Online Room Allocation Portal

IIT (BHU)

Problem Statement

This project is primarily aimed at bringing about automation in the hostel and room allocation process for the students residing in our institute. In this project, we propose as well as implement a hostel management system, which features automated allocation of rooms to the students of various branches residing in our institute. The present system is very hectic for both wardens and the students. Hours are wasted waiting in a queue for hostel registration. The management of students by wardens is also done on paper which is quite a laborious task and leads to lot of delay and errors. We, thus, aim to modify this procedure by completely shifting the process of hostel allocation to an online portal. This portal will be available to students from anywhere and they can register in hostels assigned to them very easily. The management work would also become less tedious as wardens could update status of students (like no dues status) with single click and errors could be corrected at a short notice.

Besides, the database system will also maintain records of hostels' features like no. of rooms, warden records, staff records etc.

Present scenario:

At present, the hostel allocation system followed in our institution is very random and a lot of time is lost in the process. Following outlines the registration process and problems associated:

- The students are supposed to be present many days earlier at the campus so as to get rooms of their desired choice and with desired partners. Thus, people who live far like in south India have to waste lot of their holiday so that they can get a room.
- Some students who do summer internships may not get a room at all as the records of the rooms are not maintained properly.
- There is a lot of mismanagement as many times cases occur wherein a branch is not allotted required number of rooms.
- The system of first come first serve followed for hostel allocation may seem simple but is not perfect.
- A lot of paper work is required to be done during shifting of hostels which wastes a lot of time of both students and the warden and staffs.
- Miscommunication between hostel warden and students causes undue and unwanted delay.
- During shifting of hostels each year, the students are unaware of the rules of hostels as well as the workflow in the hostels.
- The mess management is all done manually and thus creating list of no dues may have errors.
- Since the staff records of the hostel are not present on any notice board or any forum, there is always a risk of security breach such as thefts.

Client Requirements

Our clients many comprise of students and wardens managing the hostel allocation procedure. The automation has to be done in such a way that minimum effort is required for allocation of hostels each year. The wardens are supposed to manage the registrations of students to hostels, which can become really time consuming. Following is a list of requirements we aim to fulfill through our online portal for hostel allocation.

STUDENT REQUIREMENTS

- Students require an online system to register to hostel.
- A proper framework or mechanism should be designed so that all the students have a fair chance in the room selection process.
- The students should be allowed to choose their partners based on compatibility.
- The paperwork to be performed by students should be minimal.
- Most of the process should be such that one can register get allocated a room while he is at his home during the summer breaks.
- The student must have access to the profile of each of the staff present in the hostel.
- The mess management and no-dues generation should be automated.
- There should exist a forum and notification page wherein the students may post complaints and also get news about the hostel.
- The overall registration process should be easy and with least manual intervention.

WARDEN (HOSTEL MANAGER) REQUIREMENTS:

- Wardens require an easy to use mechanism to allocate rooms to hostel which has maximized automation.
- The hostel management should require less dependence on staffs for the warden as this causes delay.
- The warden should have to do less paperwork of the hostel as many of the hostel wardens are Professors who also have to handle academics.
- Warden should have access to all student profiles in a particular hostel and they should be able to check the status (no-dues) of every students.
- Warden should be directly informed about the requirements in the hostel.

ADMIN WARDEN REQUIREMENTS:

