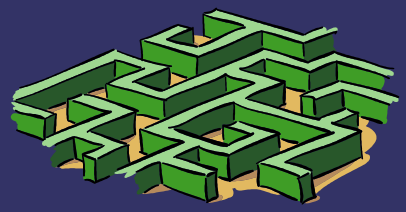
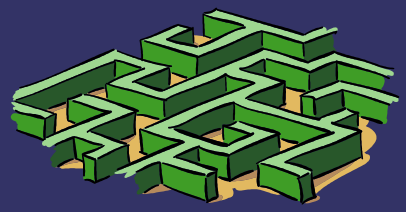
ZvTop in org.lcsim

Jan Strube

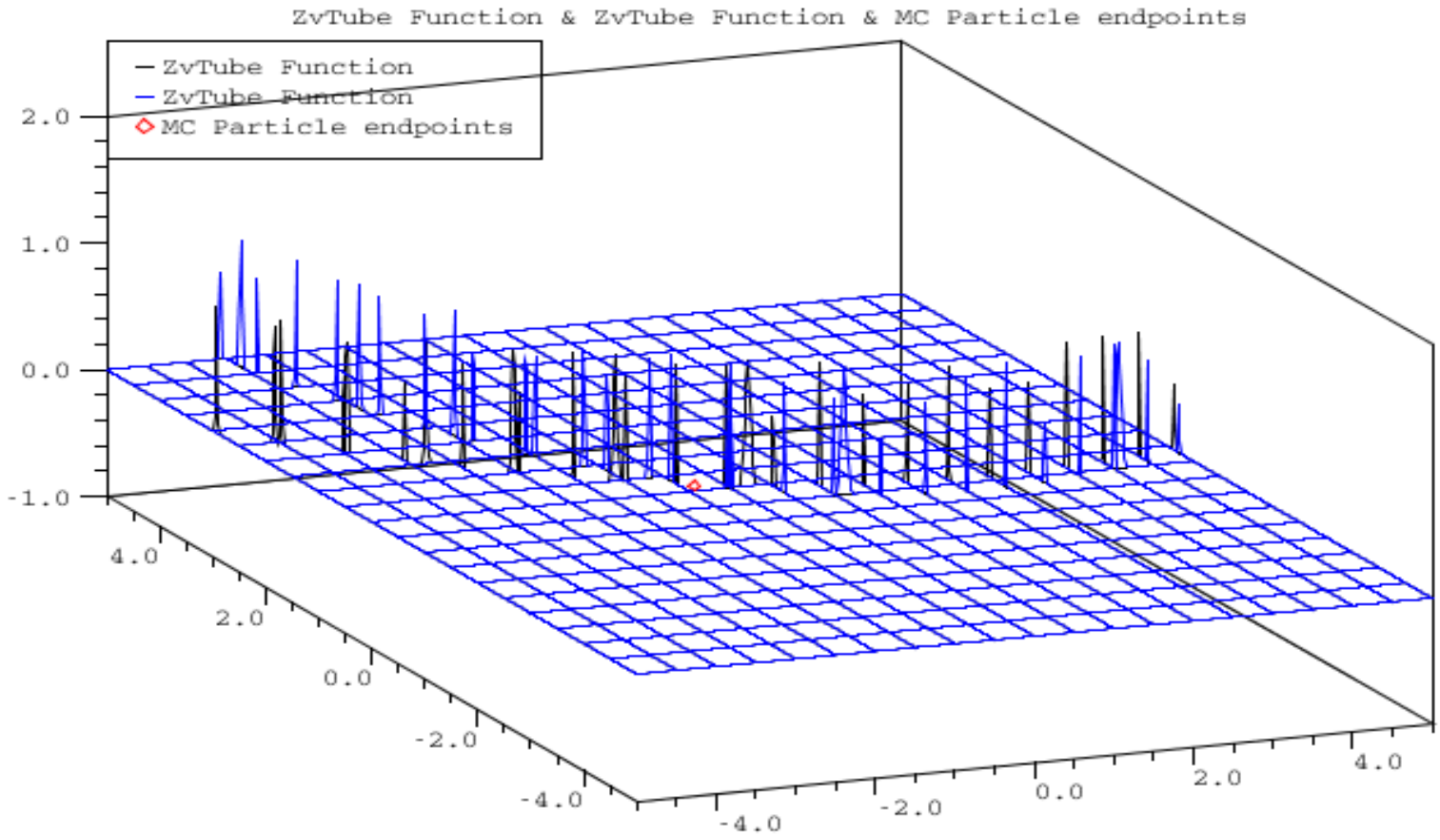


Introduction

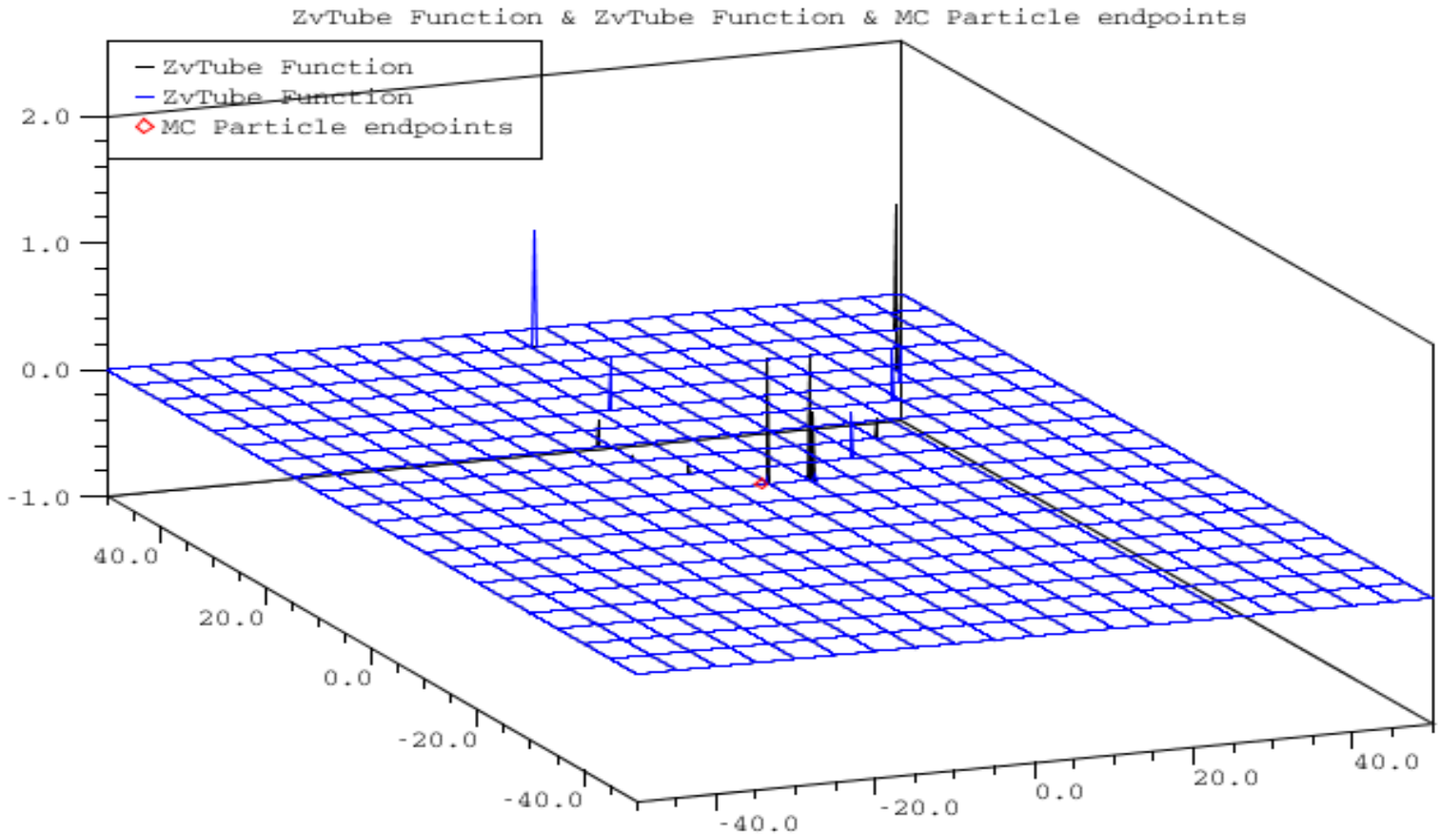
- ZvTop creates a Gaussian Tube around a parabolic approximation of the track.
- It calculates the overlap of all combinations of two of these tubes (in a Jet)
- It clusters the maxima of these overlap functions to form vertex candidates
- The tracks of a candidate are then fitted to that point. They are kept if they pass a chi-squared cut.



