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Management System

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Abstract - Hostel Management System is an application which is developed for managing different activities in the hostel. This project is expected to restrict human work and make hostel allocation easier for student and hostel administrators with the help of a web application[3]. For room allocation, Genetic Algorithm is used which allocates room to the students as per their preferences. Also, the web application consists of a generation of QR Codes which can be used by the students to scan it while leaving/entering the hostel premises. And the same can be used in mess also. Students will get opinion notices in their mails which informs parents/ guardians about their ward's presence in the hostel and their curricula. The student can lift leave requests and cleaning issues to the warden. The warden can update the student records and daily roll call list. The fees details and the due of the student can also be verified using this QR database management and interrogate method. The students can fill their online feedback using this application which will allow only the students to access their account and also provide security. All these prominent features make our system more smarter and efficient.

Key Words: Hostel Management, Room allocation System, Particle Swarm Optimization, QR Based Check-in Check-out, QR Based Mess System.

1.INTRODUCTION

Hostel is a place which is like a second home for the people who live outside the home. They feel safe while living in a hostel [4]. To manage the data and information of the person who is living in the hostel is a very tidy task. It needs a lot of time for many people who are managing it. QR Code Based Hostel Management System helps in keeping the track of workflow in the hostel. The hostel staff will keep the record of hostellers and hence help in reducing the work of the staff. The QR Code Based Hostel Management System will work and update the hostellers records, guest record and hostellers fees record, hostellers attendance record and room records, mess billings and admission process. This system automatically calculates the hostel fees, mess fees etc.

It manages the student information, room information, room allocation details, fees details, mess bill details and staff details of the hostel. It is also used to generate reports of student details, fee details and mess bill details of the student. It keeps track of the number of students in the room and availability of the room with the help of a QR scanner through check in check out. It helps organization from the manual work which is very difficult to find the record of the students and the mess bills of the students.

We have used angular for frontend, Flask for backend, Figma tool for creating UI's and MySQL for Database.

2. LITERATURE REVIEW

A. Automated Scheduling of Hostel Room Allocation Using Genetic Algorithm [1]:

In this paper, Room Allocation is done using Genetic Algorithm. A GA is a stochastic search algorithm which can be used for a variety of combinatorial optimization problems. GA is also known as nature inspired algorithm for the reason that the steps in GA are based on the evolutionary process of biological organisms. GA simulates the evolutionary process of biological organisms by generating individuals randomly that form up an initial population.

B. An Automatic Hostel Space Allocation System [2]:

This research paper deals with problems encountered in the allocation of hostels to students manually in colleges. This work designs a system that is capable of managing a database which will automatically allocate space (Hall and Room) to students. The proposed system will automatically allocate rooms, and roommates by taking certain criteria into consideration and also keeps proper records of all the vacant rooms. This automatic allocation method was developed using tools such as HTML, JavaScript, CSS, PHP, and MySQL.

C. Hostel Management System [3]:

This research study paper addresses problems encountered in the tracking of students while entering and leaving hostel premises with the help of Radio Frequency Identification (RFID) technology. RFID helps us to track any item or thing or a human being by implementing it in a correct way and also helps to save time without the involvement of human work. This Hostel Management System was developed using tools such as HTML, JScript, CSS, PHP, and MySQL.

D. Online Hostel Management [4]:

In this research paper, they created a framework using PHP and MySQL which helped in building up the Online Hostel Management System. It reduces the efforts made by the hostel staff while managing the hostel. It removes the pen and paper idea which has been utilized by staff before. The created framework gives solutions for manual hostel administration problems and further gives data for example hostel information, hostel room data, and hostel accounts data. It is an online site so anybody can get to it from anywhere with no unpredictability with the assistance of a working web association.

E. A Review on QR Code Analysis [5]:

In this paper authors give a on Quick Response Code. QR Code is the short form of Quick Response Code, specifies that the code contents need to be decoded rapidly at excessive speed. QR code is an optical tag that may be studied via means of device with statistics at the related product or item. A QR Code is a two-dimensional code which could store information statistics and is designed to be studied via means of smartphones. Data is retrieved via means of taking pictures of the code using a digital digicam and processing the picture with a QR reader. The main comparison among the QR code and Barcode is the quantity of statistics they are able to shop or share. A QR Code can shop the identical quantity of statistics accommodated in a 1-D Barcode in one-tenth the space. The code consists of modules prepared all through a rectangular sample with white background.

3. Proposed Work/Methodology

3.1 System architecture

The system architecture is given in Figure 1.

Authorized users of different modules i.e Admin, Student, Secretory, Security, Mess Staff, Warden are allowed to login and view their profile.

3.2 A. Administrator:

• **Rooms:** This page has many functionalities like

users can add rooms, allot rooms to the students, view room allotment and change or update the rooms.

• **Staff Member:** Only the administrator has the authority to add and manage Staff members.

• **Student:** Users can add and manage students.

• **Staff and Student Profiles:** Users can view and update staff and student profiles.

• **Reports:** In reports users can approve or reject the applications of students regarding their complaints, outpasses and so on. Also, they can generate

reports on mess bills, hostel bills. Generate reports regarding students and send those reports to the parents.

