TED ÜNİVERSİTESİ

Project Analysis Report

GATE
(Guard and Access Technology for Estates)

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1. Introduction

The GATE (Guard and Access Technology for Estates) project is a comprehensive management and security platform developed to address the complex challenges faced by residents of large-scale housing complexes, particularly those in high-risk areas prone to natural disasters. Inspired by the needs of mass housing developments such as those initiated by Turkey's TOKİ, GATE is designed to enhance security, improve communication, and streamline management processes within these communities.

With an innovative approach that integrates AI-powered security measures with user-friendly communication tools, GATE aims to create a secure and well-organized environment. The system offers a mobile application and web-based interface accessible to both residents and administrators to support seamless interaction and effective management. The scope of GATE includes technologies such as AI facial recognition for identity management, financial and accounting tools for dues tracking, and robust notification and communication channels.

This analysis report provides an in-depth exploration of the GATE project by detailing its proposed functionalities, requirements, and design models. We will begin with an overview of the system, followed by a breakdown of functional and nonfunctional requirements, and a discussion on any pseudo requirements that shape the system's constraints. Additionally, we will present various system models, including scenarios, use cases, object and class models, and dynamic models. Finally, the report will showcase user interface designs, focusing on navigational paths and screen mock-ups to illustrate the platform's user experience. Through this structured analysis, we aim to demonstrate how GATE addresses the needs of housing complexes in a comprehensive and user-centered manner, setting a benchmark for innovation in estate management and security technology.

2. Current system

There is currently no existing system in place for this project. The GATE (Guard and Access Technology for Estates) project is being designed from scratch to meet the management and security needs of large-scale residential complexes. The project aims to provide an integrated and modern platform as an alternative to manual processes or fragmented solutions currently in use. Therefore, there is no previous system or structured solution to evaluate in the "Current System" section.

3. Proposed system

3.1 Overview

The GATE (Guard and Access Technology for Estates) project aims to create an advanced and integrated management and security platform specifically designed for large-scale residential complexes. This platform addresses challenges commonly faced by residents and administrators in such environments, particularly in areas prone to natural disasters like earthquakes. GATE's primary objective is to improve the security, communication, and management processes within these communities through innovative technology.

This system will provide a seamless experience via a mobile application and website, accessible by both residents and complex managers. By leveraging AI-powered features, such as facial recognition, GATE offers enhanced security solutions. Additionally, the platform includes management tools to streamline administrative tasks, a notification system for effective communication, and financial tools for handling maintenance fees and resident debts.

The proposed GATE platform prioritizes user privacy and data security, adhering to relevant data protection regulations. The system's architecture and user interface are designed to be user-friendly, responsive, and accessible across various devices, ensuring an intuitive experience for users of all technical backgrounds. With a focus on sustainable and ethical practices, GATE aims to set a benchmark in the field of housing management technology, providing a comprehensive solution to modernize and secure residential complexes.

3.2 Functional Requirements

1- Notification System

Goal: To ensure that residents receive important notifications such as security, maintenance payments, and events.

- When the site management or the system itself sends notifications, these notifications are instantly delivered to users via the mobile application or website.
- Users can mark notifications as read or access past notifications.

2- Security and Identified Person Tracking

Goal: To ensure the tracking of undefined people, that is, people who are not on the site resident list, within the site.

- With camera integration, facial recognition systems are used to record people entering the site.
- If unidentified people are detected, the security team is notified.
- Site residents or site management can pre-define guests to whom they have given special permission in the system.

3- Payment and Accounting Tracking

Goal: To enable site residents to track their dues, maintenance and other payments quickly and regularly and to make payments easily.

- Users can view their dues and past payments via the mobile application or website.
- Payment reminders are made automatically.
- Online payment option is offered for payment transactions.

4- Estate Rules and Management Communication

Goal: The site management can quickly notify site residents about the rules and management decisions.

- Announcements and rules made by the management can be updated and communicated to residents via the application.
- Residents can provide feedback or contact the management via messages.

5- License Plate Recognition and Parking Management

Goal: To regulate the vehicle entrance and exit of residents and guests and manage parking spaces.

- The license plates of the vehicles that will enter the site's parking areas can be predefined in the system.
- The parking area occupancy rate is displayed in real time

6- Request for Quick Help and Emergency

Goal: In case of emergency, residents can quickly seek help from authorized persons or security.

- The user can request quick help by pressing the emergency button on the mobile application.
- Security and management units receive notifications in case of emergency and can intervene quickly.

3.3 Nonfunctional Requirements

1- Performance:

- Response Time: System should load user dashboards in under 3 seconds.
- Scalability:

2- Usability:

- Ease of use: Intuitive design with least learning process for new users.

3- Scalability:

- Handle of user intensity: System should handle about 30 to 50 percent of the total number of users without decrease in performance.

4- Reliability:

- Data Integrity: Regular backups and data recovery systems to prevent data loss.

5- Compliance:

- Regulatory Compliance: Full adherence to KVKK, and relevant local data protection laws.

3.4 Pseudo requirements

1- Technology Stack:

- Mobile app to be developed in Flutter for cross-platform compatibility.
- Web application built using React on frontend side, and C# with .Net on the backend.

2- Data Handling:

- AI features, such as facial recognition, will benefit existing frameworks like OpenCV or TensorFlow.

3- Integration with Local Infrastructure:

- Integration with local monitoring and access systems for seamless security monitoring.

3.5 System models

3.5.1 Scenarios

1. Resident Scenarios

1.1. Make Payment:

- The resident logs into the mobile application.
- They navigate to the "Finance" menu to view their maintenance fee.
- The resident confirms the payment details and uses the online payment option to complete the transaction.
- Upon successful payment, the resident receives a notification.

1.2.Submit Complaint/Request:

- The resident goes to the "Support" section in the mobile app.
- They fill out the complaint or request form with the necessary details.
- The request is reviewed by the manager, and the resident receives a notification once a response is provided.

