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Classes for hmatrix packages

1 Introduction

The hmatrix library has 3 basic classes that contain H-matrix information and can be used to construct conatiners for specific H-matrices (**Hquantities, HMatrix, Hqsum**) and 2 basic classes for handling H-matrix output (**HMatrixPkg, D0Hmatrix**).

At present there is only one package implemented (**HMatrix41Pkg**) which generates a 41x41 matrix summing over the 41 quantities used for the electron-photon Hmatrix in run I.

2 Basic Classes

2.1 Hquantities

This class is meant to be a general store for any quantities used for making H-matrices.
Constructors:

- **Hquantities***()*
- **Hquantities***(const int n)*
- **Hquantities***(std::vector<Float8>& vquant)*
- **Hquantities***(const int n, float* quant)*
- **Hquantities***(const int n, Float8* quant)*

Acces methods:

- **int size()***const* : return size
- **void getQuant***(float* quant)const*: return quantities in a array

- **void getQuant***(Float8* quant)const*: return quantities in a array
- **void getQuant***(Matrix& hqm)const*: return quantities in an Nx1 matrix
- **void getQuant***(std::vector<Float8> &vquant)const*: return quantities in a vector container

2.2 Hqsum

This class inherits Hquantities. In addition to being a container it has a += operator that performs sums over Hquantities.
Constructors:

- **Hqsum***()*
- **Hqsum***(const int n)*
- **Hqsum***(Hquantities &hq)*

Methods:

- **int nentries***()const*: return number of entries, ie how many times += operator was used.
- **void getQaver***(Matrix& hqm)const*: return contents divided by nentries
- **Hqsum operator+=***(Hquantities &hq)*
- **void print***(ostream &os) const*: print contents

2.3 Hmatrix

Contains a matrix constructed by summing over Hquantities(i)*Hquantities(j).
Constructors:

- **Hmatrix***()*
- **Hmatrix***(const int n)*

- **Hmatrix***(Hquantities &hq)*

Methods:

- **int nentries***()const*: return number of entries, ie how many times += operator was used.
- **int matrixDimension***()const*: return dimension
- **void getMatrix***(Matrix& hqm)const*: return contents divided by nentries
- **Hqsum operator+=***(Hquantities &hq)*
- **void print***(ostream &os) const*: print contents

2.4 HMatrixPkg

This is an abstract class that must be inherited by all packages generating H-matrix . It supplies a jobSummary hook for the framework that is implemented to handle writing of H-matrices. It inherits fwk::Package and fwk::JobSummary.

Constructor:

- **HMatrixPkg***(fwk::Context* context)*

Methods are the ones required by the framework. In addition it has a protected method to be used by classes inheriting it:

- **CalData* getCalData***(edm::Event &event, std::vector<const EnergyCluster< TowerAddress >& ecv)*: given the event it returns a pointer to CalData and a vector of pointers to EnergyCluster objects.

2.5 D0hmatrix

This class makes persistent d0om versions of Hqsum and Hmatrix for writing to file. It inherits d0_Object.
Constructor:

- **D0hmatrix***()*

Methods:

- **write***()*: write to file
- **print***(ostream& os)*: print contents

3 Classes for HMatrix41

The HMatrix41 classes implement the 41x41 electron-photon H-matrix used in run I. There are three classes:**H41elq, H41elqMaker and HMatrix41Pkg**.

3.1 H41elq

This class inherits Hquantities and is meant to be a container of the 41 quantities used in the run I H-matrix.
Constructors:

- **H41elq***()*
- **H41elq***(float *quant)*

Access methods:

- **float EM1energy***()*
- **float EM2energy***()*
- **float EM3energy***()*
- **float EM4energy***()*
- **float log10E***()*
- **float zvOverSigma***()*
- **float Energy***()*

3.2 H41elqMaker

This class supplies a method to make H41elq objects.
Constructor:

- **H41elqMaker***()*
- **H41elqMaker***(float zsig)*: zsig is width of interaction region. Default constructor sets zsig=0.

Method:

- **H41elq* makeH41elq***(CalData* calptr, const EnergyCluster¡TowerAddress¿* clusptr)*: make H41elq given calorimeter data and a cluster. The user is the owner of H41elq.

3.3 HMatrix41Pkg

Class providing the interface to framework and methods to make 41x41 run I H-matrices. Inherits HMatrixPkg and Process.
Constructor:

- **HMatrix41Pkg***(fwk::Context* context)*

Overriden hook method

- **fwk::Result processEvent***(edm::Event &event)*

4 Required libraries

The hmatrix library depends on: energycluster, caldata, caladdress, mcpp, d0_mcpp and d0om.