Student Accommodation Management System

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GitHub link : https://github.com/AtharvaKulkarniIT/VIT_Student_Accomodation-in-c/tree/main

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Abstract- The "Student Accommodation Management System" project is a C language implementation of the hostel room allocation process held in colleges over the country. The system allocates the available rooms according to the academic performance of the students mainly their CGPA. A rank list of students in every branch is displayed and the toppers of each branch are given an NCGPA (Normalised CGPA) rank of 1. The students are then sorted into descending order of their CGPA and given the corresponding NCGPA rank. The counseling procedure, takes into consideration only the NCGPA rank and uses it to allocate the rooms. The desired output shall be a combined list of students from all branches alongwith their NCGPA's followed by a user – friendly counselling procedure and room allotments.

Keywords- Hash Tables, Queues, FIFO (First In First Out), Linked List, Data Structures.

I. INTRODUCTION

In this project, we choose and implement a NCGPA list for every student branch in a "Hash Table" and then generate a rank list for all the students in the university and then they will come in a queue according to their rank and select the room which they desire accordingly.

$$NCGPA = \frac{(CGPA\ of\ the\ Student\ ) * Group\ Topper\ CGPA)}{Branch\ Topper\ CGPA}$$

The branches are represented by a hash table each andthe specific branch hash table consists of the classes of the given branches. Then the students are related to the given class by chaining through a given hash function.

The allotment is based on the queue concept. Here, we have used data structures like queue, hash tables, linked lists, etc.

II. METHODOLOGY

A. *OBJECTIVE OF THIS PROJECT :*

- To study in detail, applications of hash tables, queues and their implementationusing linked list.
- To provide a hassle – free and a compactsolution for the hostel counselling procedure in VIT.

III. DATA STRUCTURES

In this project, data structures such as linked lists, hash tables, queue etc. are used. This research mainly deals with the aforementioned data structures in detail.

A. *LINKED LISTS*

A linked list is a set of dynamically allocated nodes, arranged in such a way that each node contains one value and one pointer. The pointer always points to the next member of the list. If the pointer is NULL, then it is thelast node in the list. A linked list is formed when many such nodes are linked together to form a chain. Each node points to the next node present in the order. The first node is always used as a reference to traverse the list and is called HEAD. The last node points to NULL.

B. *HASH-TABLE*

Hashing is a technique that is used to uniquely identify a specific object from a group of similar objects. An example of how hashing is used is, in universities, each studentis assigned a unique roll number that can be used to retrieve information about them.

In hashing, large keys are converted into small keys by using **hash functions**. The values are then stored in a data structure called **hash table**.

The idea of hashing is to distribute entries (key/value pairs) uniformly across an array. Each element is assigned a key (converted key). By using that key you can access the element in **O(1)** time. Using thekey, the algorithm (hash function) computes an index that suggests where an entry can be found or inserted.

In many situations, hash tables turn out tobe on average more efficient than search trees or any other table lookup structure. For this reason, they are widely used in many kinds of software, particularly for associative arrays, database indexing, caches and sets.

C. QUEUES

Queues are data structures that follow the **first in first out (FIFO)** i.e. The first element that is added to the queue is the first one to be removed. It is a linear data structureand an abstract data type. Elements are always added to the back and removed from the front.Think of it as a line of people waiting for a bus.The person who is at the beginning of the line is the first one to enter the bus.

IV. ALGORITHMS

A. SORTING DATA

This project deals with Hostel Room Allotmentto students on basis of their ranks obtained. Hence it is necessary to sort the data of students according to their NCGPA to get a sorted rank list. There are many sorting algorithms available but to handle a huge and a large data set, an optimized and efficient algorithm is requiredwhich reduces the time complexity.
Merge Sort is often preferred for sorting alinked list. The slow random-access performanceof a linked list makes some other algorithms(such as quicksort) perform poorly, and others (such as heapsort) completely impossible.

Following is the Pseudo-code:

