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Subject: Re: GEM tracking

Posted by [Radoslaw Karabowicz](#) on Tue, 28 Apr 2009 16:11:03 GMT

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Dear Christian,

Thank you for your answer. This post will be rather long, so prepare;).

First of all: I am using pndroot revision 5003, i will get a new version tomorrow, I did not wanted to change anything in the environment for the test.

I have made a lot of print-outs in my code, which allowed me to make several observations:

1. charge. Both in the Geane and LSL track representation constructor you are taking charge of the particle (charge or q/p). At least some people take the charge from root pdg database by:

```
TDatabasePDG *fdbPDG= TDatabasePDG::Instance();
TParticlePDG *fParticle= fdbPDG->GetParticle(PDGCode);
Double_t fCharge= fParticle->Charge();
```

but the correct way should be:

```
Double_t fCharge= fParticle->Charge()/3.;
```

because in TParticlePDG from root there is:

```
Double_t fCharge; // charge in units of |e|/3
```

Fixing this did not improve anything, so it is only a (meaningless) comment.

2. I still cannot make the fitter to run. I mean it is running, but it is not fitting at all. What I mean is that the parameters like momentum change insignificantly. I am doing: initialize track parameters with position and momentum taken from the first GEM point (most people use 0.,0.,0. as the starting point, is what I am using wrong?). I smear the position by (0.1,0.1,0.1) and increase the momentum by 0.1 to see if the fitter will fix it (should it?). The example printouts come from my PndGemKalmanTask and from yours Kalman.cxx (i print the track parameter in the loop of Kalman::processTrack(Track\* trk)):

starting track0

FIRST GEM POINT AT: (x, y, z)

\*\*\*\*\* -6.55763 27.2351 89.3803

WITH MOMENTUM: (px, py, pz ----> |p|)

\*\*\*\*\* -0.192626 0.445268 1.54116 ---> 1.61572

-I- PndGemRecoHit::PndGemRecoHit(PndGemHit\*) called.

-I- PndGemRecoHit::PndGemRecoHit(PndGemHit\*) called.

-I- PndGemRecoHit::PndGemRecoHit(PndGemHit\*) called.

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-I- PndGemRecoHit::PndGemRecoHit(PndGemHit\*) called.

-I- PndGemRecoHit::PndGemRecoHit(PndGemHit\*) called.

-I- PndGemRecoHit::PndGemRecoHit(PndGemHit\*) called.

8 hits in track 0

starting fit

\*\*\*\*\*

before first iteration in Kalman::processTrack, 0.1 has been added to momentum.mag  
0: result pos = (-6.47268,27.2066,89.3913)

0: result mom = (-0.204548,0.472827,1.63655) ---> 1.71572

GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-6.47258	27.2067	89.3913
FairGeanePro::Propagate	-----	-6.47133	27.2036	89.3803
FairGeanePro::Propagate	-----	-6.70876	27.6091	90.6207
FairGeanePro::Propagate	-----	-10.8173	35.6645	119.38
FairGeanePro::Propagate	-----	-10.9983	35.9863	120.621
FairGeanePro::Propagate	-----	-15.6744	43.7319	149.38
FairGeanePro::Propagate	-----	-15.988	43.9828	150.621
FairGeanePro::Propagate	-----	-20.9761	51.4469	179.38

GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-21.7575	51.3515	180.621
-------------------------	-------	----------	---------	---------

GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-21.5577	51.0004	179.38
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-16.4667	43.6138	150.621
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-16.136	43.3895	149.38
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-11.0507	35.9565	120.621
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-10.826	35.6454	119.38
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-6.22762	27.9268	90.6207
-------------------------	-------	----------	---------	---------

before second iteration in Kalman::processTrack

1: result pos = (-6.19682,27.4796,89.3803)

1: result mom = (-0.273583,0.43237,1.63766) ---> 1.71573

FairGeanePro::Propagate	-----	-6.51044	27.267	89.3803
FairGeanePro::Propagate	-----	-6.72045	27.6048	90.6207
FairGeanePro::Propagate	-----	-11.0317	35.5209	119.38
FairGeanePro::Propagate	-----	-11.1274	35.9024	120.621
FairGeanePro::Propagate	-----	-15.7653	43.6395	149.38
FairGeanePro::Propagate	-----	-16.0421	43.9262	150.621
FairGeanePro::Propagate	-----	-21.0838	51.3342	179.38

GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-21.771	51.3386	180.621
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-21.5622	50.9962	179.38
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-16.3376	43.7225	150.621
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-16.04	43.4701	149.38
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-10.9413	36.0422	120.621
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-10.7573	35.6996	119.38
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GEANETRACKREP: USING BACKPROPAGATION!

