Shiv Chandra Kumar
Program2:

Following is the step by step explanation of the design and method i have used for this program.

1. I implemented a Binary search tree using linked lists
2. I implemented methods for Insert, delete and search and make null methods in it.
3. i have created a method for search by city name that returns city coordinates which will then used by quad tree methods to search the record in quad tree.
4. there is also a remove data method which takes coordinates and city name as input and remove the data from the binary tree.
5. i am using all major functions which are to be called from main program as private and public methods both. I have used the method overloading concept to prevent the actual method and calling only the public method from the main function.
6. I implemented a quad tree separately in a class and using it in main function by creating an instance of the class.
7. for implementation of quad tree i used the plan explained in the program. I search for the quadrant to place the record of city and when an empty quadrant is found i am placing the data there.
8. on finding a internal node i am dividing i am dividing it in four quadrant and placing my city record(i.e. x and y coordinates and city name) in the correct coordinate.
9. i evaluate the quadrant beforehand and enter my data only after finding the correct argument.
10. on finding an existing record in the quadrant i am looking to fill my data i subdivide the quadrant again in four equal quadrants.(Northwestern, Northeastern,Southwestern, Southeastern). and then insert both the existing and new data simultaneously in the correct quadrant
11. the whole process is done recursively so as to minimize the time complexity of the program.
12. i used search of name of the city in quad tree when i have the coordinates and when i have city name i use Binary search tree for searching the coordinates.
13. I have used preorder traversal as for Quad tree Debug command as mentioned in the program assignment.
14. there are assumptions taken according to the programming assignment. Such as Northwestern quadrant starts with (0,0) and the range of the universal set is 0 to 2^14-1 on both x and y axis.
15. At last my program reads commands from the given input file and executes it one by one.
16. there was not much scope to write in length about the design decisions as it should be with in one page. so above is my brief explanation.