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Smart Meeting Scheduling

Deepika Solankar[#1], Neha Patil[#2], Rutuja Patil[#3], Saloni Patil[#4,] Geeta S. Navale[#5]

[#] Department of Computer Engineering, Sinhgad Institute of Technology and Science, Savitribai Phule Pune University, Pune.

[1]deepika.rqusp16@sinhgad.edu [2]neha.svxqp16@sinhgad.edu [3]rutuja.dcmlf17@sinhgad.edu [4]saloni.qturp16@sinhgad.edu [5]gsnavale_sits@sinhgad.edu

Abstract

The management and booking of rooms in large buildings is a tedious and complicated task. The combination of different rooms with different sizes and equipment, the possibility to choose between different dates and times is the reason why a good booking system is needed to make this task as easy as possible. A system that supports reservations of rooms in conference buildings or universities or other large buildings. This system shows how a complicated human task like reservations can be solved by using a smart meeting scheduling system as the android app in the development. From the facility users' perspective, requesting a room is as easy as selecting the facility he or she wants, searching for an available time slot, and completing the reservation form. This paper talks about the works carried out by the various authors which will assist humans in office environments to schedule meetings efficiently.

Keywords— Ad-hoc, Smart Meeting Room, Database, Scheduling, Agent Based Modelling, Multi-Agent Decision Making, Utilization Control

I. INTRODUCTION

The management and booking of rooms in large buildings is a tedious and complicated task. The combination of different rooms with different sizes and equipment, the possibility to choose between different dates and times is the reason why a good booking system is needed to make this task as easy as possible. The basic functionality of the system is to keep track of rooms in different buildings, reservations of rooms and different types of users. Reservations of the rooms should be visualized to the user in a simple and intuitive way. There should be a simple way of getting an overview of the reservations. A booker should be able to reserve and cancel his/her own bookings and should be able to search for a room with a certain property like size, price, number of seats and equipment. There should be an administrator that can administrate the whole system through the interface without writing any SQL queries. This includes the management of add, edit and delete functions for every entity in the system including new users and their privilege management. One type of user should only be able to look at existing reservations and not be able to reserve rooms. The system should be a complete content management system for handling the reservations of rooms, buildings, equipment and users.

II. MOTIVATION

Once, a person who is working in MNC company, lost a potential client due to the lack of information about availability of conference rooms. Traditional system of booking a meeting room has many drawbacks viz. slow, inefficient, and inconvenient. It may also happen that two parties have booked the same room at the same time, but they were informed late due to miscommunication or lack of communication. In traditional system, you cannot preview the meeting room prior to its

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booking, be it in the form of images or reviews based on user experience. Just displaying images is not enough, it will not be possible to check the audio-video constraints of the meeting room. To overcome the aforementioned problems, this paper provides a platform to develop an android app for meeting room booking which will provide a fast, efficient and enriched experience.

III. LITERATURE SURVEY

Tomoyuki Mishima [1] et. al proposed a system using unpleasant notification. The system, first, used a general notification to ask the users to input their schedules; however, the system gradually used unpleasant notification. The users are not unpleasant if they finished inputting their schedules soon. By using this system repeatedly, users will tend to input their schedule rapidly to avoid unpleasant situation. There are four steps to be passed for that a user finishes an input. They are awareness, recognition, keeping recognition and execution. Various unpleasant notification techniques were also summarized. The techniques include gradable notification in which the system gradually uses more unpleasant notification. This gradable notification can expect an effect to finish the input as soon as possible to avoid becoming unpleasant. Second technique is notification way which involves E-mail notification, pop-up notification, switch the focus on a web browser functional restriction. The effects of the notification techniques on the steps of passing of user's input are provided. However, in the system only two notification techniques were useful and the order of notifications execution is not efficient and does not give expected results. This system will be using various notification techniques described by Tomoyuki Mishima and also change the order of notification methods to get good results. This system will compel users to input their schedule and also give efficient experimental results.

