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D'mulot Residence Complaint System

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Article Info	Abstract
	House maintenance is essential to meet the housing needs to establish a safe and conducive living environment. Considering the time limitation, many of us find using the traditional manual method to submit complaints cumbersome. Transitioning the manual method to a digital complaint system will be developed by using Prototyping Model. The proposed solution involves developing a web-based complaint system with two versions, web-based and mobile-based versions, to implement a dedicated complaint management system that provides a structured framework for receiving, prioritizing, tracking, resolving, and managing complaints records. The system will help provide prompt issue resolution, maintenance supervision, and efficient property management for various housing accommodations.

1. Introduction

Rental housing refers to a property occupied by someone other than the owner, for which the tenant pays a periodic mutually agreed rent to the owner [1]. D'mulot Residence is a residential house located near UTHM that provides rental housing needs for students, especially female students. To create a safe and conducive living environment for female students attending UTHM, residents are encouraged to report or complain about any issues and problems that arise in their houses. In addition, complaints are viewed as essential tools for ensuring the property's long-term quality, and tenant satisfaction. As of now, residents use WhatsApp platform to report any issues related to their rented property to the landlord that range from maintenance, utilities, safety, and any other issues. The residents may send text messages, images, or videos to describe the issue effectively. However, the current process of issuing, receiving, tracking, resolving, and maintaining complaints records by using WhatsApp may not be the most efficient or organized way to handle complaints, especially in a formal student rental housing setting like D'mulot Residence. Moreover, with the growth in population and urban migration, traditional manual methods are being replaced by contemporary computerized applications [2]. The landlord may struggle to handle a high volume of complaints efficiently, which can lead to operational inefficiencies, increasing the workload and costs for the landlord in terms of maintenance and resolution. Hence, the lack of proper documentation in the current process poses significant challenges to maintaining a clear and organized record of all complaints. Due to limited search and categorization capabilities, retrieving specific complaint details and communication histories becomes cumbersome. Besides, without a clear priority system, there is a risk of overlooking urgent issues, such as maintenance emergencies or safety problems. that can lead to delayed or inadequate responses, potentially resulting in property damage, safety hazards, or resident injuries. The proposed solution involves the development of a web-based complaint system with two versions, which are web-based and mobile-based versions. This project's purpose is to implement a dedicated complaint management system that provides a structured framework for receiving, prioritizing, tracking, resolving, and complaints record. Thus, D'mulot Residence Complaint System, a web-based system will be designed to provide an organized platform for

managing complaints and property records that will make it easier to categorize, prioritize, and track complaints, leading to better record-keeping.

The paper's structure is as follows: Section 2 presents a comprehensive list of related works for the project. Section 3 details the methodology employed in the research. In Section 4, the outcomes of the system are delved into. Lastly, Section 5 offers a discussion on the concluding aspects of the project.

2. Related Work

An overview of the related works concerning the D'mulot Residence Complaint System is provided in this section.

2.1 Technology Used

The proposed web-based system will be using MySQL for the database by using phpMyAdmin. Structured Query Language (SQL) is a powerful tool for interacting with relational database systems [3]. Thus, the system will be deployed on the local web server through the XAMPP control panel by using PHP which is short for Hypertext Processor. It provides a phpMyAdmin administration tool that facilitates the management of a MySQL database. Additionally, PHP is specifically designed for web development, allowing its code to be seamlessly integrated directly into HTML. The proposed system will also be developed by using JavaScript. JavaScript is a scripting language that either runs on client-side or server-side [4]. JavaScript can be executed on the client side, allowing it to run in a user's web browser, and on the server side, where it operates on the server before being sent to the client. Hence, it is often used in conjunction with HTML and CSS to enhance the functionality and appearance of web pages. Laravel, which is a free and open-source PHP framework that provides a set of tools and resources to build modern PHP applications [5], will also be included in the development of the system. It follows the model-view-controller (MVC) architectural pattern and comes with a variety of features and tools that streamline common tasks in web development, which potentially results in the development of a well-structured and effective web system.

2.2 Comparison with Existing System

The three existing systems are compared by their features of the system which are User Authentication and Registration, Make a Complaint Module, Record Property, Record Maintenance Activities, Monitoring and Tracking Complaint Module, Predict Maintenance Cost Module and Generate Report Module. Table 1 shows the comparison between three existing systems which are WeCare UTHM, eAduan KPDN, and e-Aduan Fasiliti UITM with the proposed system, D'mulot Complaint System.

