Experiment No.1:- Binary Search

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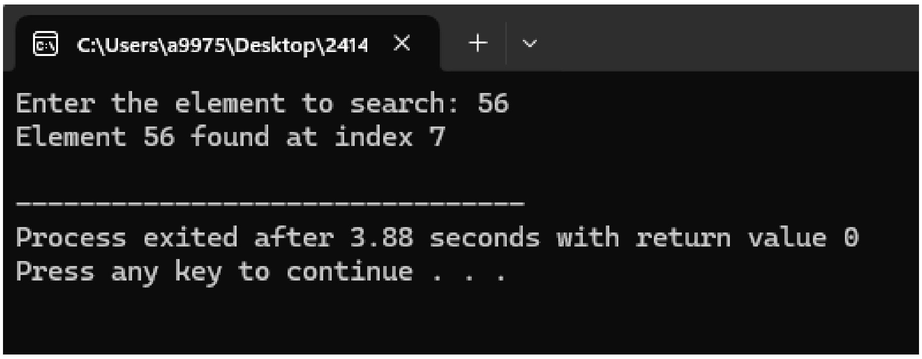
Program:-

```
#include <stdio.h>

int binarySearch(int arr[], int low, int high, int key) {

  if (low > high) {

    return -1;

  }

  int mid = (low + high) / 2;

  if (arr[mid] == key)

    return mid;


  else if (arr[mid] > key)

    return binarySearch(arr, low, mid - 1, key);

  else

    return binarySearch(arr, mid + 1, high, key);

}

int main() {

  int arr[] = {2, 5, 8, 12, 16, 23, 38, 56, 72, 91};

  int n = sizeof(arr) / sizeof(arr[0]);

  int key;

  printf("Enter the element to search: ");

  scanf("%d", &key);

  int result = binarySearch(arr, 0, n - 1, key);

  if (result != -1)

    printf("Element %d found at index %d\n", key, result);

  else

    printf("Element %d not found in the array\n", key);
    return 0;
}
```

Output:-

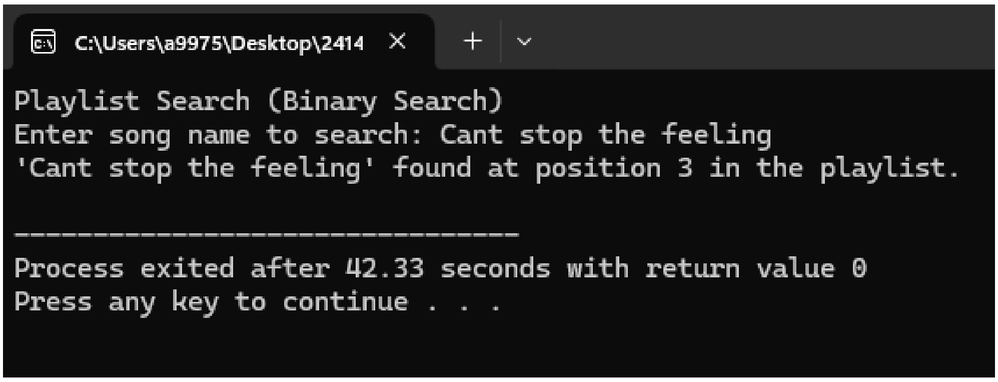


```
Enter the element to search: 56
Element 56 found at index 7

--------------------------------
Process exited after 3.88 seconds with return value 0
Press any key to continue . . .
```

Application:-

```
#include <stdio.h>
#include <string.h>
int binarySearch(char playlist[][50], int n, char key[]) {
    int low = 0, high = n - 1;
    while (low <= high) {
        int mid = (low + high) / 2;
        int res = strcmp(key, playlist[mid]);
        if (res == 0) {
            return mid;
        }
        else if (res > 0) {
            low = mid + 1;
        }
        else {
            high = mid - 1;
        }
    }
    return -1;
}
int main()
{
    char playlist[][50] = {
        "Aashiqui",
        "Bahubali",
        "Cant stop the feeling",
        "Dil Diya Gallan",
        "Gabriela",
        "Piya Ore Piya",
        "Swalla",
        "Tera Ban Jaunga",
        "Zingaat"
    };
    int n = sizeof(playlist) / sizeof(playlist[0]);
    char key[50];
    printf("Playlist Search (Binary Search)\n");
    printf("Enter song name to search: ");
    gets(key);
    int result = binarySearch(playlist, n, key);
    if (result != -1)
        printf("'%s' found at position %d in the playlist.\n", key, result + 1);
    else
        printf("'%s' not found in the playlist.\n", key);
    return 0;
}
```

Output:-



```
Playlist Search (Binary Search)
Enter song name to search: Cant stop the feeling
'Cant stop the feeling' found at position 3 in the playlist.

--------------------------------
Process exited after 42.33 seconds with return value 0
Press any key to continue . . .
```

List Of Applications:-

1. Finding a song in sorted playlist.
2. Searching in a sorted array
3. Finding the first occurrence of an element
4. Finding the last occurrence of an element
5. Finding the square root of a number
6. Searching in an infinite (unbounded) sorted array
7. Finding a peak element
8. Finding the rotation count in a rotated sorted array
9. Finding the minimum element in a rotated sorted array
10. Finding the maximum element in a rotated sorted array
11. Binary search on answer (parametric search)
12. Searching in a 2D matrix
13. Finding the position to insert an element
14. Finding floor or ceiling of a number
15. Finding missing or duplicate elements in a sequence
16. Finding transition point in a binary array (0s and 1s)