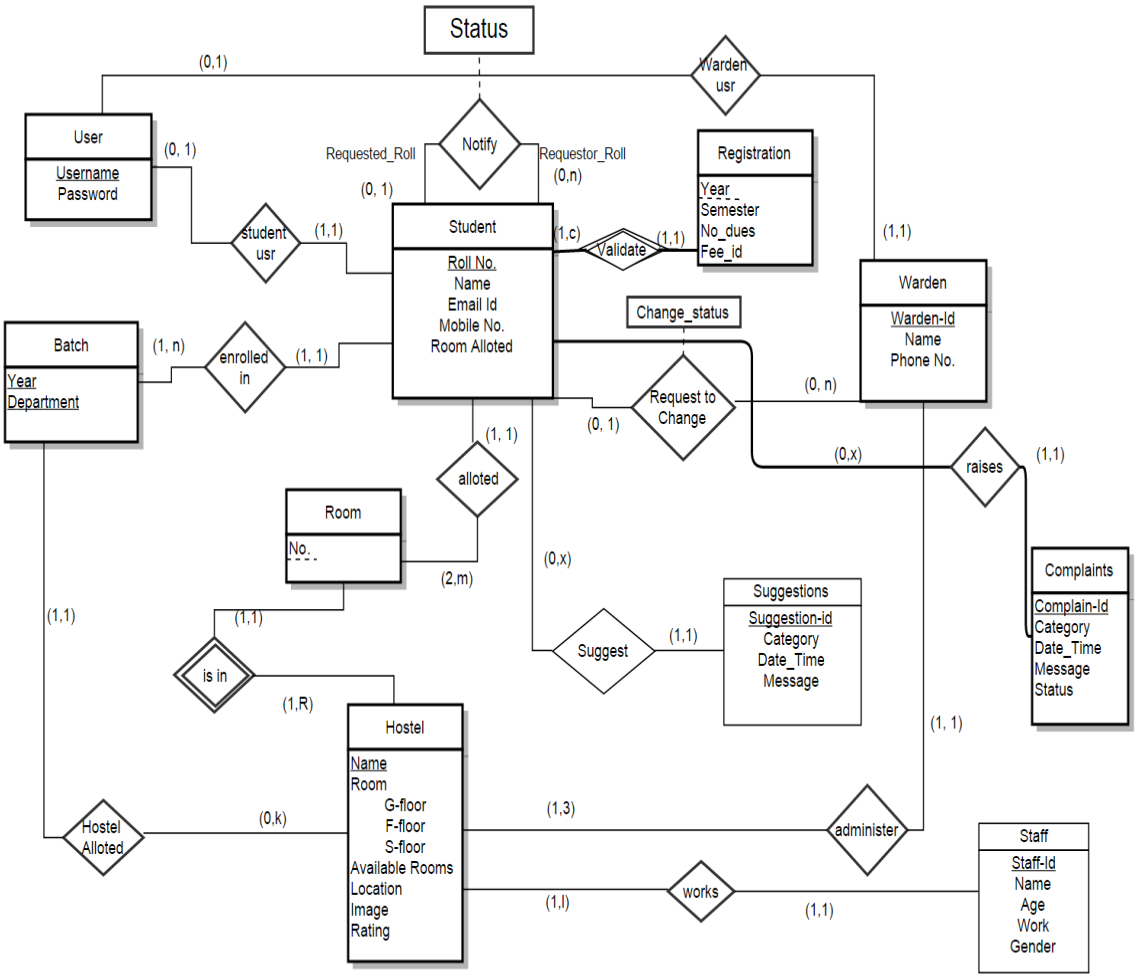
- The admin warden (the head of council of warden) should have the information of all the hostels' seating capacity.
- He should have the information of all the branches so that assignment of hostels to various branches should be done without error and in easy manner, rather than gathering information from all the people.
- He should have updated knowledge of hostel finances.

Profile Requirements

There should be 3 profiles with different rights for the normal and independent functioning of the system.

- ***Admin Profile***: The warden or any authority concerned with the hostel administration will have the control of this profile. Following should be his rights:
    1. Update hostel names and the database table for allotted hostels to the departments and batch of students.
    2. Updating the room series allotted to a particular batch of students.
- ***Warden Profile***: The warden of the hostel will have the privilege to change the **No Dues** status of the students which will be used in the allotment process.
- ***Student Profile***: Any registered student will have the privilege to select hostel, view available rooms and register for the room of his choice. And once a student books a room he will have the privilege to accept the request for approval of the roommate.

Entity Relationship Model



Entity relationship model to Relational Model

In this section, we will discuss how we convert an Entity relationship diagram to Relational Model.
In ERM we have a model telling the relationship between entities (i.e. objects/person with importance to the model). But this kind of system is not implementable directly into computer.

To convert this ERM to relational model

- First create tables comprising of attributes of entities.
- To imitate relationship between the entities, we create a table (one to many) or add the common connecting elements (one to one) in the both of tables belonging to entities.

In our ER model we have included entities:

1. Student: Contains information about the students with primary key being the Roll no. assigned.

2. Registration: This entity contains information about the student status which would be used to validate registration for students.

3. Warden: Information about the wardens associated with the hostels.

4. Complaints: Complaints regarding the hostel.

5. Hostel: Contains information about the hostels like number of rooms etc.

6. Batch: Information about the batch which can be used to update information of students simultaneously for same batch students.

7. User: The username and encrypted password for assessing the online portal.

Which appear as tables in our relational model.

Accommodating relationships:

- *Allotted* and *is_in* linking student, room and hostel has been covered by adding room_alloted in the student entity table.
- *Raises* linking complaint and student has been covered by adding *roll_no* in the complaint table.
- *Hostel_Alloted* linking hostel and batch has been covered by adding a new table comprising of year, department and hostel_name
- *Enrolled_in* linking student and batch has been covered by adding roll_no in batch table.
- *Student_usr* linking student and user has been covered by adding roll_no in user tables, renamed henceforth to verification table.

- *Validate* linking student and registration has been covered by adding roll_no in the registration table.
- *Notify* linking student to student has been covered by creating a new table Notification with adding roll_no of sender and receiver and status.

NORMALIZATION

After making relations from ER-Diagram, we have normalized our relations. Finally these functional dependencies can be observed in our relational schema.

Warden: warden_id → warden_name, contact_no, hostel_name

Student: roll_no → first_name, second_name, contact_no, father_name, mother_name, address, room_alloted

Hostel: hostel_name → g_floor, f_floor, s_floor, image_path, rating

Hostel_alloted: year, dept_name → hostel_name

Registration: roll_no, year, semester → nodues

Preference: roll_no → pref1, pref2, hostel_name

Suggestions: roll_no, message → category, date_time

Verification: roll_no → hash_value, email_id, password

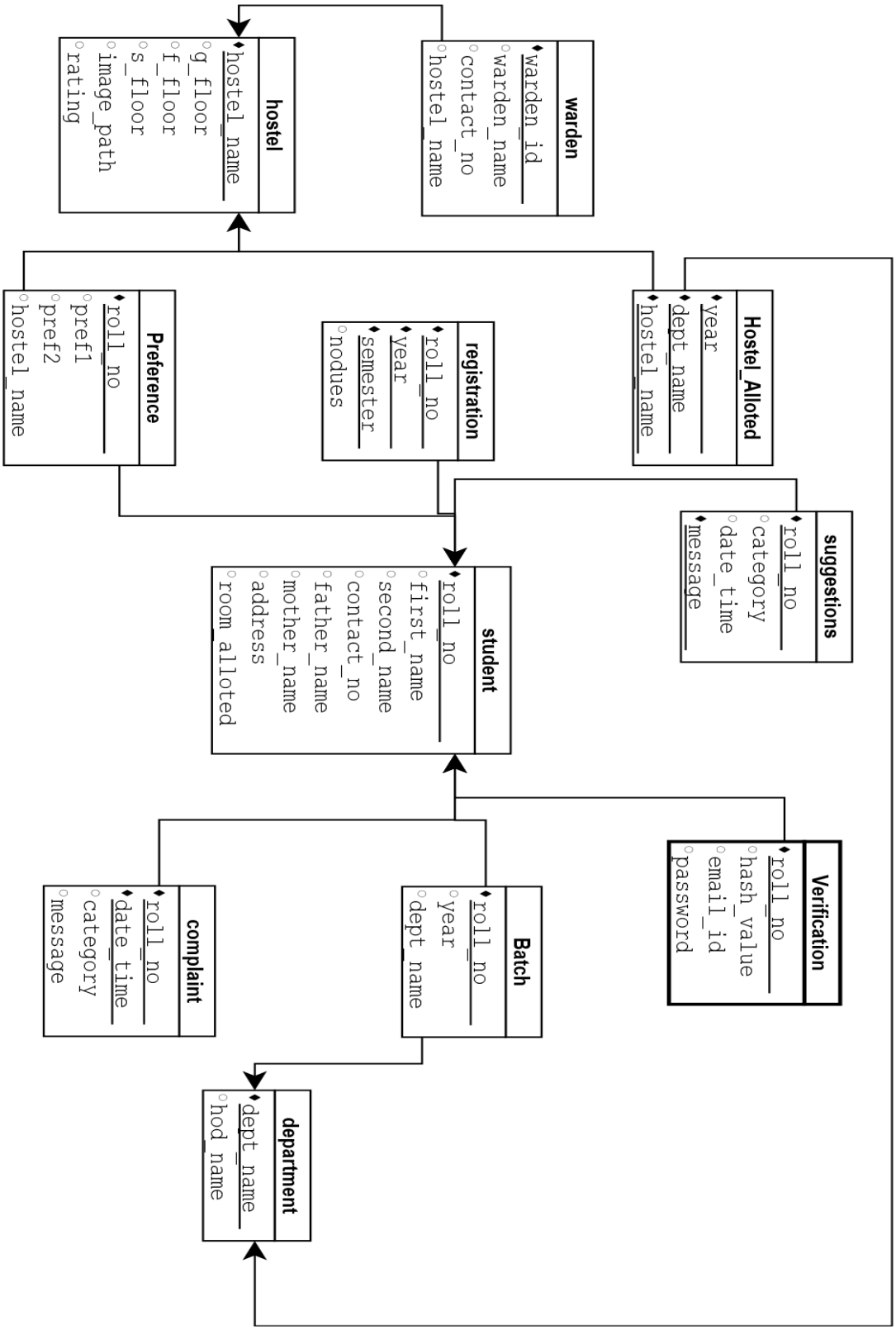
Batch: roll_no → year, dept_name

Department: dept_name → hod_name

Complaint: roll_no, date_time → category, message

As we can see that all dependencies satisfies the 3NF criteria hence our relational schema is in 3rd Normal form.

Relational Schema



Project Workflow

The project Room Allocation Portal was designed with a view to make this allocation process online reducing manual labour and making it more user friendly and less time consuming. We made use of django framework to manage especially the backend related to our website. It's a Model View Controller (MVC) framework in which the controlling code resides in one file while urls, templates (html files), forms etc. resides in a separate set of files. This framework gives wider control over data manipulation and rendering templates in a more easy and subtle way. We used html, css and javascript as languages for frontend and python as a backend one. Database that we used is mysql.

The graphical user interface was made keeping in mind the ease of completing this process at the same time making it attractive. The features implemented is described in the next section while a flow chart describing the execution plan of the website is given on the subsequent page.

Features

User Interface

- As a user enters into the website from the landing page he gets an easy to use signup and login page to enter into the main room allocation portal.
- How to apply link on the login page gives a complete information about the room allocation process so there is no scope of confusion.
- The main portal page provides many user friendly interfaces giving the information need in just few clicks.
- Moreover the drop down showing available rooms give a quick and just one click support for booking your desired room.
- The image area showing the configuration of rooms alongside makes your choice easier in selecting the rooms.
- The different links like staff and profile lands you to dedicated page for their profiles.
- Complaints and Suggestion sections allow a user to post complaints and suggestion regarding the procedure or rooms or hostel in general. This can be viewed by Warden and actions can be taken as per the requirements.
- It is a responsive site with cross browser functionalities.

Security

- This implementation of project restrict SQL Injection by parsing the string and checking for its consistency.
- Password is saved with a strong hashing algorithm and thus it's next to impossible to recover it and thus is highly secure.
- The signup process goes through a Captcha and thus restricts the entry of unwanted robots and allows only human access.