1.3. Send Emergency Alert:

- In case of an emergency, the resident selects the "Emergency" option in the mobile app.
- The alert, along with their registered location, is automatically sent to security personnel.
- Security responds to the alert, and the resident receives feedback from the security team.

1.4. Make a Reservation:

- The resident wants to reserve shared facilities, like the gym.
- They choose an available time slot from the reservation calendar and complete the booking.
- The resident is notified once the manager approves the reservation.

2. Manager Scenarios

2.1. Send Payment Notifications:

- The manager monitors maintenance fees and other payments.
- They send a payment notification to residents who have pending payments via the app.
- Residents complete their payments using the notification link.

2.2. Broadcast Announcement:

- The manager prepares an announcement for the community and sends it through the application.
- All residents receive the announcement as a notification and can view it on their main screen.

2.3. Track Maintenance Requests:

- The manager reviews maintenance requests and ongoing repairs in the building.
- They coordinate with service providers and update the maintenance schedule as needed.
- The manager informs residents about scheduled maintenance and any related activities.

2.4. Access Camera Feeds:

- The manager accesses camera feeds around the complex to monitor security.
- They coordinate with security personnel if additional support is needed for any situation.

3. Security Personnel Scenarios

3.1. Respond to Emergency Alerts:

- Security personnel receive emergency alerts from residents.
- They proceed to the specified location and assess the situation, contacting the resident if needed.
- Upon completing the intervention, security informs the manager of the situation.

3.2. Report Unauthorized Vehicle:

- Security identifies an unauthorized vehicle in the parking area.
- They capture a photo of the vehicle and record its license plate information, submitting a report to the manager.
- The manager notifies the vehicle owner regarding the issue.

3.3. Log Entry/Exit Records:

- Security personnel monitor the entry and exit points of the complex.
- They log visitor entry and exit details through the app and notify the manager as necessary.

4. Admin Scenarios

4.1. Manage Users:

- The admin accesses the user management panel to add new users (managers, security personnel, or residents).
- They enter the necessary details and assign appropriate permissions to the new user.

4.2. Perform System Updates and Maintenance:

- The admin conducts regular updates and maintenance tasks on the platform.
- After updates, they monitor system performance and address any issues.

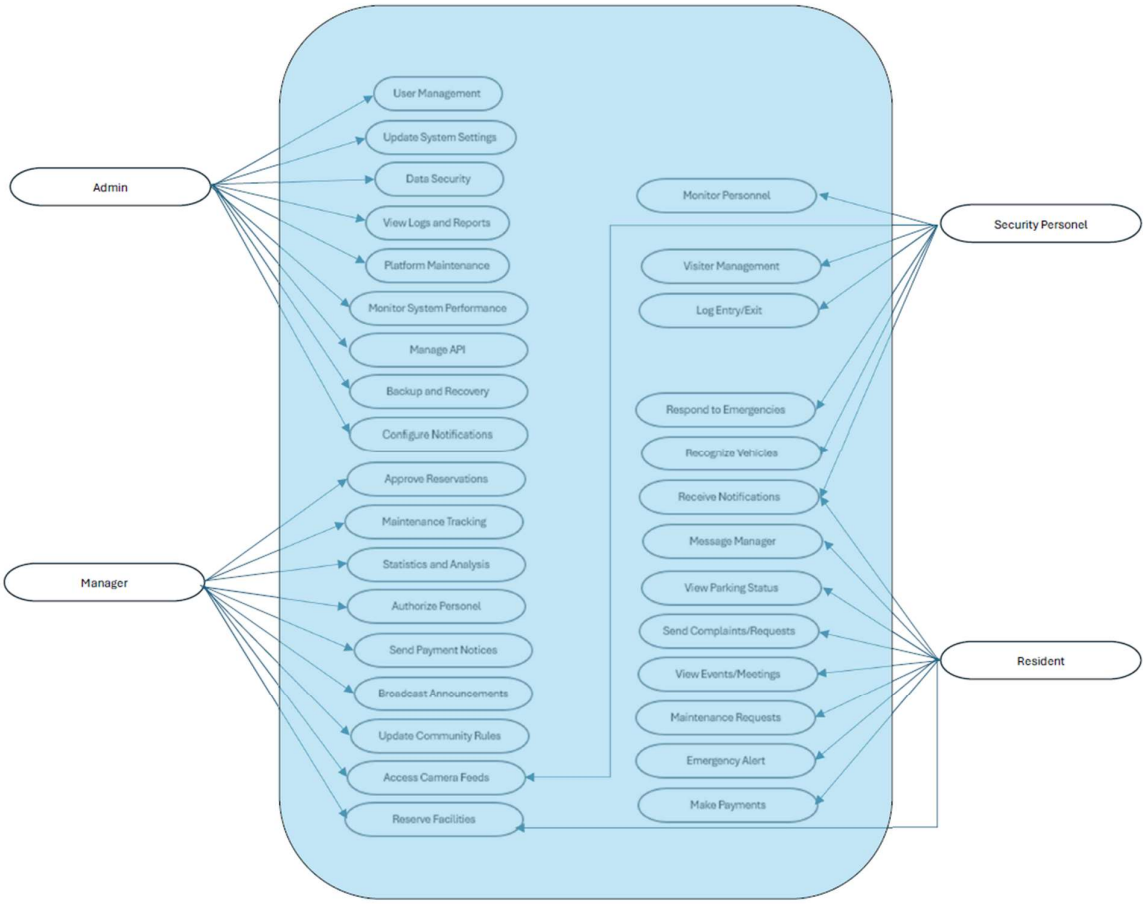
4.3. Backup and Data Recovery:

- The admin schedules daily data backups and configures the automatic backup plan.
- In case of data loss, the admin restores data from backups to ensure the system operates normally.