The web-based online booking system for halls in institutes/colleges was suggested by Chetan Bulla et.al [2]. They proposed a system which is purely used for educational and government purpose. It uses XAMPP server for communication. This system is based on "Three Tier Architecture". These three tires are user, server and database. User is provided with user interface which allows booking hall and checking the status of booking. Server avoids conflict in booking. Database is used for storing information and retrieve accordingly. This system provides priority-based booking. For e.g. If a student booked hall, at the same time if teacher also booked the hall for some event then priority will be given to teacher. This system works on two modules i.e. user module, admin module which makes use of server for communication. However, this system is often browser incompatible
i.e. if the system is run on different browsers like Mozilla, Firefox then it gives inefficient result. As the system will be using Three Tier architecture which includes user, admin and database module, the same approach can be used in the proposed system. User to book the room, admin for adding data related to rooms and database for storage.

The smart meeting scheduling with real-time occupancy detection was demonstrated by Linh Duc Tran et.al [3]. This helps to overcome the issues of under-utilization of rooms. It also provides support for ad hoc or impromptu meetings. Consider the following scenario: A room is booked but due to some reasons, the meeting will be held an hour after the scheduled time. At that time, the booked room will be underutilized. Similar situation occurs if the meeting gets over prior to the stipulated time. These issues are resolved in the aforementioned paper. They used Passive Infrared (PIR) sensors to detect real-time occupancy in the meeting room. They have further integrated it into Microsoft Outlook for ease of use. The proposed system uses both hardware and software. It uses PIR fusion devices to detect the presence of people in a room, which will help to understand

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whether the room is occupied or not. This system will use utilization algorithm to detect occupancy and ensure utilization of the rooms. The system uses sensors for that purpose, however, in this system, sensors will not be used. The system will be implemented using only the utilization control algorithm. The data to the utilization control system will be provided manually, by the admin. Unlike the solution presented in the paper, where the authors have used complicated sensors and PIR devices, simply the input data to the algorithm will be provided. This data includes the status of the rooms, status of the meeting, meeting time, etc. which will help the algorithm to make further decisions regarding scheduling of the further meetings. System will also use ad-hoc system for urgent meetings. Meeting Scheduling (MS) is a common task for organizations of any size. This problem embodies a decision process affecting several individuals, in which it is necessary to decide when one or more meetings should be scheduled.

Osama Mussawar [4] et.al discussed problem of meeting scheduling and a solution based on multiagent decision making is presented. This system will develop the internal thinking and selection process of the agents which enables them to interact and negotiate effectively. The selected outcome, in most of the cases, is a kind of optimal for agent society, which depicts the efficiency of one's decision procedures. Development of formal optimality criteria and statistical analysis can be used to further assess the efficiency. In this simulation framework there is no specific limit to the number of agents or time slots. In the real world, there is usually no central decision maker for scheduling a meeting. Rather, agents interact with each other, negotiate and agree on final outcome or time slot. The problem of meeting scheduling is a typical problem of group decision. However, it does not take into account statistical and historical data while making a decision. Also, the development of formal optimality criteria and statistical analysis is not used as of now to further assess the efficiency and efficacy of the negotiation protocols. This system will use the distributed framework, where all the agents are involved in the decision-making process. The system will model the internal decision- making mechanism of an agent, which represents how an agent will interact rationally and negotiate with other agents.

N Saravanan [5] et.al proposed Smart Meeting Room (SMR) architecture and addressed various imminent issues pertaining to a meeting room environment by providing automation. The Smart Room requirements at real-time are automatically customized and act according to the customer's needs. Due to the developments in Machine to Machine (M2M) communication, a connection between the devices and the customers on a real-time basis can be established. This enables the smart rooms to interact with the users and act according to their needs as well as automatically establish communication with other meeting rooms. Various types of sensors like temperature sensor, humidity sensor, PIR (Passive Infrared) based motion detector etc. are deployed in the smart room to monitor and enable the actuators. Ericsson's APPIoT framework facilitates smooth discovery, attachment and data sharing between devices in a close proximity. Gnokii and Pidgin systems are used with the architecture to ease the customization and execution of different events. A microcontroller serves as the brain and gateway for the control operations and provides users with additional features such as setting up of the room environment, loading presentations on the display in advance etc. By continuously learning from the environment within the room, the actuators trigger a responsive event automatically to control the room's ambience and the bookings.

Sagargouda S. Patil [6] et.al proposed a shrewd meeting room administration and booking framework with continuous inhabitance discovery to help impromptu gatherings and boost usage. It has three modules viz. Hall Booking Android App: This module will provide user interface to the user to login and book hall for events. This is developed using Java and Eclipse for Android platform. Hall and User Management Module: This module is used by the government officials for creating all available halls in the database. This module also has interfaces to create users from

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various ministries and departments, who will login from android and book halls. Communication Module: This module is used by the android app to communicate with the central database. It has multiple advantages like a message so that customer immediately receives the guarantee of the service, and the systems operates autonomously 24*7.