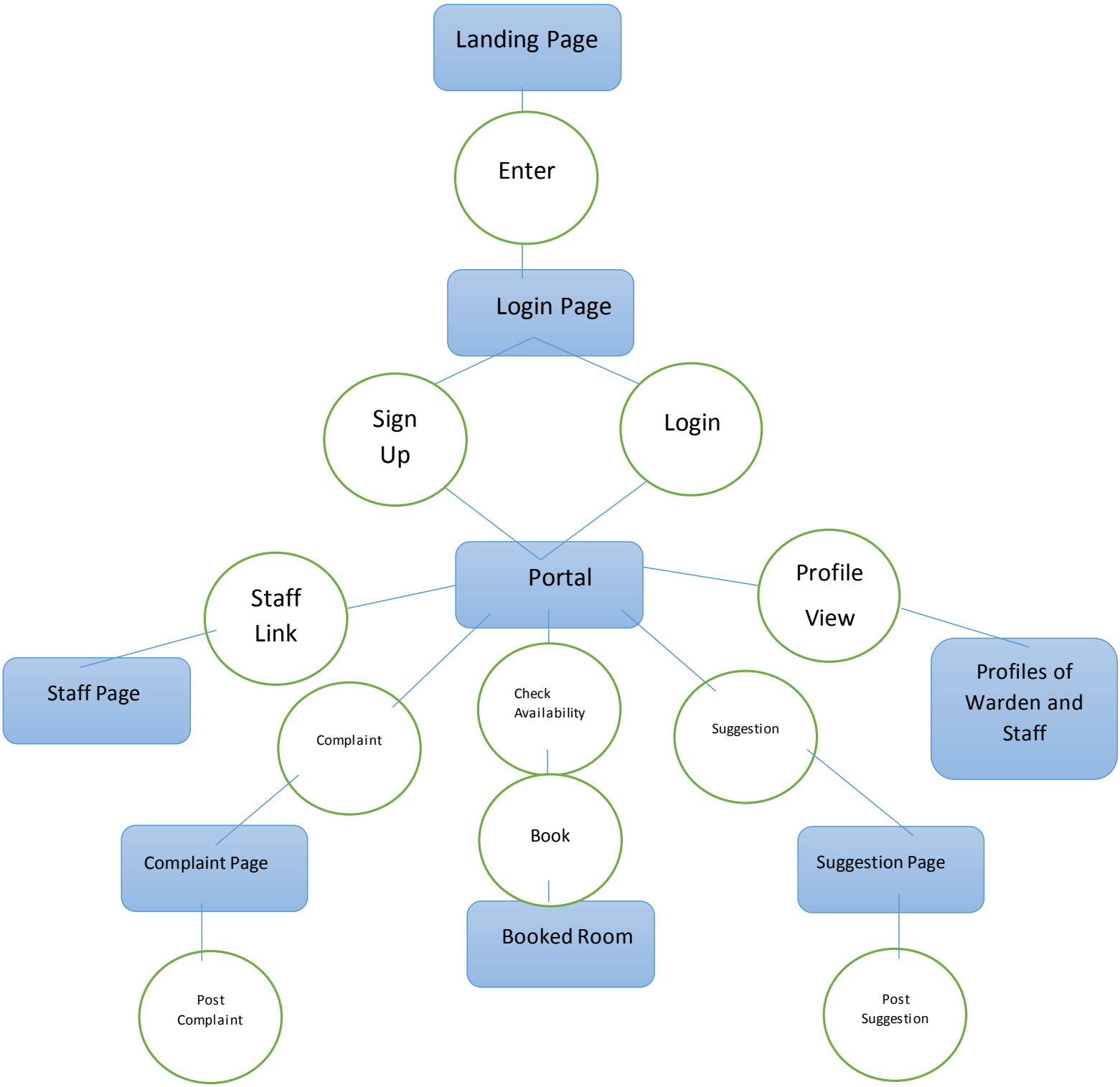
- One time link is sent to a user's email id to maintain the authenticity of a user and for security reasons.

