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|  | **Manav Rachna University** |
| **Lab Assignment 0** |
| **Subject:** Analysis and Design of Algorithms **Subject Code**: **CSH204B**  **Semester: III** | |

**Learning Objective:** Students would be Able to implement searching algorithms

**Learning Outcome:** To implement the search algorithms and calculate time complexity

1. Implement recursive binary search and linear search and determine the time required to search an element.

Code:

# 1.  Implement linear search and determine the time required to search an element.

import time

import random

def linear\_search(arr, x):

    for i in range(len(arr)):

        if arr[i] == x:

            return i

    return -1

arr = [1, 2, 3, 4, 5, 6, 7, 8, 9]

x = 1

start = time.time()

result = linear\_search(arr, x)

end = time.time()

execution\_time = (end - start)\*1000000

print("Execution Time: ", execution\_time)

# 2.  Implement recursive Binary search and determine the time required to search an element.

import time

def binary\_search(arr, left, right, target):

    if left <= right:

        mid = left + (right - left) // 2

        if arr[mid] == target:

            return mid

        elif arr[mid] > target:

            return binary\_search(arr, left, mid - 1, target)

        else:

            return binary\_search(arr, mid + 1, right, target)

    return -1

arr = [1, 3, 5, 7, 9, 11, 13, 15, 17, 19]

target = 7

start\_time = time.time()

result = binary\_search(arr, 0, len(arr) - 1, target)

end\_time = time.time()

time\_taken = (end\_time - start\_time)\*1000000

if result != -1:

    print(f"Element found at index {result}")

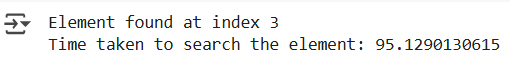
else:

    print("Element not found")

print(f"Time taken to search the element: {time\_taken:.10f}")

Output:





1. Implement recursive linear search and determine the time required to search an element.

Code:

# Implement recursive linear search and determine the time required to search an element.

import time

def recursive\_linear\_search(arr, x, index=0):

    if index >= len(arr):

        return -1

    if arr[index] == x:

        return index

    return recursive\_linear\_search(arr, x, index + 1)

arr = [1, 2, 3, 4, 5, 6, 7, 8, 9]

x = 1

start = time.time()

result = recursive\_linear\_search(arr, x)

end = time.time()

execution\_time = (end - start) \* 1000000

print("Execution Time:", execution\_time, "microseconds")

Output:

