Homework # 3 builds upon Homework # 2. Recall that in HW#2, our program reads the contents of datafile "CS531_Inet.txt". Each line in "CS531_Inet.txt" contains an IPv4 address and alias pair as shown below:

111.22.3.44 platte
131.250.95.21 jet
172.66.7.88 wabash
111.22.5.66 green
131.250.47.63 baker

As with HW#2, for this assignment, you will create your own test data files using the sample format. Grading will involve using different data files with the same format.

In HW#2, you were asked to construct a linked list of *address_t* structures, each of which contained the four integers of an IPv4 address along with a fifth component in which to store an associated alias of up to 10 characters. In this project, you will replace the linked list with a **Binary Search Tree** (BST).

Again, you will create a structure type called **address_t** similar to that used in HW#2, with the following modifications needed to convert the linked list to a BST.

```
struct address_t
{
    int octet[4];
    char alias[11];
    struct address_t *leftChild, *rightChild, *parent;
    int height, depth;

}
struct address_t *head = NULL;
```

As CS531_Inet.txt is being read in, the data will be stored in the BST composed of address_t structures containing the address/alias pairs read in from the file.

Once the BST has been created, the user will receive the following menu options (the same menu as in HW2).

1) Add address
2) Look up address
3) Update address
4) Delete address
5) Display list
6) Display aliases for location
7) Save to file
8) Quit

## Program Structure and Design

- displayList(), displayAliasesForLocation(), and saveFile() shall be based on **Inorder Traversal**.

- displayList() will display the alias, address, height, depth, and parent's alias for each node.

- deleteAddress(), lookUpAddress(), and displayAliasesForLocation() will display an error message if the alias (or location) entered is not listed. Following the error message, the menu will be redisplayed.

- A separate UDF will be defined for each menu option.

- No duplicate aliases or address are allowed. If attempted, display an appropriate error message followed by the menu.

- For this exercise, all aliases will be entered in lower case.

## Rubric (10 points}

- Is the source code well documented and formatted using clearly readable indentation and white space (while viewed within **vi**)? **1 point**

- Is the BST and associated recursion properly implemented? **2 points**

- displayList() must display the correct alias, address, height, depth, and parent's alias for each node in order to receive credit. **2 points**

- Does each menu option map to its own UDF, and is each UDF properly implemented? **5 points**

- 1 global variable may be used. Each additional global variable will cost 1 point

- **Note:** Your program must compile using gcc/unix in order to receive credit.

Based on the sample data discussed above, an example run of the program may look like:

    1) Add address
    2) Look up address
    3) Update address
    4) Delete address
    5) Display list
    6) Display aliases for location
    7) Save to file
    8) Quit

Enter menu option: **5**

```
baker     131.250.47.63 height:0  depth:3  parent:green
green     111.22.5.66    height:1  depth:2  parent:jet
jet       131.250.95.21 height:2  depth:1  parent:platte
platte    111.22.3.44    height:3  depth:0  parent: NONE
wabash    172.66.7.88    height:0  depth:1  parent:platte
```

(note that option 5 displays the list in alphabetical order, due to the inorder traversal)

Enter menu option: **6**

Enter Locality: **131.250**

Location: 131.250
baker
jet

Enter menu option: **2**

Enter alias: **platte**

platte: 111.22.3.44

Enter menu option: **1**

Enter IPv4 address: 131.250.42.18

Enter alias: barbara

Enter menu option: **5**

```
baker      131.250.47.63  height:1  depth:3  parent:green
barbara    131.250.42.18  height:0  depth:4  parent:baker
green      111.22.5.66    height:2  depth:2  parent:jet
jet        131.250.95.21  height:3  depth:1  parent:platte
platte     111.22.3.44    height:4  depth:0  parent: NONE
wabash     172.66.7.88    height:0  depth:1  parent:platte
```

Enter menu option: **6**

Enter Locality: **131.250**

Location: 131.250
baker
barbara
jet

Enter menu option: **8**

**Goodbye!**