Additional Features

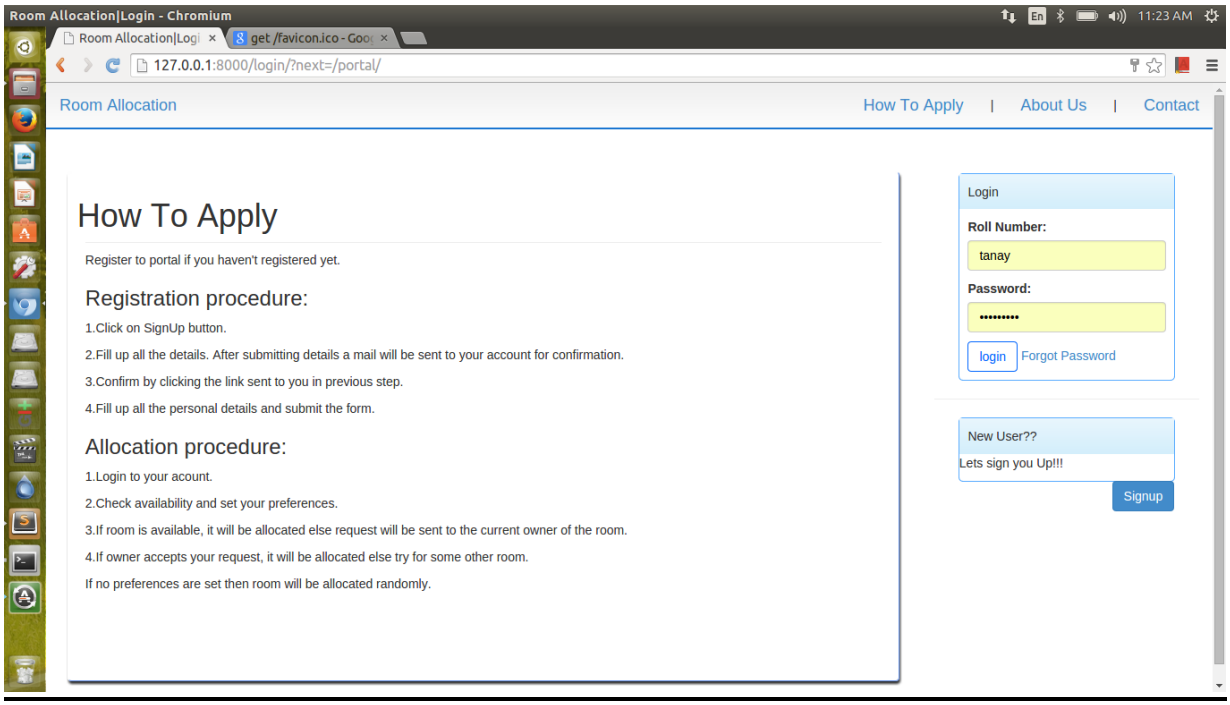
- A forgot password recovery link helps a user to change his password in case he forgets by sending recovery email to the registered email id.
- This website is backed by a strong admin site that can control the database in a interactive manner.
- Different users are given different access rights to manipulate the data in the database.
- Concurrency control is implemented using locking algorithm and thus a student cannot book more than one room.
- In addition to this user input on the login page is restricted in many ways like making a user use his roll no as his username and strong control is exercised on the type of data input according to the field. The input that is not in the correct format raises an appropriate error.
- It also has a notification functionality which gives recent notifications to the user.

In this project user data security has been given utmost importance and at the same time took care of maintaining authenticity of users. The email verification system is designed to make the student login with his official email id and roll no. The different admin rights given to different users like warden and other authorities let them to change data like no-dues status without which a student will not be able to book his room. Moreover the available room data is constantly updated in order to keep it up-to-date and all the measures for faster and efficient booking system are implemented. The Captcha implementation at the time of signup prevents bots from booking a student's room. Just in a few clicks student can own a room with a view of the room alongside in an image section that shows the hostel and rooms in general. The notifications specific to the hostel are shown in the top center of the page.

