AN EFFICIENT PARALLEL MAP VISUALIZATION FRAMEWORK FOR LARGE VECTOR DATA

Mingqiang Guo[a,b*], Liang Wu[a,b] Zhong Xie[a,b]

[a]Faculty of Information and Engineering, China University of Geosciences (Wuhan), Wuhan, China
[b]GIS Software and Application Project Research Centre of the Educational Department, Wuhan, China
*Corresponding author

With the tremendous development of surveying and mapping technologies, the volume of vector data is becoming larger. For mapping workers and other GIS scientists, map visualization is one of the most common functions of GIS software. But it is also a time-consuming process when processing massive amounts of vector data. Especially in an Internet map service environment, large numbers of concurrent users can cause major processing delays. In order to address this issue, this paper develops an efficient parallel visualization framework for large vector data sets by leveraging the advantages and characteristics of graphics cards, focusing on storage strategy and transfer strategy. The test results demonstrate that this new approach can reduce the computing times for visualizing large vector maps.

Grâce au développement incroyable des technologies d'arpentage et de cartographie, le volume de données vectorielles est en expansion. Pour les travailleurs en cartographie et les autres scientifiques des SIG, la visualisation cartographique est l'une des fonctions les plus couramment utilisées des SIG. Mais il s'agit aussi d'un processus coûteux au niveau du temps lorsqu'il faut traiter des volumes importants de données vectorielles. Surtout dans un environnement de service cartographique Web, des nombres élevés d'utilisateurs simultanés peuvent entraîner des retards importants dans le traitement. Afin de s'attaquer à cette question, le présent article développe un cadre de visualisation parallèle efficace pour de grands jeux de données vectorielles en tirant profit des avantages et caractéristiques des cartes graphiques, en se concentrant sur la stratégie de stockage et de transfert. Les résultats de l'essai démontrent que cette nouvelle approche peut réduire les temps de calcul pour la visualisation de grandes cartes vectorielles.

Mingqiang Guo
gmqandjxs@163.com

Liang Wu

Zhong Xie

1. Introduction

Geographic Information Systems (GIS) are currently being used in many practical and scientific fields, such as land resource plans and management [*Tang et al.* 2011], global climate monitoring [*Zhou et al.* 2003], traffic management [*Arentze et al.* 2010], early disaster warning [*Daneshvar and Bagherzadeh* 2011] and so on. For these GIS applications, the map visualization is the most common and useful function, as most business functions are based upon it.

With the development of survey and mapping technologies, vector data has been annually accumulated and its volume has reached an unprecedented scale, which in turn, brings great challenges to current GIS software [*Wang* 2010]. Made apparent by CyberGIS, vector data rendering is a time-consuming process wherein the larger the volume of the vector data, the longer the rendering time. Though rendering algorithms can improve this process by using the parallel computing capabilities of multi-core CPUs, the response time is still very long when the volume of vector data is large in quantity [*Yang* 2005]. Clusters provide a good solution to slow rendering times, but it proves very expensive to buy more servers which then possess more processing cores. This issue, however, can be solved by a many-core GPU (graphics processing unit), which is the key component of computer graphics cards. Compared with multi-core CPU, the many-core GPU is cheaper and