B. Secretary:

• View Student Profile: User can view student profile and information. Also Users can add and manage students.

• **Rooms:** This page has various functionalities. Here users can allot rooms to the students, view room allotment.

C. Security:

• **Generate QR:** Users can generate QR code and provide them to students for scanning.

D. Mess:

• **Edit:** Mess_Staff will have access to edit/update the food menu of breakfast, lunch or dinner.

• **Generate QR:** Users can generate QR code and provide them to students for scanning.

E. Warden:

• **Hostel Information:** Warden will be able to see all the hostel details like total wings and total students living in a particular room.

• Leave Approval: Warden will be able to see all the Leave applications of the security, mess_staff and he/she can approve or reject it.

F. Student:

• **Complaint Registration:** Students can register Complaints regarding various hostel facilities like furniture, electrical, plumbing, others. Once confirmed, students will get a mail notification from the warden or administrator.



• Outpass Application: Students can also apply for outpass required to go for an outing from the college. Once confirmed, students will get a mail notification from the warden or administrator.

• Outpass Log: In this function users(students) can view their logs regarding outpass status.

• **Complaint Log:** In this page, students can view their logs regarding complaint status.

• Scan QR code: Users can scan QR code for Check-in , Check-out and for Mess.

G. Automatic Room Allocation:

After Verification of students is done, students are allocated rooms in the hostel Automatically according to their preferences.

H. QR Code System:

QR code can be generated by the system and be scanned by students for Check-in and check-out through the system. All the details like student name, time, day, date are stored in the database.

3.3 Machine Learning Technique Genetic Algorithm (GA)

Genetic Algorithm (GA), it is a method for solving both constrained and unconstrained optimization problems that is based on selection, the process that drives on the concept of biological growth. GA repeatedly modifies a population of individual solutions. At each generation GA selects individuals from the current population to be parents and uses them to produce childrens for next generation. GA is an adaptive stochastic search algorithm which is based on evolutionary biological ideas of parent selection, crossover and mutation.



Fig. 2 Simplified flow of Genetic algorithm

The evolution starts with an initial population of completely random individuals and moves through numerous generations searching for an optimal solution. During each generation, fitness of each individual is evaluated, multiple individuals are statistically selected from the current population, and are mutated to form a new population, which now becomes the current population in the next iteration of the algorithm. GA offers fitness improvements in every generation. GA has been applied to a wide range of issues. We have applied GA to allocate rooms to students based on their constraints. This involves allocation of students under each category into a floor and room within the hall.

Constraints

Hostel Room Allocations have their own constraints pressed by the requirements of the system. These imposed constraints need to be satisfied in order to achieve the overall goal of the allocation process. We have classified the constraints into two parts which are hard and soft constraints. Hard constraints are to be abided strictly during the allocation process while soft constraints may not be strictly enforced but sometimes with necessary penalty. The different set of constraints falls under these two categories. Hard constraints are more important as a result of some administrative considerations and must be strictly enforced. For example, students who have health related issues must be allocated at ground floor. Thus certain categories of students must be allocated to certain floors. It should be noted that male and female can not be allocated in the same room or hostel.

Other requirements classified as hard constraints are: (1) all Foreign students(Fo) category must be accommodated, (2) allocation of all Health related students(Hi) due to their health status, (3) Hi must be allocated to the lowest floor possible in the given hall, (4) all allocated First Year students(FE) should be allocated to the First floor possible in the given hostel, (5) all allocated Final Year students(BE) should be allocated to the highest floor possible in the given hostel, (6) all other students(SE, TE) must be allocated in floors between FE and BE

Other requirements considered as soft constraints are: (1) as many BE and FE as possible are offered accommodation, and (2) as many SE and TE as possible should be offered accommodation.

Fitness Evaluation

The fitness value of an individual in a population is computed as a measure of the degree of satisfaction of given constraints that has a major role in allocation. The degree of satisfaction is calculated as a combined factor of rooms allocated and weights assigned to conflicting constraints. These two are used in calculating the fitness value of the individual (current allocation). The fitness values are a set of $f = \sum w_{e} u_{e} \in [0, 1]$

numbers in range 0 to 1 $f = \sum_{q} w_{q} u_{q} \in [0, 1]$

This is a mathematical formula for calculating fitness function.

wq is the weight assigned to constraint q u is utilization factor



Operators

Initial population is generated randomly for each category of students. During successive generations, a proportion of existing populations are selected to generate a new population set. We used Tournament Selection. The individual solutions are selected by first selecting 3 random individuals and selecting the fittest individual as a parent. This algorithm is selected to allow the selection of a small proportion of less fit individuals for making room for diversity and to prevent premature convergence. The fitness values of all individuals are sorted in reverse order. The sorted fitness values are summed to calculate the cumulative fitness of each solution as well as the total fitness of the entire population.

The crossover of selected parents is done for each category of students based on a generated random number, in the interval [0, 1]. If a randomly generated value is less than 0.5, then the first child inherits the allocation of the category from the first parent while the second child inherits from the second parent, and vice versa.