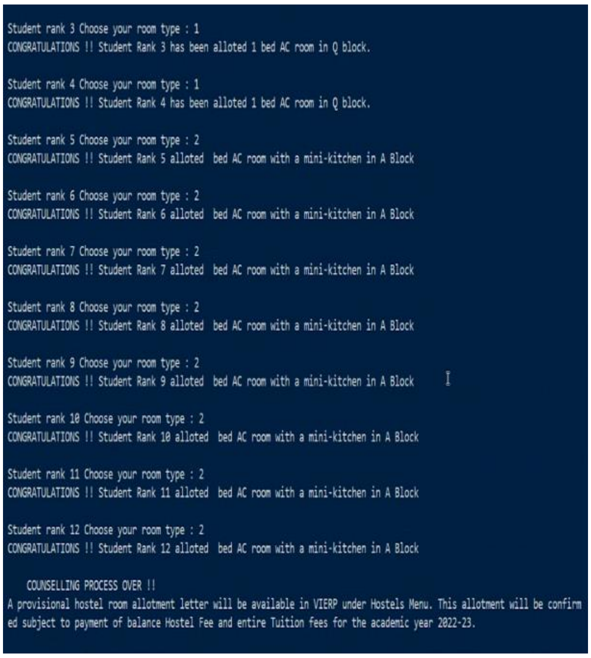
```
struct node
{
       int data;
       struct node* next;
};

void Merge_Sort(struct node
**headref)
{
       struct node* head =
       *headref;struct node
       *a;
       struct node *b;
       if(head==NULL || head-
              >next==NULL)return;

       /*Split the linked list
       into twoequal
       sublists.*/
       FrontBackSplit(head, &a,
       &b);

       //Sort the
       two halves
       Merge_Sort(&a
       );
       Merge_Sort(&b
       );

       /*Merge the sorted first
       half and second half,
       recursively and updatethe
       head pointer*/
       Merge(a,b);
}

struct node* Merge(struct node* a,
                           struct
                           node* b)
{
       struct node*
       result=NULL;
       if(a==NULL)
              r
       eturn b;
       if(b==NU
       LL)
          return a;
        if(a->data <=
          b->data)
    {
              result=a;
              result->next=Merge(a-
              >next,b);
       }
       else
       {
              result=b;
              result->next=Merge(a,b-
              >next);
       }
       return result;
}
```

V. RESULTS

Our system is efficient in doing the required tasks and use of different data structures catered to this. An user-friendly system is obtained for student accommodation which accommodates students according to their NCGPA.

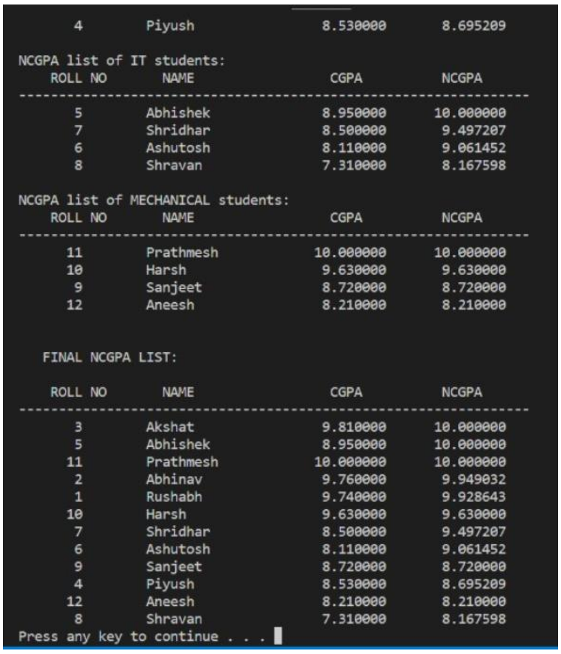
Following are some snapshots of our system:

- Room allocation:



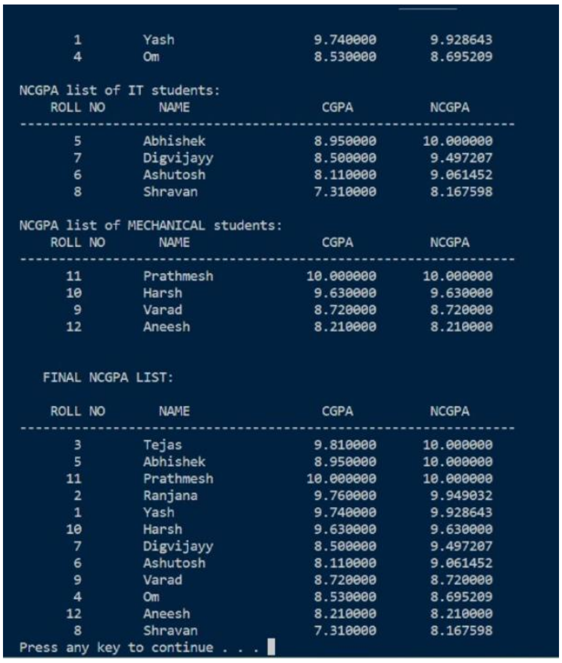
```
Student rank 3 Choose your room type : 1
CONGRATULATIONS !! Student Rank 3 has been alloted 1 bed AC room in Q block.

Student rank 4 Choose your room type : 1
CONGRATULATIONS !! Student Rank 4 has been alloted 1 bed AC room in Q block.

Student rank 5 Choose your room type : 2
CONGRATULATIONS !! Student Rank 5 alloted  bed AC room with a mini-kitchen in A Block

Student rank 6 Choose your room type : 2
CONGRATULATIONS !! Student Rank 6 alloted  bed AC room with a mini-kitchen in A Block

Student rank 7 Choose your room type : 2
CONGRATULATIONS !! Student Rank 7 alloted  bed AC room with a mini-kitchen in A Block

Student rank 8 Choose your room type : 2
CONGRATULATIONS !! Student Rank 8 alloted  bed AC room with a mini-kitchen in A Block

Student rank 9 Choose your room type : 2
CONGRATULATIONS !! Student Rank 9 alloted  bed AC room with a mini-kitchen in A Block

Student rank 10 Choose your room type : 2
CONGRATULATIONS !! Student Rank 10 alloted  bed AC room with a mini-kitchen in A Block

Student rank 11 Choose your room type : 2
CONGRATULATIONS !! Student Rank 11 alloted  bed AC room with a mini-kitchen in A Block

Student rank 12 Choose your room type : 2
CONGRATULATIONS !! Student Rank 12 alloted  bed AC room with a mini-kitchen in A Block

   COUNSELLING PROCESS OVER !!
A provisional hostel room allotment letter will be available in VIERP under Hostels Menu. This allotment will be confirm
ed subject to payment of balance Hostel Fee and entire Tuition fees for the academic year 2022-23.
```