Cheah Wai Shiang [7] et.al discussed the use of mobile agents in mediating the interaction between people, and between people and a system, including resolving conflicts through negotiation in a flexible and user controllable manner. They also discussed the issues and design principles for argumentation-based negotiation in HAI in the context of a Flexible Smart Room Booking System. Different agents are used like The AgentGenerator is the stationary agent that will generate different types of task-oriented agents (login agent, query agent, booking agent) for handling the instruction from the user. The LoginAgent is the mobile agent that will migrate to the server side for the validation process. The QueryAgent is a mobile agent that will perform the query request after receiving the input from the user. The BookingAgent is a mobile intelligent agent with the capability to perform the activities listed below: (i) Make booking or handle the booking process. (ii) Negotiate for the unavailable timeslot using the argumentation-based negotiation process. (iii) Refer to the user for additional information and important decision. (iv) Argue about the proposal that has been given by the LTAAgent. The negotiation agent (NAAgent) acts as a contact agent for the user (interfaces the user to the negotiation process). It is an intelligent agent with the capability to perform the activities listed below: (i) Handle the negotiation process by using argumentation-based negotiation. (ii) Pass the argument from the BookingAgent to the GUIAgent for displaying purposes. Some of the arguments are express like, dislike, reward and so on. (iii Disturb the user when necessary for decision-making. (iv) Refer to the user for incomplete information and important decisions.
(v) Handle the cancellation process upon the agreement to give up the room for the other user.

Bogdan Walek [8] et.al proposed a fuzzy approach and expert system for hotel booking system. The proposed approach is based on evaluating hotel services for different kinds of hotel guests. The output of the expert system is a proposal of suitable hotel services for hotel guests during the process of hotel booking. The expert system consists of a knowledge base which contains IF-THEN rules for determining which hotel services and activities around the hotel are more or less suitable for the hotel guest. The main aim of the proposed expert system is to evaluate and propose suitable hotel services and suitable activities and events for hotel guests. Evaluation of hotel services uses an expert system with a knowledge base and information from a questionnaire filled-in by hotel guests. Evaluation of activities and events uses an expert system with a knowledge base, information from a questionnaire filled-in by hotel guests and a database of points of interest, activities and events.

Karolina Czekalska [9] et.al described the implementation of web-based hotel reservation system which enables users to book hotel rooms by means of a web browser. The system is based on JavaServer Faces technology in the presentation layer, Spring Framework in the service layer and iBatis library for the data access layer. Its key features are: (i) To search and to book hotel rooms. (ii) To notify of every event related to a user by sending the email on a given address during the registration process. (iii) To support definition process of each component of the hotel. The components of the hotel are: rooms, promotions, packages, discounts and services. (iv) To complete the reservation process by notifying the system about the fact that the guest came to the hotel and received keys to the booked room.

Table I summarizes highlights and observations of the related work discussed above.

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TABLE I
LITERATURE REVIEW

Ref. No.	Highlights	Observations
[1]	All inputs are necessarily provided to the system.	Only input is given in the system no further processing is provided.
[3]	Check the utilization of these rooms based on predefined policies. Occupancy detection.	Use of complicated sensors. Website based. No suggestions based on history.
[2]	Priority based booking.	PHP is used due to which there may be connectivity issues. Browser incompatibility.

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[4]	It gives various ways to tackle the issue of preference scheduling and simultaneous decision making.	It does not take into account statistical and historical data while making a decision.
[5]	Complete end-to-end solution for smart office.	No rescheduling system, if the room is already booked.
[6]	Individual is able to book room and booking confirmation message is also sent.	No option of rescheduling and no option for priority booking.
[7]	Negotiation feature helps to induce flexibility in terms of user's needs.	Only booking and negotiation facility is available, no option or cancellation or rescheduling.
[8]	The questionnaire enables the user to find the room that would be suitable to their needs.	Provides only user's preference-based suggestion.
[9]	Error-resistant and flexible in terms of adding new functionalities.	Web-based system, less ease of access.