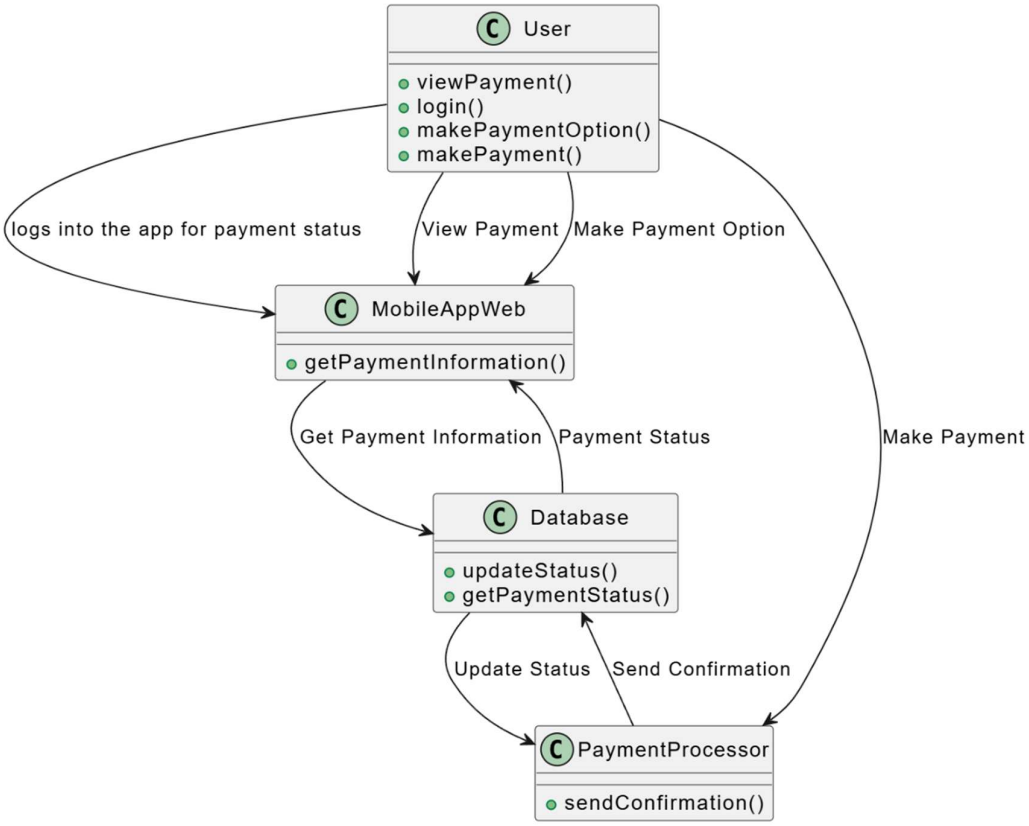
4.4. Manage Notification Settings:

- The admin configures notification types and frequency for the entire system.
- Different notification settings are assigned to different user groups and managed accordingly.

