

Earth Sciences Summer Student Program:

Indexing the sky: improving queries in Astronomical Databases

Supervisors:

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Project description:

Modern Astronomy relies on access to gigantic telescopes that are producing images and other data in such a large amount that Astronomers cannot deal with it in the same way they used to do. To face this avalanche of data, Astronomers have to unite with computer scientists, and built Data centers that will facilitate the access and the analysis of the data. Based at the National Taiwan Normal University Department of Earth Sciences, the Taiwan Extragalactic Astronomical Data Center is one of such new facilities and has for goal to propose access to up-to 1Pb of data dedicated to extragalactic astronomy by 2015.

The main functionality of an astronomical data center is to provide access to gigantic catalogues spanning the whole sky and whole wavelength ranges. In order to make a full use of such extensive datasets, cross-matching between catalogues is essential, and therefore very fast queries are vital. One of the most recent solutions is the use of hierarchical subdivision of the celestial sphere using spherical triangles. This kind of algorithms, based on quadtree algorithm, is nowadays widely used to query in astronomical database.

The final goal of this project is the implementation of a Hierarchical Triangular Mesh (HTM) algorithm in our database. We propose to a student to contribute of several fundamental steps of this implementation during the summer. He/she will join a team of motivated students, astronomers and computer Scientists and make an essential contribution to the development of the Taiwan Extragalactic Astronomical Data Center.

Preferred background of student candidates:

- Senior or Junior students with good English skills are both welcome.
- Strong knowledge/experience in computers (linux system) is essential.
- Good programming skills (C, C++) is required.
- Background knowledge in astronomy is not necessary.

師大地科暑期研究計畫

天空索引：研究天文資料庫的改進方法

指導老師：

主要指導老師：傅谷石 教授 (師範大學地球科學系)

次要指導老師：橋本康弘 教授 (師範大學地球科學系)

本計畫與 蔡孟峰 教授 (中央大學資訊工程學系) 合作

計畫簡介：

近代天文發展仰賴各種不同之大型望遠鏡的觀測資料，龐大的數據資料處理使天文學家必須與電腦科學家相互合作，建立資料庫以便處理與分析天文資料。師大地科的新設備-河外天文資料庫中心將計畫於2015年成為可以容納1Pb之河外天文學的專用資料庫。

天文資料庫的主要機能為提供龐大數據包含全天觀測與全波段觀測。為了擴大此資料庫的應用，快速的在不同的天文目錄下尋找相同的天體是必要之研究。其中一個解決方法是利用在天球之球面三角的層次細分(hierarchical subdivision)來尋找目標候選之天體。此種演算法(algorithms)是屬於四叉樹演算法(quadtree algorithm)，現今已廣泛運用在不同的天文資料庫中。

本研究計畫期望學生在暑假期間為資料庫完成 Hierarchical Triangular Mesh 之演算法。暑期學生將與其他學生，天文學家與電腦科學家一同研究並且發展師大河外天文資料庫之相關性能。

申請條件：

- 擁有良好英語能力之大三大四學生。
- Linux的經驗背景。
- 需要良好的程式語言能力(C or C++)
- 天文背景知識並不是必要條件。