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Based on the observations listed in the Table I, this paper proposes a problem statement as below-

To develop an Android application for smart meeting scheduling with room booking and navigation for one building consisting of four floors and 18 rooms each.

The following objectives help to achieve the above-mentioned problem statement-

- To book a room according to availability.
- To enable navigation on room.
- To implement room recommendation feature based on previous history.
- To enable 360-degree room view.
- To implement a basic Chatbot.

IV. PROPOSED SYSTEM

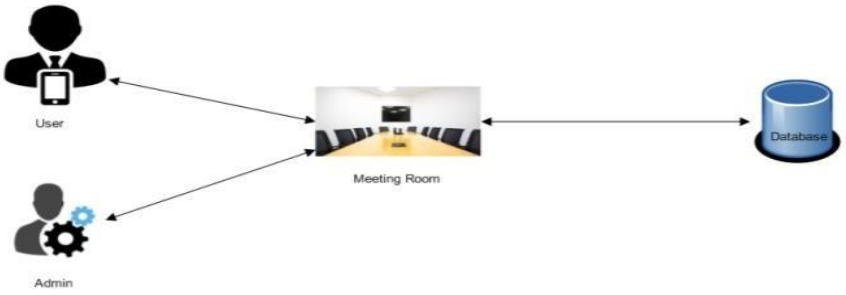

Fig.1: System Architecture: Smart Meeting Scheduling (SMS)

The system architecture of Smart Meeting Scheduling (SMS) as shown in Fig. 1 is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system. System architecture consists of 4 components as mentioned below

i. Android App:

It is mainly an android application from which user can access the functionality of the project. It is built using android studio development tool which can accept the input from user and accordingly provide the output.

ii. User:

In user module user can view hall images with detailed information of hall. They can book hall by login or by registering themselves if they are new user by entering the valid information. After login by entering login-ID and password, user will be able to continue the process further. Hall will be booked on the basis of day. Users will also give a rating to the room.

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iii. Admin:

Admin can add buildings which provide halls for conference and can view or update building, admin can also delete building or can update information related to building such as name, address etc. Admin can add hall in a building and can view or update hall information. Admin can even stop booking of a particular building/room in case if building/room is temporarily not available to the user due to some internal works. Admin can also see the booked hall and details of everyone who have booked hall.

iv. Database:

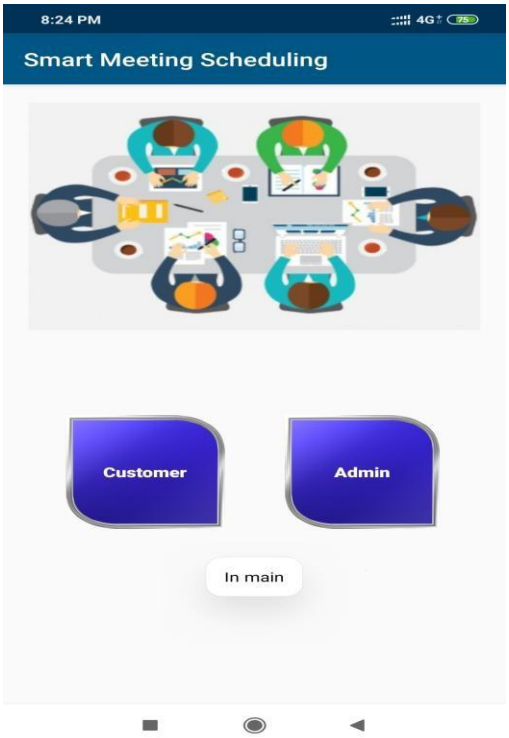
The database contains the room details and the details of the users like their username and password.

V. RESULT AND DISCUSSION

For booking a meeting room, following results were obtained-

1. User Interface-

The user interface consists of various options through which the user can access the application and take advantage of various features. There are mainly two users who can operate the application. One is the admin and other is the customer. Figure 2 below shows the first page when the application is opened. Figure 3 shows the page when the customer successfully logs into the system. A customer can book a room by clicking on view room button as shown in figure 4. Customer can also see 360° view of room, navigate towards the room using get directions button and also chat in the application regarding room details and queries which is shown in figure 5, figure 9, and figure 10 respectively. Figure 6 shows the page when the admin successfully logs into the system. Admin has the rights to add, edit, and delete rooms shown in figure 7 and figure 8 respectively. Figure 11 shows the details of a room which is booked.