ZvTubes

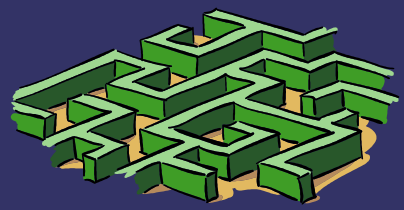

ZvTube Function & ZvTube Function & MC Particle endpoints
ZvTube Function
ZvTube Function
MC Particle endpoints
2.0
1.0
0.0
-1.0
4.0
2.0
0.0
-2.0
-4.0
-4.0
-2.0
0.0
2.0
4.0

ZvTubes II


ZvTube Function & ZvTube Function & MC Particle endpoints
ZvTube Function
ZvTube Function
MC Particle endpoints
2.0
1.0
0.0
-1.0
40.0
20.0
0.0
-20.0
-40.0
-40.0
-20.0
0.0
20.0
40.0

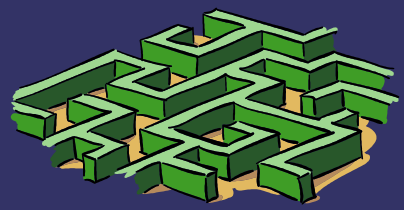
Status – the good

```
Event 7: 0.0
Number  ID      Parent  E       px      py      pz      MC /    Part status
  0:        J/psi             10.39    +0.02    -1.52    +9.80  2  0    +0.01    -0.00    +0.85
  1:          mu-       J/psi    3.99    +1.34    +0.11    +3.76  1  0
  2:          mu+       J/psi    6.40    -1.32    -1.63    +6.04  1  0
entering findVertives

entering clusterCandidates
done clusterCandidates
done findVertices

found 1 Candidates
SpacePoint:
    x: 0.0023854106365792 66
    y: -0.0078019518705095 83
    z: 0.8613124105086385
  rxy: 0.0081584702545791 92
 rxyz: 0.8613510487211914
  phi: -1.2740769239700278
theta: 0.0094718550106901 97
```



Status – the bad

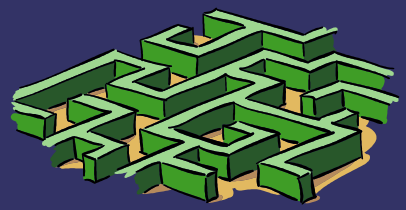
```
Event 5: 0.0
Number  ID      Parent  E       px      py      pz      MC /    Part status
  0:        J/psi               6.63    +4.76    +2.87    +1.88  2  0    -0.59    -0.33    +0.56
  1:          mu-       J/psi    5.26    +4.66    +2.36    +0.61  1  0
  2:          mu+       J/psi    1.37    +0.10    +0.51    +1.27  1  0
entering findVertives

entering clusterCandidates
done clusterCandidates
done findVertices

found 1 Candidates
SpacePoint:
    x: -0.366964780599413 2
    y: -0.25453667507212685
    z: 0.13209536066518474
  rxy: 0.4466005700367 4875
 rxyz: 0.4657265866003509
  phi: -2.535156697375 23
theta: 1.283215895541795
```



Status – the ugly

FitStatus is: NAN_ERROR_IN_DIST
found 0 vertices

SwimStatus is (in ZvFitter): TOO_BIG_DIP_ANGLE
FitStatus is: SWIM_FAILURE
found 0 vertices



Summary

- The topological finder can find Track overlaps in the easiest case
  - Sometimes more sometimes less convincingly
    - Can be tuned
- The parabolic approximation might need to be tuned (SLD: 0.6T, ILC: 5T)
- This is something people can play with now.
- The fitter and the “ZvSwimmer” are broken !
- The IP needs special treatment