

Midterm Exercise

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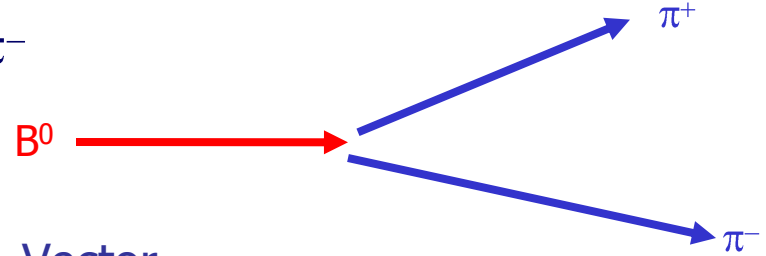
<http://www.roma1.infn.it/people/rahatlou/programmazione++/>

Corso di Programmazione++

Roma, 25 May 2009

Exercise 1: Object Oriented Kinematics

- Consider the two body decay $B^0 \rightarrow \pi^+ \pi^-$
 - B^0 : mass 5280 MeV
 - π^+ : mass 140 MeV
 - Each particle can be represented by a 4-Vector
 - $P_4 = (P_x, P_y, P_z, E)$
- Assume B^0 moves along Z axis: $P_x(B^0) = P_y(B^0) = 0$
- Assume $P_z(B^0)$ is a Gaussian distribution with mean $\mu = 2000$ MeV and width $\sigma = 200$ MeV
- Simulate 1000 decays of B^0 to two particles. For each B^0
 - Generate momentum of B^0
 - Calculate the momentum of two daughters from conservation of energy and momentum
- Show the distribution of the p_x, p_y, p_z, E , and the angle between the two pions in the laboratory



How Many Classes Do You Need?

- Each particles can be represented by its 4-momentum
 - you need a 4-vector class to do arithmetics
- Use TRandom class of root to generate random numbers
- Histograms: use TH1F class of root
- Lorentz Transformation: if you need to go from center of mass frame to laboratory you will need to perform Lorentz Transformation
 - Different solution possible
 - Transformation as method of 4-vector
 - Create a new matrix class that interacts with 4-vectors

Midterm Deadline

- The complete project must be sent to me by 12:00 on Wednesday 3 June
- You must provide one application .cpp file and all necessary source and header files and instructions on how to compile, link and run the executable
- You can
 - send a tar file via email including all the material
 - CD or DVD with all the files
 - Arrange to meet me in the office