3.5.2 Use case model

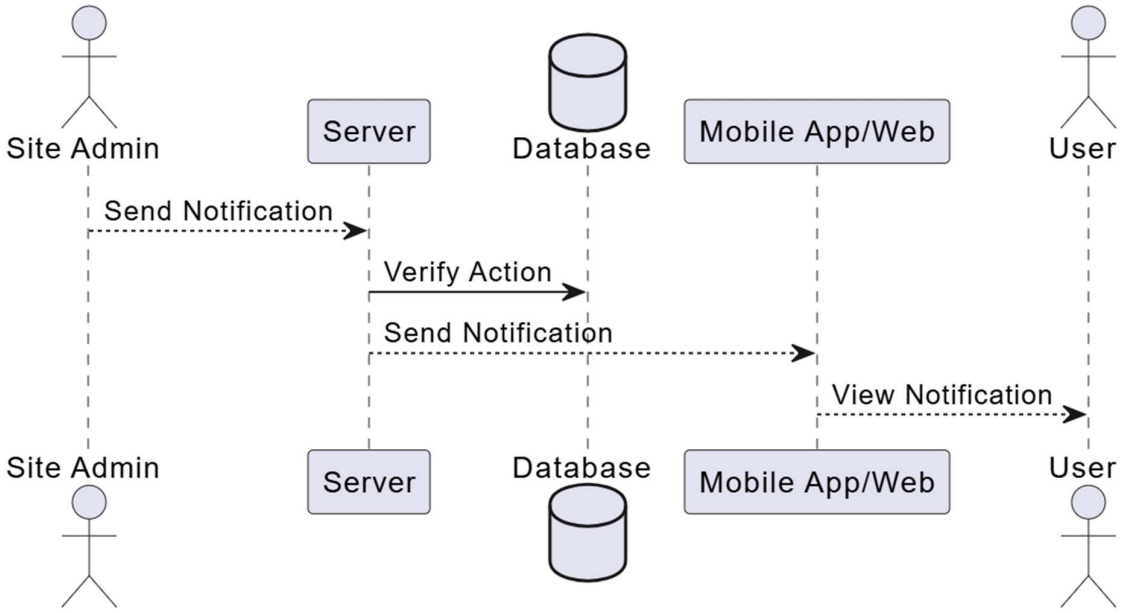


3.5.3 Object and class model

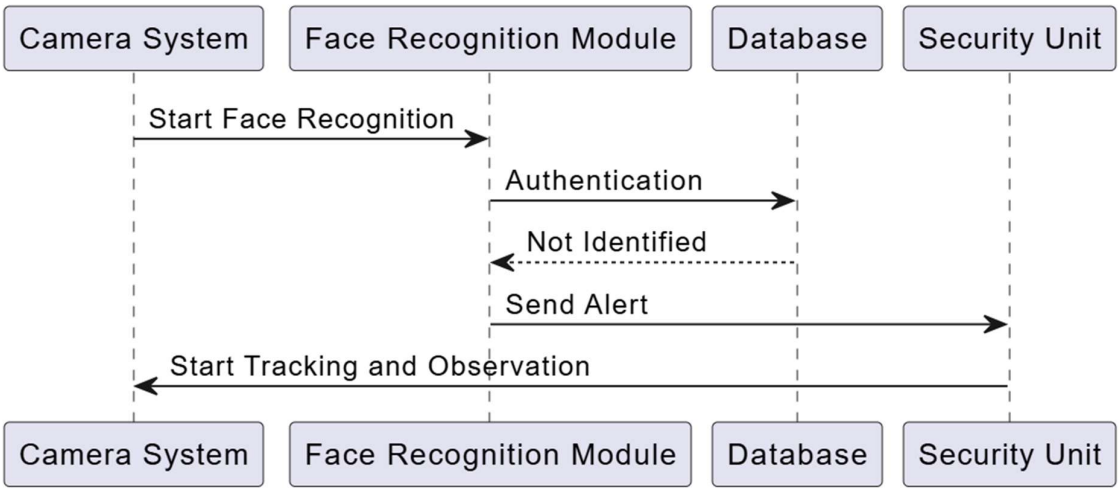


3.5.4 Dynamic models

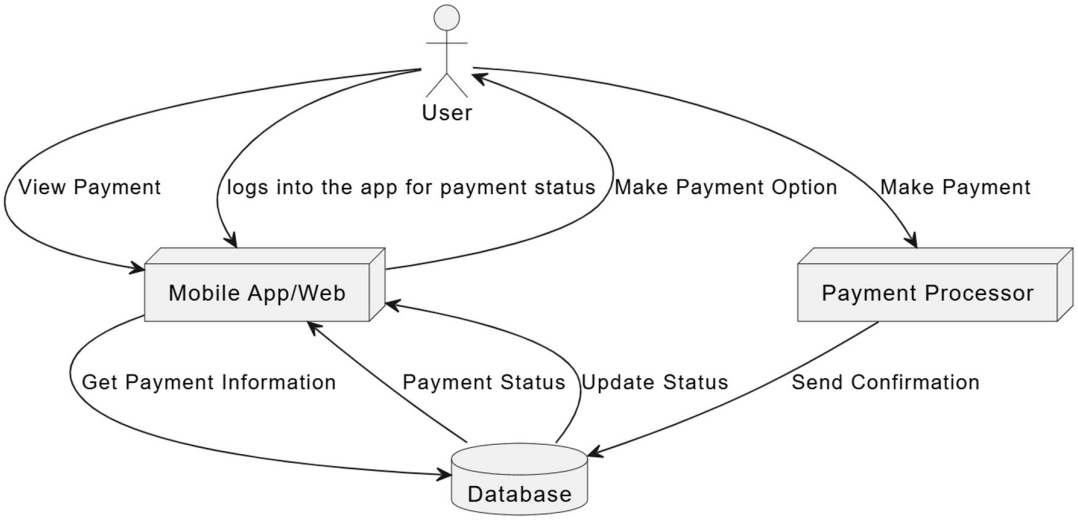
1- Notification Sending Process



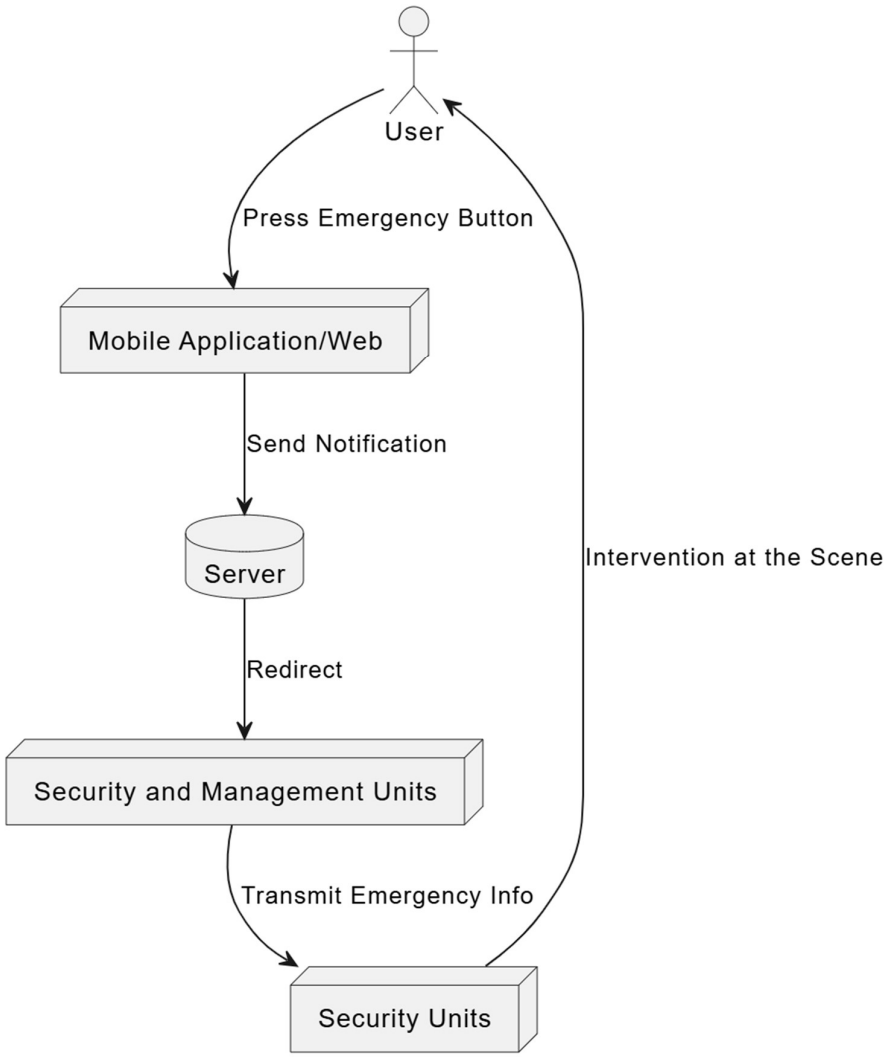
2- Security Camera and Unidentified Person Tracking Process



3- Payment Tracking and Reminder Process



4- Emergency Notification Process



3.5.5 User interface - navigational paths and screen mock-ups

You can also access the user interface of our project and web site of the project from the link below.

https://app.uizard.io/p/b1803ef9

https://gate-team.github.io/GATE_Project-website/

EnhanceSecurity

Manage your housing complex efficiently.

