

ABSTRACT

A new algorithm for isosurface extraction is proposed and implemented. The algorithm is based on the new mathematical understanding of the theory of the quasi-Monte Carlo methods. Different from the general isosurface extracting methods, which work on the whole data set, this algorithm works on a subset of the original large three-dimensional data set, which is generated by the quasi-Monte Carlo method. The isosurface is generated on this subset data as an approximation to the isosurface generated from the whole data set. Hammersley, Halton and Hyperbolic Cross points are used as the quasi-Monte Carlo points in the implementation.

The results show that the QMC techniques enjoy a linear speedup with the number of QMC points. For large data sets, we usually can reduce the data size remarkably and still get a good representation of the original isosurface. The advantage of the techniques becomes more prominent when the data size gets larger. The QMC points generally generate visually better and smoother isosurfaces and these isosurfaces represent the overall shape of the original isosurfaces better than a regular subset of the original data.

The preprocessing of the QMC isosurface extraction might be time consuming. But this is a one-time process. After it is done, the postisosurface extraction is very fast.