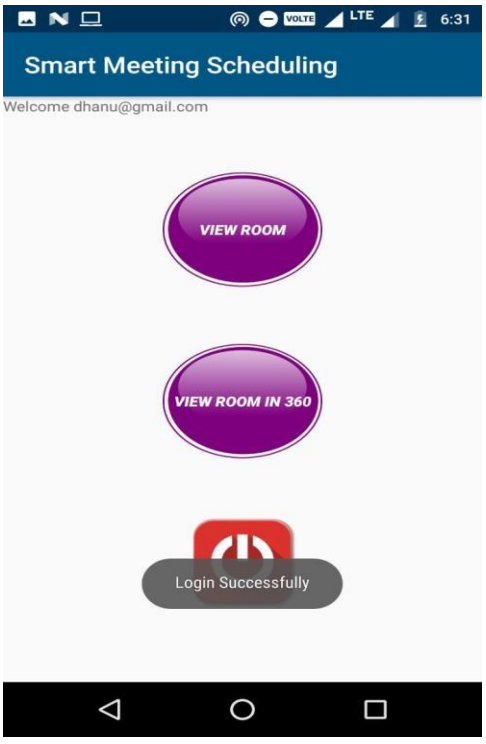


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Fig 2: Main Page

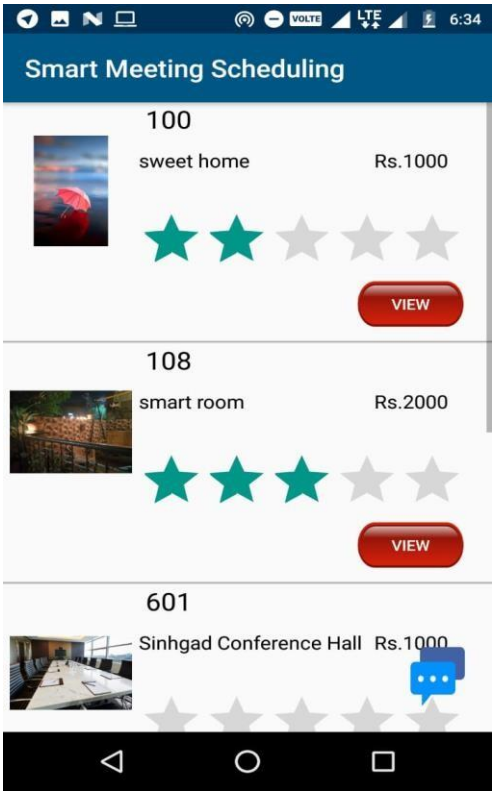


Fig 3: Customer successful login

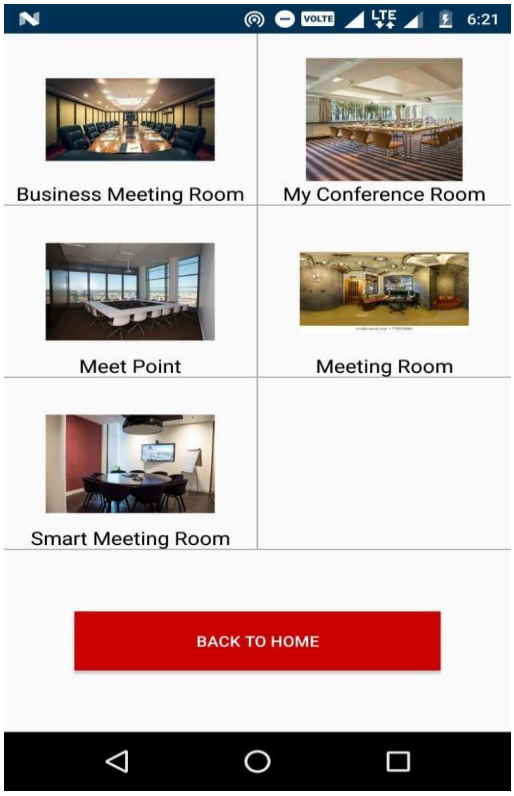
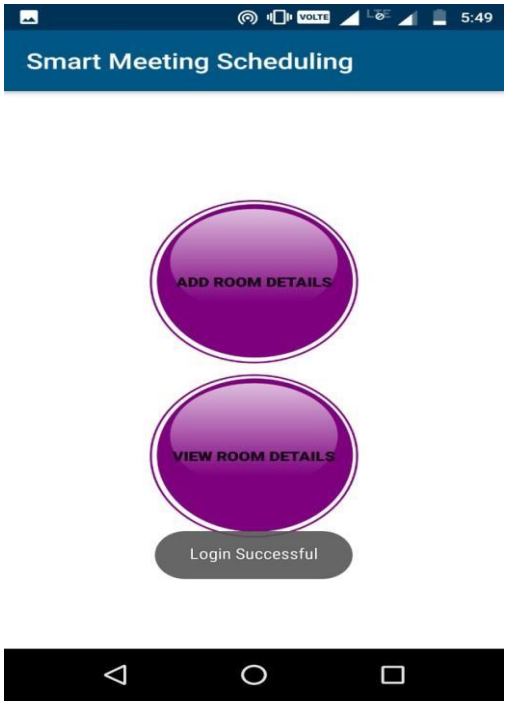