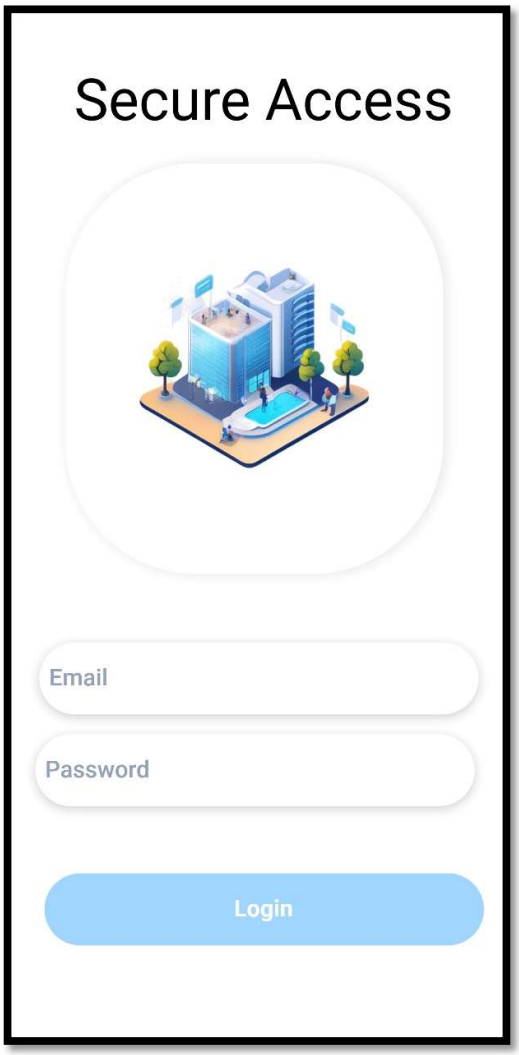
Get started

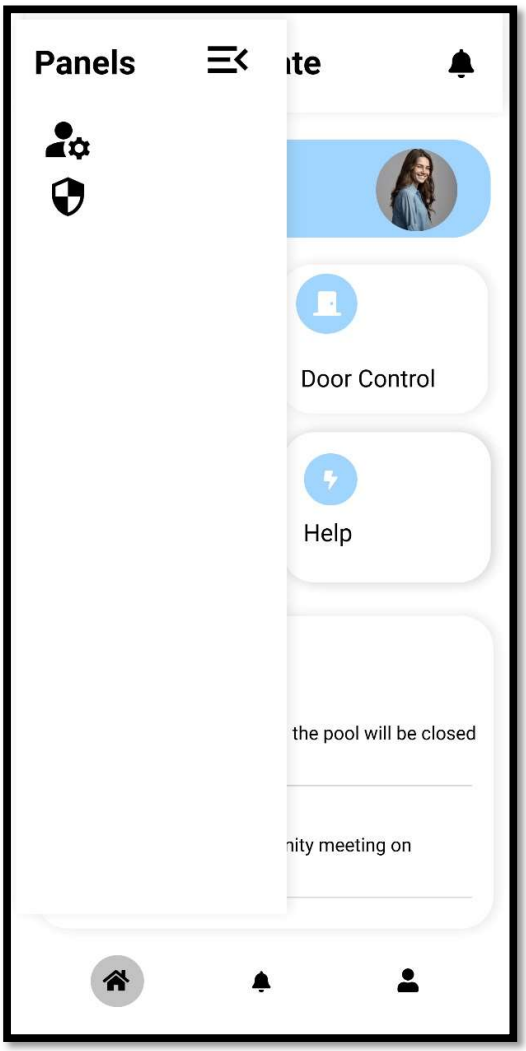
Secure Access

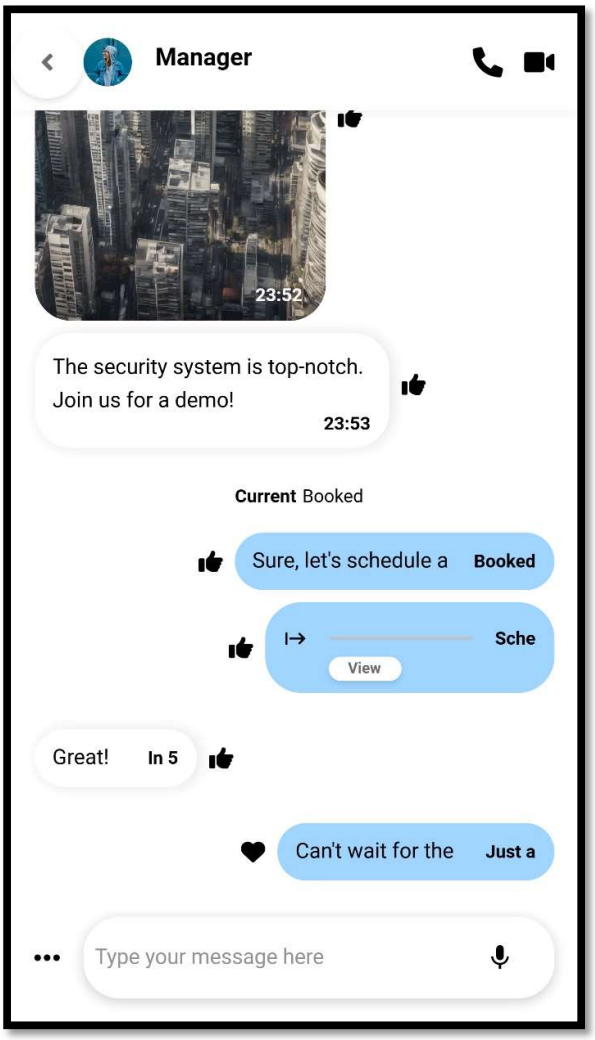
Email

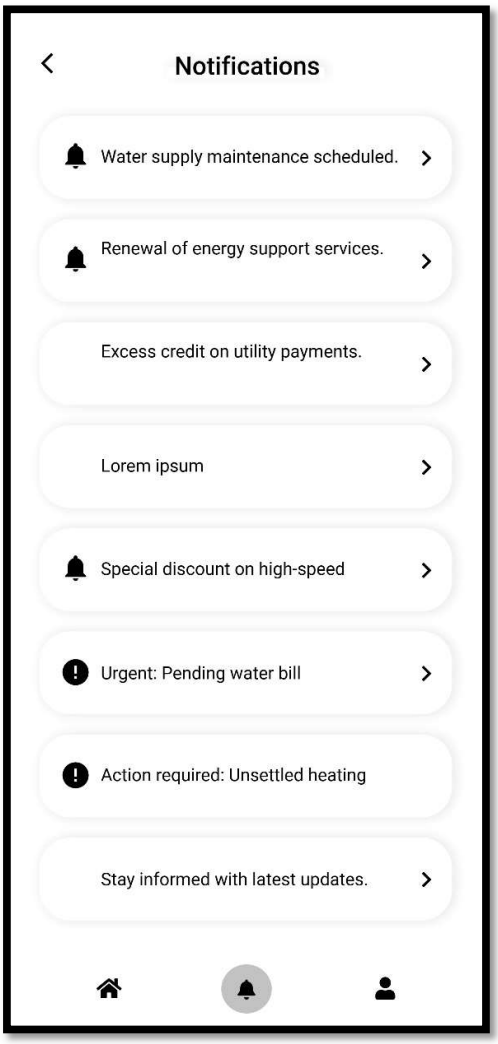
Password

Login


Secure Access
Email
Password
Login


Panels
Door Control
Help
the pool will be closed


Manager
23:52
The security system is top-notch.
Join us for a demo!
23:53
Current Booked
Sure, let's schedule a
Booked
Sche
View
Great!
In 5
Can't wait for the
Just a
Type your message here


Notifications
Water supply maintenance scheduled.
Renewal of energy support services.
Excess credit on utility payments.
Lorem ipsum
Special discount on high-speed
Urgent: Pending water bill
Action required: Unsettled heating
Stay informed with latest updates.