- Student Details:



```
       4        Piyush                8.530000      8.695209

NCGPA list of IT students:
    ROLL NO        NAME                  CGPA          NCGPA
-----------------------------------------------------------------
       5        Abhishek              8.950000     10.000000
       7        Shridhar              8.500000      9.497207
       6        Ashutosh              8.110000      9.061452
       8        Shravan               7.310000      8.167598

NCGPA list of MECHANICAL students:
    ROLL NO        NAME                  CGPA          NCGPA
-----------------------------------------------------------------
      11        Prathmesh            10.000000     10.000000
      10        Harsh                 9.630000      9.630000
       9        Sanjeet               8.720000      8.720000
      12        Aneesh                8.210000      8.210000


   FINAL NCGPA LIST:

    ROLL NO        NAME                  CGPA          NCGPA
-----------------------------------------------------------------
       3        Akshat                9.810000     10.000000
       5        Abhishek              8.950000     10.000000
      11        Prathmesh            10.000000     10.000000
       2        Abhinav               9.760000      9.949032
       1        Rushabh               9.740000      9.928643
      10        Harsh                 9.630000      9.630000
       7        Shridhar              8.500000      9.497207
       6        Ashutosh              8.110000      9.061452
       9        Sanjeet               8.720000      8.720000
       4        Piyush                8.530000      8.695209
      12        Aneesh                8.210000      8.210000
       8        Shravan               7.310000      8.167598
Press any key to continue . . .
```

- NCGPA List according to CGPA:



```
       1        Yash                  9.740000      9.928643
       4        Om                    8.530000      8.695209

NCGPA list of IT students:
    ROLL NO        NAME                  CGPA          NCGPA
-----------------------------------------------------------------
       5        Abhishek              8.950000     10.000000
       7        Digvijayy             8.500000      9.497207
       6        Ashutosh              8.110000      9.061452
       8        Shravan               7.310000      8.167598

NCGPA list of MECHANICAL students:
    ROLL NO        NAME                  CGPA          NCGPA
-----------------------------------------------------------------
      11        Prathmesh            10.000000     10.000000
      10        Harsh                 9.630000      9.630000
       9        Varad                 8.720000      8.720000
      12        Aneesh                8.210000      8.210000


   FINAL NCGPA LIST:

    ROLL NO        NAME                  CGPA          NCGPA
-----------------------------------------------------------------
       3        Tejas                 9.810000     10.000000
       5        Abhishek              8.950000     10.000000
      11        Prathmesh            10.000000     10.000000
       2        Ranjana               9.760000      9.949032
       1        Yash                  9.740000      9.928643
      10        Harsh                 9.630000      9.630000
       7        Digvijayy             8.500000      9.497207
       6        Ashutosh              8.110000      9.061452
       9        Varad                 8.720000      8.720000
       4        Om                    8.530000      8.695209
      12        Aneesh                8.210000      8.210000
       8        Shravan               7.310000      8.167598
Press any key to continue . . .
```

VI. CONCLUSION

The idea of this project is to create a hassle – free and a user-friendly environment for the accommodation of the student based on their grades and thereby ranks obtained. The data structures used in this project and algorithms implemented are done taking into considering the required operations to be done in such a system.

- The project is based on the allotment of hostel rooms based on the NCGPA of the students of different branches.
- Separate hash tables have been used to represent different branches and each part of the hash table is a slot (morning/evening).
- All the records in the different hash tableswere merged and sorted to obtain the finallist based on their NCGPA.
- After this, the students are arranged in a queue on the basis of their NCGPA rank.
- After final list is created, they arearranged in a queue which follows FIFO concept, the first element (student) coming out of the queue will select the room and the and the element is deleted from the queue.