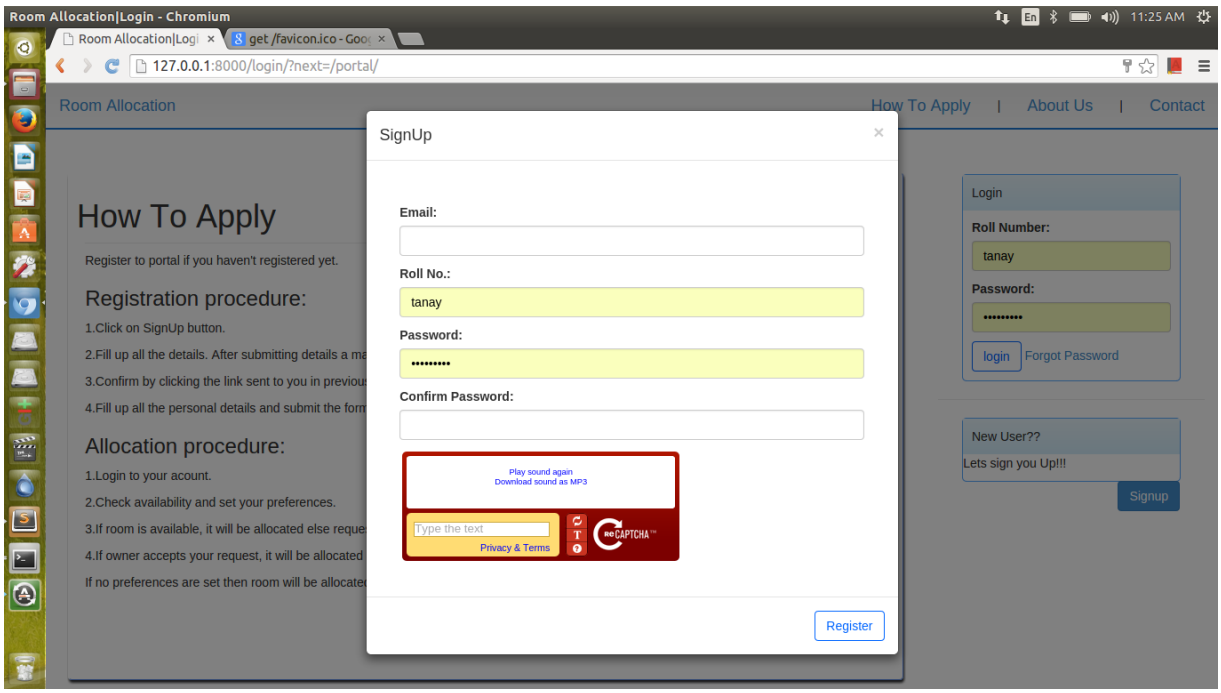
Project Work Flow Chart



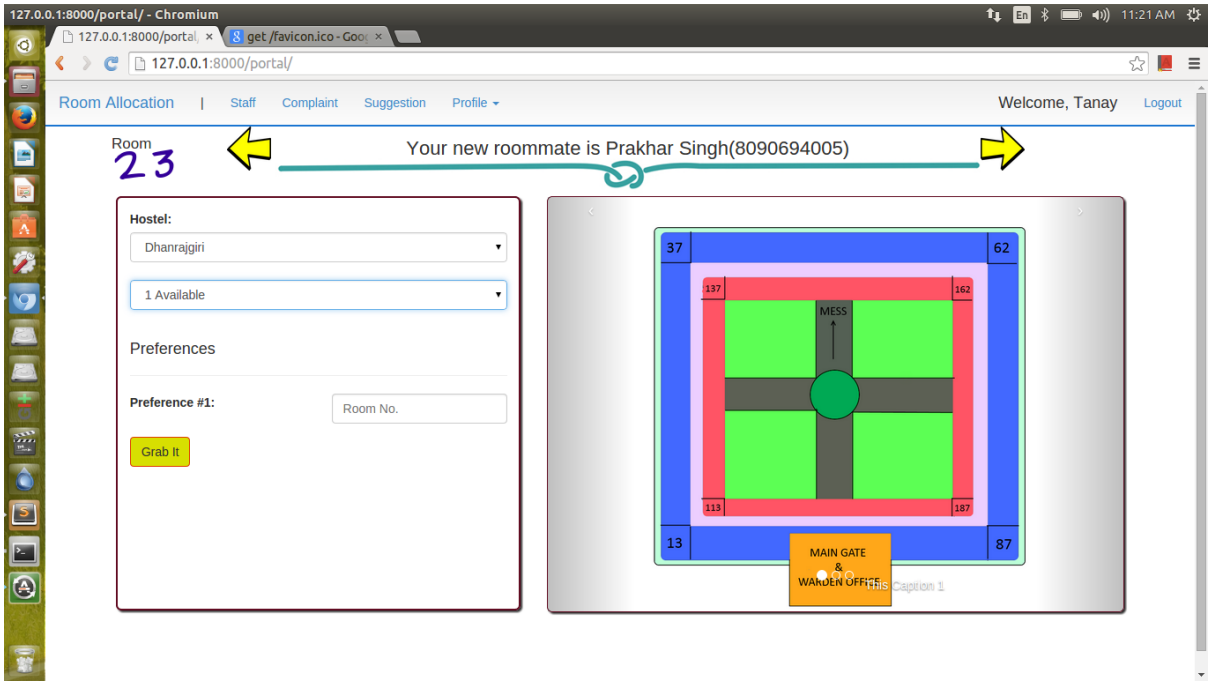