FairGeanePro::Propagate	-----	-6.18766	27.9631	90.6207
-------------------------	-------	----------	---------	---------

before third iteration in Kalman::processTrack

2: result pos = (-6.17669,27.4995,89.3803)

2: result mom = (-0.27435,0.431638,1.63773) ---> 1.71573

FairGeanePro::Propagate	-----	-6.50937	27.2686	89.3803
FairGeanePro::Propagate	-----	-6.7202	27.6054	90.6207
FairGeanePro::Propagate	-----	-11.0291	35.5213	119.38
FairGeanePro::Propagate	-----	-11.1251	35.9029	120.621
FairGeanePro::Propagate	-----	-15.7649	43.6389	149.38
FairGeanePro::Propagate	-----	-16.0422	43.9256	150.621
FairGeanePro::Propagate	-----	-21.0853	51.3326	179.38
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-21.7713	51.3384	180.621
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-21.5623	50.9961	179.38
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-16.337	43.7229	150.621
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-16.0396	43.4704	149.38
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-10.9409	36.0425	120.621
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-10.757	35.6998	119.38
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-6.18749	27.9632	90.6207

before forth iteration in Kalman::processTrack

3: result pos = (-6.1766,27.4996,89.3803)

3: result mom = (-0.274355,0.431634,1.63773) ---> 1.71573

FairGeanePro::Propagate	-----	-6.50936	27.2686	89.3803
FairGeanePro::Propagate	-----	-6.7202	27.6054	90.6207
FairGeanePro::Propagate	-----	-11.0291	35.5212	119.38
FairGeanePro::Propagate	-----	-11.1251	35.9029	120.621
FairGeanePro::Propagate	-----	-15.7649	43.6389	149.38
FairGeanePro::Propagate	-----	-16.0422	43.9256	150.621
FairGeanePro::Propagate	-----	-21.0853	51.3326	179.38
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-21.7713	51.3384	180.621
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-21.5623	50.9961	179.38
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-16.337	43.723	150.621
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-16.0395	43.4704	149.38
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-10.9409	36.0425	120.621
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-10.757	35.6998	119.38
GEANETRACKREP: USING BACKPROPAGATION!				
FairGeanePro::Propagate	-----	-6.18749	27.9632	90.6207

before fifth iteration in Kalman::processTrack

4: result pos = (-6.1766,27.4996,89.3803)

4: result mom = (-0.274355,0.431634,1.63773) ---> 1.71573

FairGeanePro::Propagate	-----	-6.50936	27.2686	89.3803
-------------------------	-------	----------	---------	---------

```

FairGeanePro::Propagate ----- -6.7202 27.6054 90.6207
FairGeanePro::Propagate ----- -11.0291 35.5212 119.38
FairGeanePro::Propagate ----- -11.1251 35.9029 120.621
FairGeanePro::Propagate ----- -15.7649 43.6389 149.38
FairGeanePro::Propagate ----- -16.0422 43.9256 150.621
FairGeanePro::Propagate ----- -21.0853 51.3326 179.38
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -21.7713 51.3384 180.621
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -21.5623 50.9961 179.38
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -16.337 43.723 150.621
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -16.0395 43.4704 149.38
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -10.9409 36.0425 120.621
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -10.757 35.6998 119.38
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -6.18749 27.9632 90.6207

```

before sixth iteration in Kalman::processTrack

5: result pos = (-6.1766,27.4996,89.3803)

5: result mom = (-0.274355,0.431635,1.63773) ---> 1.71573

```

FairGeanePro::Propagate ----- -6.50936 27.2686 89.3803
FairGeanePro::Propagate ----- -6.7202 27.6054 90.6207
FairGeanePro::Propagate ----- -11.0291 35.5212 119.38
FairGeanePro::Propagate ----- -11.1251 35.9029 120.621
FairGeanePro::Propagate ----- -15.7649 43.6389 149.38
FairGeanePro::Propagate ----- -16.0422 43.9256 150.621
FairGeanePro::Propagate ----- -21.0853 51.3326 179.38
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -21.7713 51.3384 180.621
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -21.5623 50.9961 179.38
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -16.337 43.723 150.621
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -16.0395 43.4704 149.38
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -10.9409 36.0425 120.621
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -10.757 35.6998 119.38
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -6.18749 27.9632 90.6207
GEANETRACKREP: USING BACKPROPAGATION!
FairGeanePro::Propagate ----- -6.1766 27.4996 89.3803