Fig 4: View Room

Fig 5: View Room in 360°



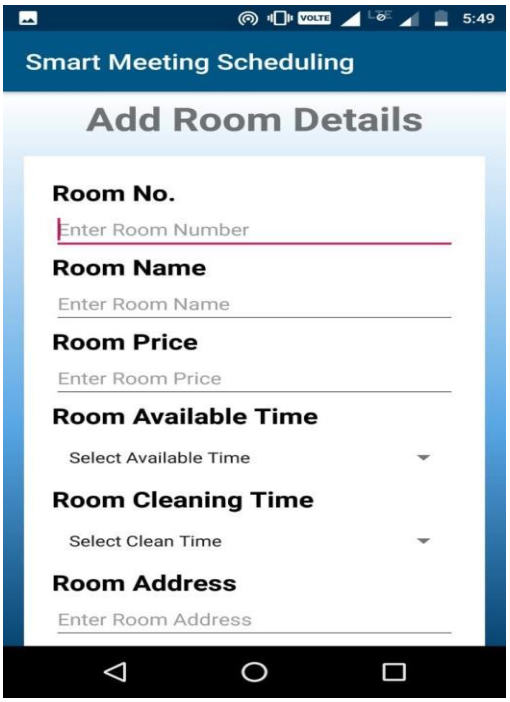


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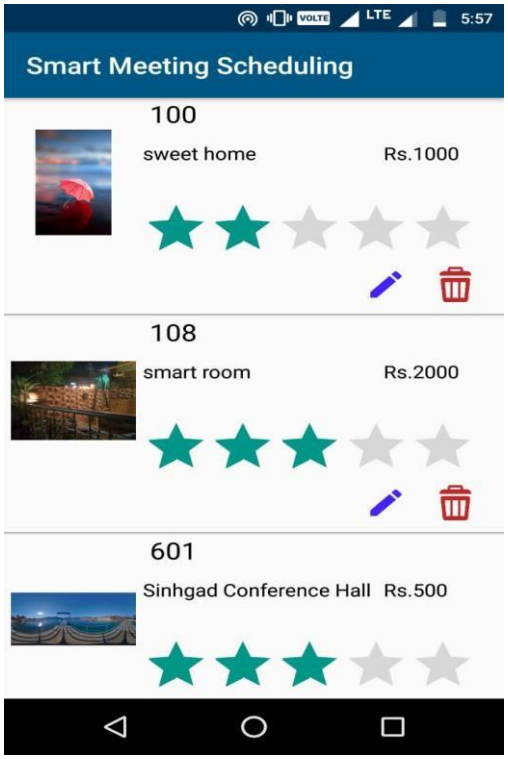
Fig 6: Admin successful login