Mutation depends on a specific mutation rate and a randomly generated value . The best mutation rate is in the range of 0 to 0.1

4. Results and Discussion

> Generation #56	25) H2_101 sdt002 Fe Fe
1) H1 001 cd+001 Hi Hi	26) H2_101 sdt005 Fe Fe
2) H1 001 cd±003 Hi Hi	27) H2_101 sdt006 Fe Fe
3) H1 001 cd+004 Hi Hi	28) H2_102 sdt034 Fe Fe
4) H1 002 - ++050 H: H:	29) H2 102 sdt036 Fe Fe
4) H1_002 S01030 H1 H1	30) H2 201 sdt008 Se Se
5) H1_101 Sal007 Fe Fe	31) H2 201 sdt010 Se Se
6) H1_101 Sat011 Fe Fe	32) H2 201 sdt012 Se Se
7) H1_101 Sdt014 Fe Fe	33) H2 202 sdt032 Se Se
8) H1_201 sdt017 Se Se	34) H2 202 sdt033 Se Se
9) H1_201 sdt020 Se Se	35) H2 202 sdt043 Se Se
10) H1_201 sdt021 Se Se	36) H2 203 sdt044 Se Se
11) H1_301 sdt024 le le	37) H2 301 sdt016 Te Te
12) H1_301 sdt02/ le le	38) H2 301 sdt018 Te Te
13) H1_301 sdt030 Te Te	39) H2 301 sdt019 Te Te
14) H1_302 sdt035 Te Te	40) H2 302 sdt029 Te Te
15) H1_401 sdt040 Be Be	41) H2 302 sdt031 Te Te
16) H1_401 sdt042 Be Be	42) H2 302 sdt041 Te Te
17) H1_401 sdt048 Be Be	43) H2 303 sdt046 Te Te
18) H1_402 sdt049 Be Be	44) H2 403 sdt022 Be Be
19) H2_001 sdt009 Hi Hi	45) H2 403 sdt023 Be Be
20) H2_001 sdt013 Hi Hi	46) H2 403 sdt025 Be Be
21) H2_001 sdt015 Hi Hi	47) H2 404 sdt026 Be Be
22) H2_002 sdt037 Hi Hi	48) H2 404 sdt028 Be Be
23) H2_002 sdt038 Hi Hi	49) H2 404 sdt039 Be Be
24) H2_002 sdt047 Hi Hi	50) H2 405 sdt045 Be Be

Fig.3 Students Allocated using Genetic Algorithm

These were the sample datasets which were used during the implementation of Genetic Algorithm. We created a random population using the dataset provided and implemented GA. After 56 generations, we get the output as shown in fig 3.



Fig. 4 Admin Login

		Username Password		
			GET STARTED	_
S 8.	TUDENT			
	Fig. 5 Studer	t Log	in	
Plani	Student Information			HELLO, MAHESH GILBILE I 🗟
品	MAHESH SURESH GILBILE			ADDRESS Aumbai

800	MAHESH SURESH GLBILE	ADDRESS Mumbai
689 ()	🕍 01 JANUARY 2000 💦 MALE	Computer Engineering
٢	mahesh@gmail.com	
(1)	SS 869193828	CHECK IN /OUT
œ		

Fig. 6 Mahesh (Student)

fillori	Room Details			HELLO, MAHESH GILBILE ! 💈
88	191			
ŝ	ROOM NUMBER > 1	Star Wing		
向	NIKHIL SHRIRAM PATIL	9135789879	nikhil@gmail.com	
@	OMKAR SANJAY PATIL	9967178705	omkar@gmail.com	
- GD				
\leftarrow				

Fig. 7 Mahesh's Roommates



Fig. 8 Mess login



Fig. 9 QR Code generated for students by Mess Staff



Fig. 10 Student Scans the code while entering to mess

Plai	Mess Today's History			
盎	Today's Date :-			
0:0 000	MAHESH SURESH OILBILE	22:44:41	Dinner	
Ô				
£]				

Fig. 11 Mess History

Ruai	Leave Information
88	Ramesh Patil Secretory From 1234 To 1234
	Winn a Lever For 3 Days Reason - Here Reason
2	Ramesh Patil Secretory From 1234 To 4321
	Winn a Lever For 4 Days Reason - 1 Very Reason - 1 Very Reproved Decision Taken By Admin Maheah
	Ramesh Patil Scoretory From 2022 04-10 To 2022 04-12
	Want a Leave For 3 Days Reason - Admash Decision Taken By Admin Makeuh Surveh Oblike

Fig. 12 Leave Module

5. CONCLUSION

The project "QR Code Hostel Management System" limits human work and makes hostel allocation easier for student and much hostel administrators. It contains a Machine Learning approach that includes the implementation of Genetic Algorithm(GA) to carry on with hostel room allocation problems. Results obtained from the experiments conducted show the feasibility of the proposed approach in dealing with the problem. However, improvements can still be made in the future to increase the total performance of the proposed approach by tuning the GA components and parameters such as encoding method, crossover method, mutation method, crossover rate, mutation rate, population size, etc.

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