi.Combine(muplus, muminus);

// ***
// *** do VERTEX FIT (J/psi)
// ***
for (j=0;j<jpsi.GetLength();++j)
{
    PndKinVtxFitter vtxfitter(jpsi[j]); // instantiate a vertex fitter
    if ( ! vtxfitter.Fit(); ) continue;

    double chi2_vtx = vtxfitter.GetChi2(); // access chi2 of fit
    double prob_vtx = vtxfitter.GetProb(); // access probability of fit
    RhoCandidate *jfit = jpsi[j]->GetFit(); // access the fitted cand
    TVector3 jVtx=jfit->Pos(); // and the decay vertex position
}
```

Cheers

Ralf

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Subject: Re: vertex reconstruction without fitting?  
Posted by [AnnaSkachkova](#) on Sat, 08 Nov 2014 14:25:19 GMT  
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Thank you, Ralf, for the answer. But the case when you can combine the particles is understandable and was already described. I wonder about the case when I have for example 2 separate muons in the final state, one coming from kaon, the other is from pion decays. And I want to get their production vertexes (supposing they are different and I do not know their origin). What shall I do? To do the "combinatorics" for a single particle?

Cheers, Anna

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Subject: Re: vertex reconstruction without fitting?  
Posted by [Klaus Götzen](#) on Sat, 08 Nov 2014 14:41:04 GMT  
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Hi Anna,

you can access the MC truth origin of a reco particle by something like

```
fAnalysis->FillList(muons, "MuonAll");  
...  
RhoCandidate *truth = muons[i]->GetMcTruth();  
  
if (truth!=0)  
{  
    TVector3 trueOrigin = truth->Pos();  
    ...  
}
```

if this is what you meant.

Best,  
Klaus

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Subject: Re: vertex reconstruction without fitting?  
Posted by [AnnaSkachkova](#) on Sat, 08 Nov 2014 15:40:06 GMT  
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Yes, Klaus, thank you. I meant the reconstructed vertex of any particle without accotiation of this particle with any other one. And the coordinate in this case will be, for example  $V_x = \text{muons}[i] \rightarrow \text{Pos}().x$ ; right? Is it in mm?

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Subject: Re: vertex reconstruction without fitting?  
Posted by [StefanoSpataro](#) on Sat, 08 Nov 2014 15:44:35 GMT

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You can reconstruct vertex ONLY if you have two particles. With only 1 particle, you can have the MC vertex but you cannot reconstruct any vertex.  
Our standard unit system foresees cm as distances unit.

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Subject: Re: vertex reconstruction without fitting?  
Posted by [Klaus Götzen](#) on Sat, 08 Nov 2014 15:46:54 GMT  
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Hi Anna,

just to make it clear: a single track (=charged particle) cannot have a reconstructed vertex (or origin), since tracking only determines the trajectory (helix) of a charged particle, but not the starting point of the track on that helix. A vertex information can only be assigned by combining it with at least a second track and the constraint, that both particles originate from the same point.

If you want to know the POCA to the IP of the reco track, you can also use

`muons[i]->Pos();`

As Stefano wrote (I was just typing when he answered ), unit is cm.

Best,  
Klaus

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Subject: Re: vertex reconstruction without fitting?  
Posted by [AnnaSkachkova](#) on Sat, 08 Nov 2014 16:02:17 GMT  
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Thank you everybody who answered! So, I understand that if I have the only single charged particle, or I do not know with which other charged particle it can be associated (the neutral ones can't be combined, right?) I can have only MC approximation, described as Klaus wrote (for x coordinate):  $V_x = \text{muons}[i] \rightarrow \text{Pos}()$ . Right?

Anna

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Subject: Re: vertex reconstruction without fitting?  
Posted by [Klaus Götzen](#) on Sat, 08 Nov 2014 16:06:06 GMT  
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Precisely: The point-of-closest-approach (doesn't have to be close to the true origin) to the IP of the reco track is

muons[i]->Pos;

The MC-truth origin is given by

muons[i]->GetMcTruth()->Pos();

(in case the pointers aren't NULL)

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Subject: Re: vertex reconstruction without fitting?  
Posted by [AnnaSkachkova](#) on Sat, 08 Nov 2014 16:08:55 GMT  
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Ok. Thank you all once again.

Best regards, Anna

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