```

ChiSq=13.963  
\*\*\*\*\*

Resulting position and momentum after 6 iterations of Kalman::processTrack  
result pos = (-6.1766,27.4996,89.3803)

result mom = (-0.274355,0.431635,1.63773) ----> 1.71573

Observation:

The momentum  $|p|$  changes very little in the process of the fitting, the three components do change considerably, from (-0.204548,0.472827,1.63655) to (-0.274355,0.431635,1.63773), but the  $|p|$  changes only from 1.71572 to 1.71573. This kind of behaviour I see for each and every particle that I tried to fit (you can check the attached file). Do you fix the overall particle momentum so that it cannot change during the fitting?

3. I have modified the RecoHit from:

```
TVector3 oo (0.,0.,hit->GetZ()),
  uu ( TMath::Cos(phiAValue),TMath::Sin(phiAValue),0),
  vv (-TMath::Sin(phiAValue),TMath::Cos(phiAValue),0);
_hitCoord[0][0] = TMath::Sqrt(hitX*hitX+hitY*hitY);
_hitCoord[1][0] = 0.;
_hitCov[0][0] = hit->GetDr();
_hitCov[1][1] = hit->GetDp();
```

to:

```
TVector3 oo (0.,0.,hit->GetZ()),
  uu ( 1.0, 0.0, 0.0),
  vv ( 0.0, 1.0, 0.0);

_hitCoord[0][0] = hitX;
_hitCoord[1][0] = hitY; // by the way, should it be [1][0] or [1][1]?

_hitCov[0][0] = 0.1;
_hitCov[1][1] = 0.1;
```

Both versions work exactly the same.

4. I have tried to use the LSL track representation:

```
starting track0
***** -6.55759 27.2354 89.3803
***** -0.192626 0.445268 1.54116 ---> 1.61572
-I- PndGemRecoHit::PndGemRecoHit(PndGemHit*) called.
-I- PndGemRecoHit::PndGemRecoHit(PndGemHit*) called.
-I- PndGemRecoHit::PndGemRecoHit(PndGemHit*) called.
-I- PndGemRecoHit::PndGemRecoHit(PndGemHit*) called.
-I- PndGemRecoHit::PndGemRecoHit(PndGemHit*) called.
-I- PndGemRecoHit::PndGemRecoHit(PndGemHit*) called.
-I- PndGemRecoHit::PndGemRecoHit(PndGemHit*) called.
-I- PndGemRecoHit::PndGemRecoHit(PndGemHit*) called.
8 hits in track 0
starting fit
*****
0: result pos = (-6.47264,27.2069,89.3913)
0: result mom = (-0.204548,0.472827,1.63655) ---> 1.71572
FitterException thrown with whatString:
```

cov[0][0]<1.-50

in line: 225 in file: /misc/karabowi/pandaroot-5003/trunk/genfit/Kalman.cxx

FitterException Info Output

```
=====
=====
1: result pos = (-6.47264,27.2069,89.3913)
1: result mom = (-0.204548,0.472827,1.63655) ---> 1.71572
2: result pos = (-6.47264,27.2069,89.3913)
2: result mom = (-0.204548,0.472827,1.63655) ---> 1.71572
3: result pos = (-6.47264,27.2069,89.3913)
3: result mom = (-0.204548,0.472827,1.63655) ---> 1.71572
4: result pos = (-6.47264,27.2069,89.3913)
4: result mom = (-0.204548,0.472827,1.63655) ---> 1.71572
5: result pos = (-6.47264,27.2069,89.3913)
5: result mom = (-0.204548,0.472827,1.63655) ---> 1.71572
*****
result pos = (-6.47264,27.2069,89.3913)
result mom = (-0.204548,0.472827,1.63655) ----> 1.71572
```

The exception using this representation is for every track, the parameters doesn't change at all... (check attached file, it unfortunately lacks information about exceptions).

5. I have similar exception in Geane as in LSL when I do not smear the position of the first GEM point as starting position for the Kalman.

Conclusion:

I seem to have some output from the fitter, but the problem is that the parameters do not change as I would like them to change.  
In particular in the Geane rep. the momentum  $|p|$  stay constant in the process of fitting, the LSL doesn't work for me at all.  
Could you take a look at the attached files and tell me if the fitter output looks normally?

That it for today.  
Yours,  
radek

ps. Thank you for patience, if you got down here;)

## File Attachments

- 1) [geaneOutput.dat](#), downloaded 295 times
  - 2) [lslOutput.dat](#), downloaded 300 times
-