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RADIO ASTRONOMY DATA ACQUISITION THROUGH HTTP REQUESTS

Abstract

Radio astronomy is a field that deals with recording astronomical objects in different radio frequencies. It often requires large and expensive instruments to achieve a high resolution which is particularly important for research purposes. Due to these criteria, individuals and research groups rely on different observatories worldwide for open-source data. The National Radio Astronomy Observatory's (NRAO) Very Large Array (VLA) in New Mexico contains 27 radio antennas in a Y-shaped configuration. It has a resolution ranging from 0.2 arcseconds to 0.04 arcseconds. The data from VLA are available based on different surveys, such as the Faint Images of the Radio Sky at Twenty-Centimeters (FIRST) and the NRAO VLA Sky Survey. The data from both surveys can be easily downloaded through their simplified webpage or access to their file transfer protocol (FTP) servers.

These resources to obtain data are an excellent choice for research needs as it is simple and quick. However, challenges arise when the data required are large in quantity. In this paper, we discuss the development and use of a simple tool called Radio Astronomy Data Acquisition Tool (RADAT) that makes it easy to obtain multiple radio sources from numerous surveys.

The python programming language is a popular choice among researchers given its ease of use and large packages available on the internet for astronomy-related research. The approach used to design RADAT is through a particular default library of python named requests and astronomy in a python package called Astropy.

RADAT makes utilization of the HTTP requests function, which is a library for Python. It makes a connection to the website of NRAO or FIRST through a URL. It then proceeds to fill in the necessary information in the forms and gathers the necessary data. The data obtained can be in either raw Flexible Image Transport System (FITS) or processed FITS files. The package Astropy collects these data and provides the completed file to the user. This file is saved in a manner that allows the user to use any FITS-compatible software for further processing. This process can be repeated over several files as per the user's requirement. This process can be automated for bulk files by creating an input file that contains the Right Ascension and Declination of radio sources, and the tool continues to download the files of the sources in the input file.