Session – 13 : The need for data structures
06-09-2019, 08:00 – 09:00 Hrs, RJN 302

The built in data types of C language are limited in the capability to hold the information we need while implementing different algorithms. Often there is a lot of book keeping. An appropriate data structure could make the implementation of an algorithm elegant.

It is possible to achieve the functionality of a good datastructure using feature of C language such as “struct”and “derived data types”. However, an object oriented language such as C++ offer more elegant implementation of data structures along with functions that work on objects and operator overloading that make the code closer to human readable forms. We shall use built in data structures in Python to discuss further on this.

Look at the code “qtree” given on the moodle page of this course for examples on implementing data structures.

Students are asked to install python and jupyter-notebook interface to be ready for the next few classes. While launching the `jupyter-notebook`, if there is any error about opening socket etc., then launch the jupyter-notebook with the option “`--ip=127.0.0.1`”. For every linux or unix machine, 127.0.0.1 is the IP address of the localhost that is the machine itself. This address is used by different utilities to talk to each other via the loopback interface.

That brings to the discussion on special IP addresses. Look at the following wiki page for a discussion on this.

`https://en.wikipedia.org/wiki/Reserved_IP_addresses`

When you connect your laptop to the WiFi using your phone as a hotspot, the point to point communication between your phone and your laptop will be using one of these private address ranges.

Similarly, when you launch a virtual machine for linux on top of your windows desktop, then your virtual machine communicates with the host computer using a virtual bridge adapter using a similar private address range.

If you directly connect your laptop to the institute WiFi then the IP address given by the DHCP server at the computer center can be looked at using the command “`ifconfig`”. Look at the string with four numbers that comes after “inet” in the output of this command to find out your IP address. There is a lot more information hidden in this output. Explore.

Homework:

[1] List out all the built-in data types of C and C++ language, the space they consume in the memory and their ability to represent information.

[2] Are there built in data types in Fortran that are not in C? Check out the complex number, for example and write about that.

[3] From what you can pick from Wiki pages, list out the built in data types in the languages Python, Sage and Octave. Comment on what needs to be programmed if you were to build up such a functionality in, say, C language.

[4] After you have installed jupyter-notebook and python, launch the notebook and watch out which port number the notebook server is running on. Can you also find out the process ID of this notebook server while it is running?

[5] From Wiki pages, list out what are the different languages that are supported by the jupyter notebook interface. Figure out what is meant by “markup syntax used in html or xml” and the “mark down” syntax of jupyter notebook.