Gat

Payment

Card Number

1234 5678 9012 3456

Expiry Date

MM/YY

CVV

123

Payment Summary

Total $120.0

Last Payment $50.00

Pay Now

Resident Profile

Member since 2021

Payments

Notifications

Profile Settings

Privacy & Security

Gate

Profile Settings

Username

JohnDoe123

Security Preferences

Use Face ID

Two-Factor Authentication

Notifications

Email Notifications

Push Notifications

App Preferences

Dark Mode

Language English

Security Panel

Log out

Notifications

Gate 3: Unauthorized access detected — 2 min ago

Visitor John Doe arrived — 10 min ago

Visitor Management

Register Visitor

Log Entry/Exit

Alex Smith exited at 3:45 PM

Emily Davis entered at 3:30 PM

Recognize Vehicles

Red Sedan - License Plate: ABC123

Black SUV - License Plate: XYZ789

Respond Emergencies

Trigger Alarm

Monitor Personnel

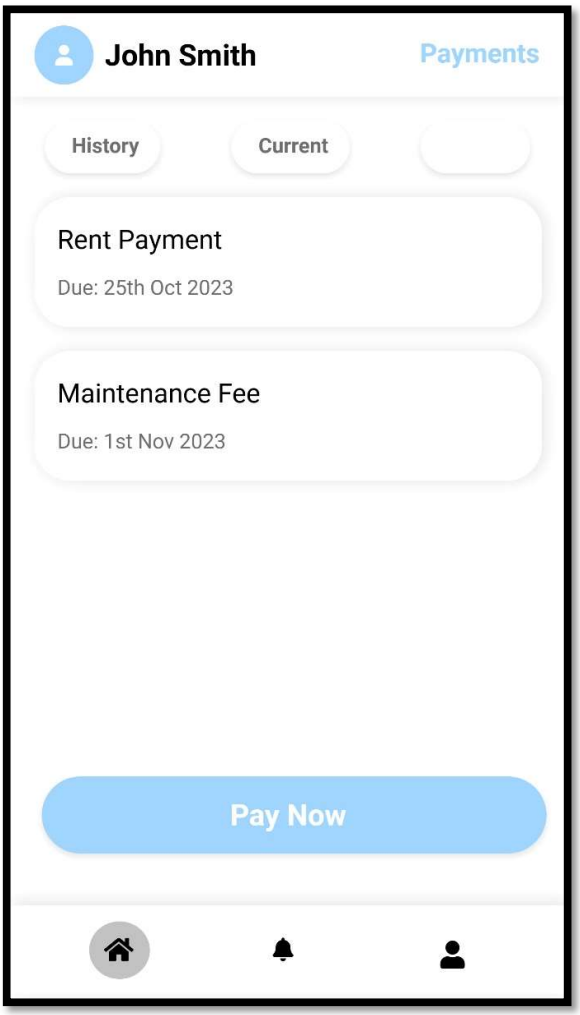
Main Entrance

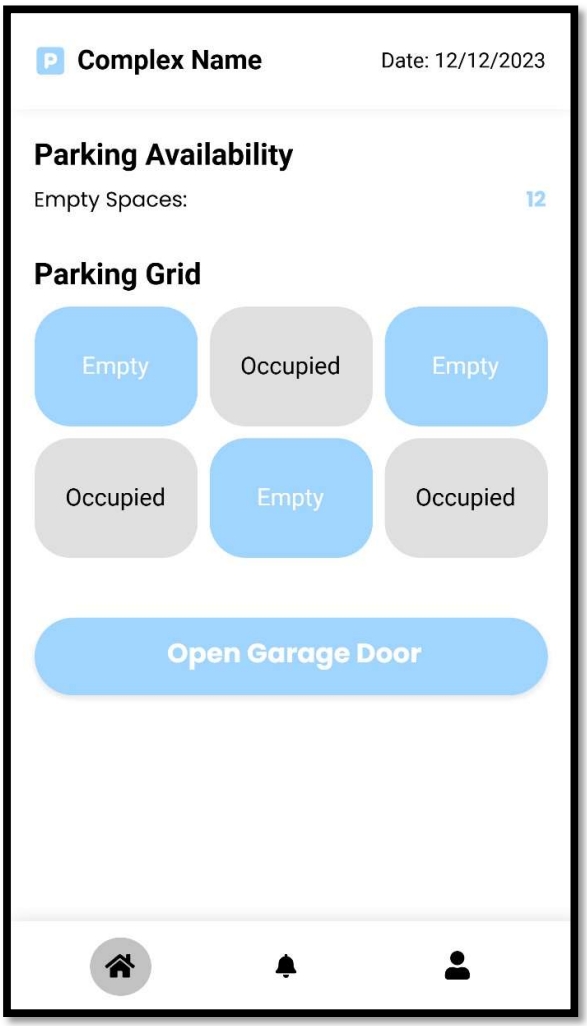
Parking Area

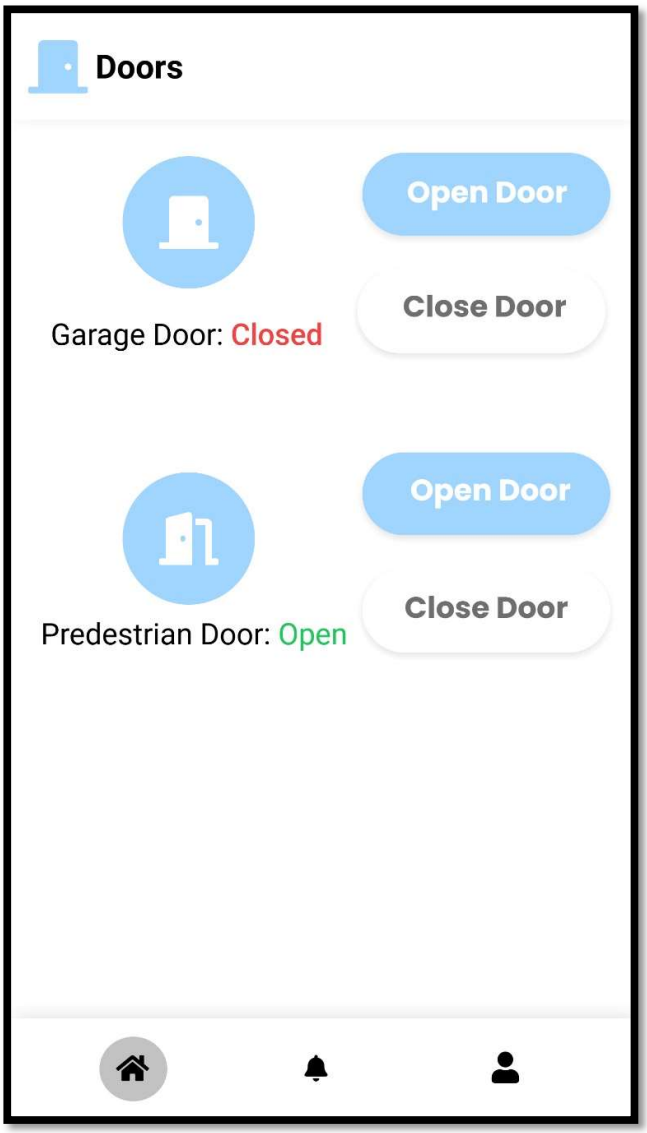
Visitor Management

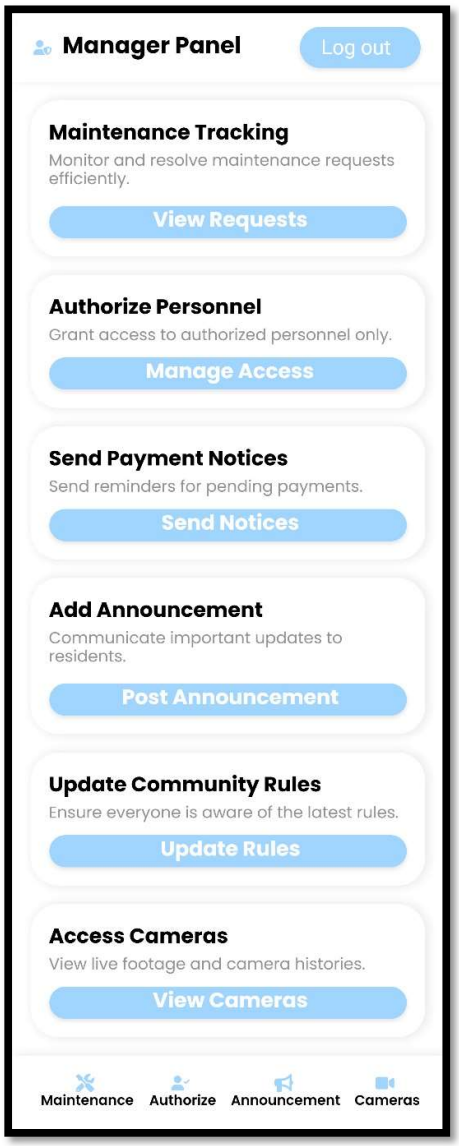
John Doe — Details

Emily Clark — Details


John Smith
Payments
History
Current
Rent Payment
Due: 25th Oct 2023
Maintenance Fee
Due: 1st Nov 2023
Pay Now