Fig 7: Add room details



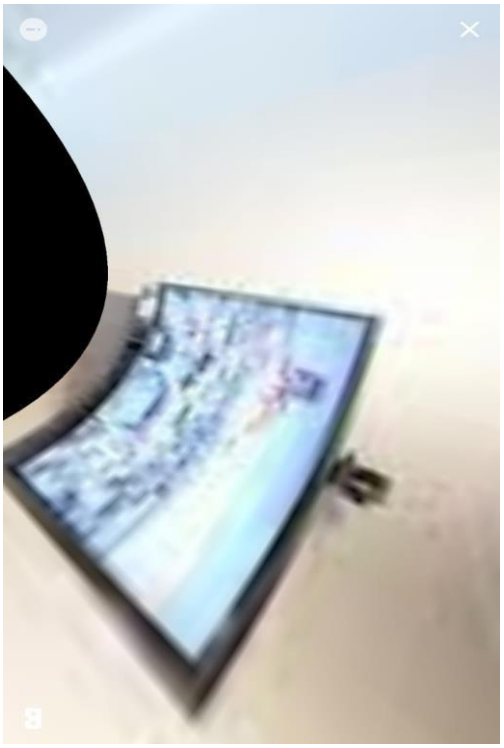
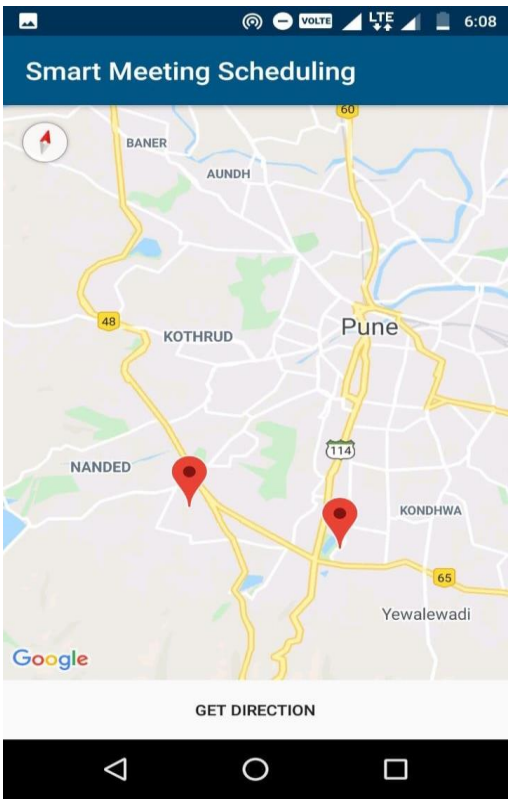


Fig 8: View Room Details

Fig 9: 360° view of the room



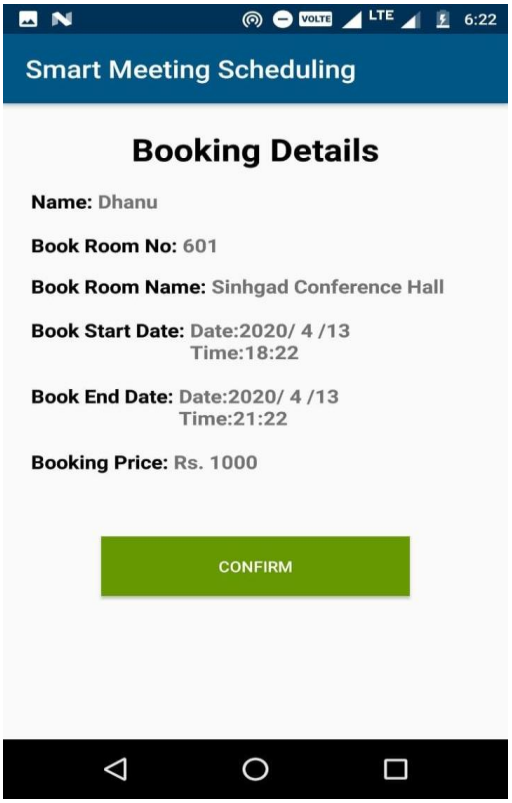


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Fig 10: Navigation towards the room

Figure 11: Booked room details

2. Final Result-

By checking the availability of the room on required time and date, the room is booked by the registered customer. If the customer is not registered then it is required to register first and then login to the system using login credentials. The customer is able to use all the features available in the application. Admin is also able to perform its operations properly.

VI. CONCLUSION

The main objective of the proposed system is to help staff to better understand client demands surrounding the room reservation system as a whole. This paper studied various existing solutions to suggest how the proposed system can be made very easy for the employees of client to reserve collaborative work rooms with a simple android application. Problem which client faced in maintaining registers and floor keeps is now solved. Administrator has the privilege to make detailed summary of room occupancy and document them for future purposes. The authors propose that this system not only makes things faster but also gives employees the flexibility to cancel and back out their reservation with a single click.

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