Searching algorithm in python

Searching is used to find the location where an element is available. There are two types of search techniques. They are:

1. Linear or sequential search
2. Binary search

Linear Search

This is the simplest of all searching techniques. In this technique, an ordered or unordered list will be searched one by one from the beginning until the desired element is found. If the desired element is found in the list then the search is successful otherwise unsuccessful.

Example

Suppose we have the following unsorted list.

Elements	90	70	80	10	50	20	40	30	100	60
Index	0	1	2	3	4	5	6	7	8	9

Searching different elements is as follows:

1. Searching for x = 40 Search successful, data found at 6^{th} position.

2. Searching for x = 90 Search successful, data found at 0^{th} position.
3. Searching for x = 55 Search un-successful, data not found.

Example	Output

def linear_search(item):
  pos = 0
  list=[90,70,80,10,50,20,40,30,100,60]
  for i in list:
  if i == item:
  print 'element is found at index',pos
  else:
  pos = pos + 1
 	
linear_search(40)
linear_search(90)
	element is found at index 6
	element is found at index 0

Binary Search

The binary search approach is different from the linear search. The binary search technique is used to search for a particular element in a sorted array or list. In this technique, two partitions of lists are made and then the given element is searched and hence, it is known as binary search.

Example

Suppose we have the following sorted list.

Elements	10	20	30	40	50	60	70	80	90	100
Index	1	2	3	4	5	6	7	8	9	10

The number of comparisons required for searching different elements is as follows:

If we are searching for x = 20: (This needs 2 comparisons)
low = 1, high = 10, mid = 11/2 = 5, check 50
low = 1, high = 4, mid = 5/2 = 2, check 20,found

If we are searching for x = 80: (This needs 2 comparisons)
low = 1, high = 10, mid = 11/2 = 5, check 50
low = 6, high = 10, mid = 16/2 = 8, check 80,found

Example	Output

def binary_search(x):
list = [10,20,30,40,50,60,70,80,90,100]
l=0
r=len(list)-1
while l <= r:
mid = (l +r)/2;
if list[mid] == x:
	Element is found at index 1
	Element is found at index 7

```
            print 'Element is found at index',mid
            return 0
        elif list[mid] < x:
            l = mid + 1
        else:
            r = mid - 1
binary_search(20)
binary_search(80)
```