Complex Name
Date: 12/12/2023
Parking Availability
Empty Spaces:
12
Parking Grid
Empty
Occupied
Empty
Occupied
Empty
Occupied
Open Garage Door


Doors
Open Door
Close Door
Garage Door: Closed
Open Door
Close Door
Predestrian Door: Open


Manager Panel
Log out
Maintenance Tracking
Monitor and resolve maintenance requests efficiently.
View Requests
Authorize Personnel
Grant access to authorized personnel only.
Manage Access
Send Payment Notices
Send reminders for pending payments.
Send Notices
Add Announcement
Communicate important updates to residents.
Post Announcement
Update Community Rules
Ensure everyone is aware of the latest rules.
Update Rules
Access Cameras
View live footage and camera histories.
View Cameras
Maintenance
Authorize
Announcement
Cameras

4. Glossary

- **Resident:** A user who resides within the housing complex. Residents can perform tasks such as making payments, submitting complaints, reserving facilities, and receiving security notifications. They interact with the GATE platform primarily for personal and community-related tasks.
- **Manager:** An administrative user responsible for overseeing maintenance, payments, announcements, and community rules within the housing complex. Managers use the GATE platform to send notifications, access financial reports, approve resident requests, and manage security aspects of the complex.
- **Security Personnel:** Users tasked with maintaining security within the complex. They respond to emergency alerts, monitor security feeds, manage visitor access, and log entry/exit data. Security personnel also report unauthorized vehicles and assist residents in emergency situations.
- **Admin:** A system administrator responsible for managing platform operations, including user management, system settings, data backup, and security protocols. Admins oversee system maintenance, perform updates, and handle API integrations.
- **Security Notification:** Alerts sent to residents or security personnel regarding any security-related event within the complex, such as unauthorized access or emergency situations. These notifications facilitate immediate awareness and response.
- **Maintenance Request:** A request submitted by residents for repairs or upkeep within their units or shared areas in the complex. These requests are managed and tracked by the manager to ensure timely maintenance actions.
- **Reservation:** A booking made by a resident to use shared facilities, such as a gym or meeting room. Reservations require manager approval and allow residents to schedule time slots for exclusive access to facilities.
- **Emergency Alert:** A rapid notification sent by a resident in case of an emergency, such as a medical issue or fire. This alert is immediately directed to security personnel for prompt response.
- **User Management:** The admin's ability to add, remove, and manage permissions for users of the GATE platform, including residents, managers, and security personnel.
- **System Update and Maintenance:** Regular updates and system upkeep performed by the admin to ensure platform stability, security, and performance.
- **Data Backup and Recovery:** The process of creating and storing backup copies of system data to prevent data loss. Recovery allows data restoration in the event of accidental loss or system failures.
- **Financial Report:** A summary of payments, dues, and other financial transactions managed by the platform, providing managers with insights into the financial status of the complex.
- **Access Camera Feeds:** A security function that allows managers and security personnel to view live footage from security cameras within the complex to monitor and address potential threats or incidents.

- **Anomaly Detection:** An AI-driven feature that identifies unusual or unauthorized behavior within the complex and alerts security personnel to ensure the safety of residents.
- **Complaint/Request:** A message sent by a resident to the management to raise concerns or request specific actions, such as repairs, service improvements, or general inquiries.
- **Notification Settings:** Configurations managed by the admin to control the types and frequencies of notifications sent to different user groups, ensuring timely and relevant communication.
- **Visitor Management:** The process handled by security personnel to track and manage visitors entering and exiting the complex, including temporary access permissions and identity verification.
- **Unauthorized Vehicle Report:** A report generated by security personnel for vehicles parked without permission, allowing managers to notify the owners and take appropriate action.
- **API Management:** Admin's task to manage Application Programming Interfaces (APIs) that enable GATE to integrate with other systems and external services, enhancing platform functionality.
- **Authentication:** The process of verifying a user's identity to ensure secure access to the system. Used in the GATE platform for login processes.
- **Authorization:** The process of granting a user permission to perform certain actions. In GATE, different roles such as manager and security personnel have distinct permissions.
- **Data Encryption:** The process of encoding data to protect it from unauthorized access. User information and other sensitive data in the GATE platform are encrypted for security purposes.
- **Backup and Recovery:** The process of regularly backing up data and restoring it in the event of data loss. This feature in the GATE platform ensures data security.
- **Cloud Storage:** The storage of data in an accessible environment over the internet. The GATE platform uses cloud storage for user data, enabling easy access.
- **Firewall:** A security system used to protect against unauthorized access. It can be used to enhance the security of the GATE platform.
- **User Interface (UI):** The graphical interface through which users interact with the system. The GATE platform is designed with user-friendly mobile and web interfaces.
- **User Experience (UX):** The experience users have while interacting with the system. GATE is designed to provide a user-friendly experience.
- **Scalability:** The ability of system components to continue functioning smoothly as the number of users or the amount of data increases. The GATE platform is scalable to accommodate a growing number of users.

5. References

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Anderson, R. E. (1992). ACM code of ethics and professional conduct. *Communications of the ACM*, *35*(5), 94–99. https://doi.org/10.1145/129875.129885

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