Screen Shots



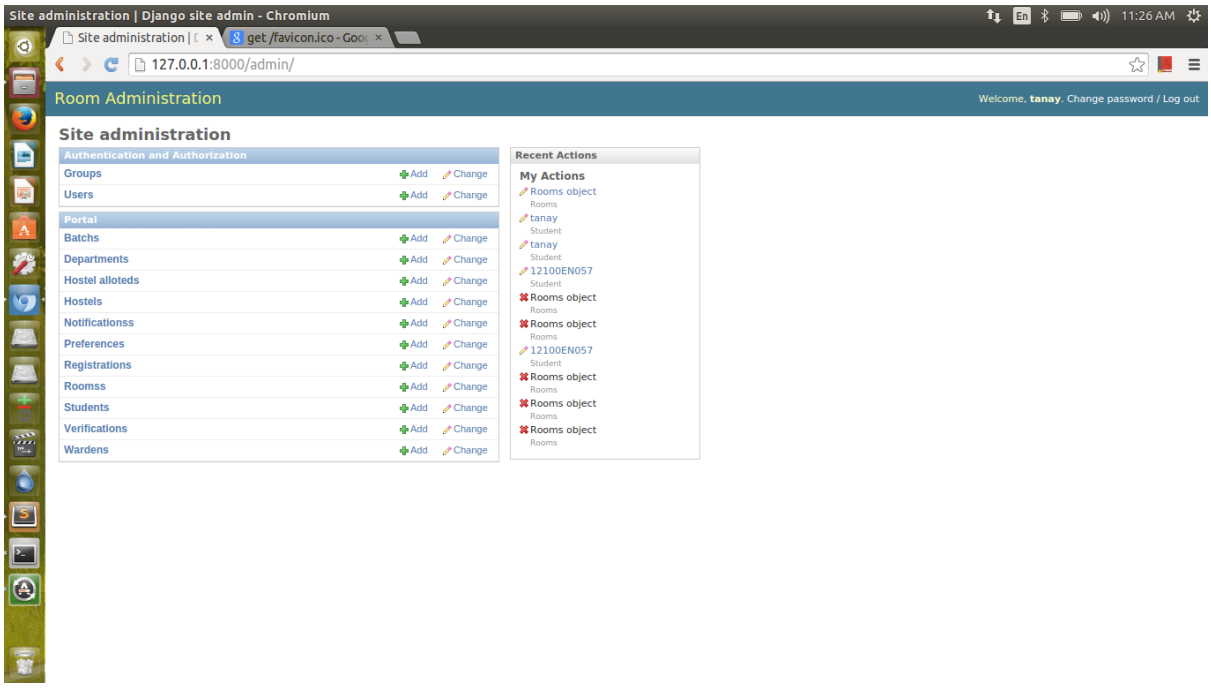
Login Page



Signup Page



Allocation Page



Admin Page