Table 1 *Comparison of existing systems*

Features/System	WeCare UTHM [6]	eAduan KPDN [7]	e-Aduan Fasiliti UITM [8]	D'mulot Residence Complaint System
User Authentication and Registration	√	√	√	√
Make a Complaint Module	√	√	√	√
Record Property	X	X	X	√
Record Maintenance Activities	X	X	X	√
Monitoring and Tracking Complaint Module	√	√	X	√
Predict Maintenance Cost Module	X	X	X	√
Generate Report Module	X	X	X	√

3. Methodology

The methodology used for this project is Prototyping Model. The Prototyping Model in software development involves creating a prototype, testing it, and iteratively refining it until a satisfactory prototype is achieved. Through ongoing feedback from users, this approach allows for continuous improvement and enhancement. There are six phases in the Prototyping model [9]. As shown in Table 2, each phase needed its own assignment and output that needed to be produced during the entire project development.

Table 2 *Software development activities and their task*

Phase	Task	Output
Planning	- Propose the project - Task scheduling - Identify problem, scope and objectives	- Project proposal - Gantt chart
Analysis	Collect and analyze the information	- Swimlane diagram (To-be-model) - Use case diagram - Use case specification - Activity diagram - Sequence diagram - Class diagram - Requirement Definition
Design	- Design system architecture - Design user interface by using PHP - Design database	- System architecture - Database schema and data dictionaries - User interfaces
Prototype Implementation (Prototype 1)	- Programming - Develop prototype 1	Program code
Prototype Implementation (Prototype 2)	- Programming - Develop prototype 2 and connecting with database	Program code
System Implementation	- Develop a complete system - Test the system	- System - Test cases - Requirement Traceability Matrix

3.1 Analysis

In this section, the results of the system analysis are presented through a range of visual representations. These include a swimlane diagram, a use case diagram, detailed use case specifications, the corresponding sequence diagram, an activity diagram, a class diagram, and a comprehensive requirement definition. Together, these visual aids communicate the findings and insights derived from the analysis of the system.

3.1.1 Swimlane

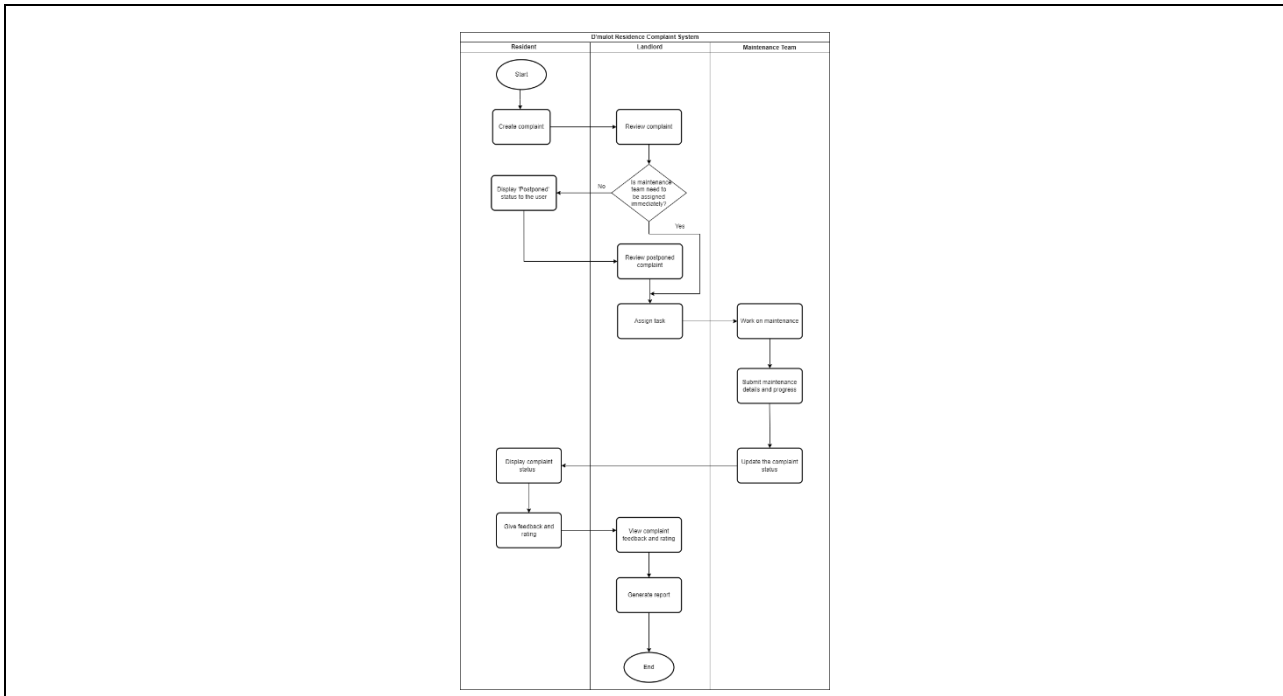Figure 1 shows the swimlane diagram for D'mulot Residence Complaint System.

Figure 1 *Swimlane diagram*

3.1.2 Use case diagram

Use Case Diagram for D'mulot Residence Complaint System is shown in Figure 2.
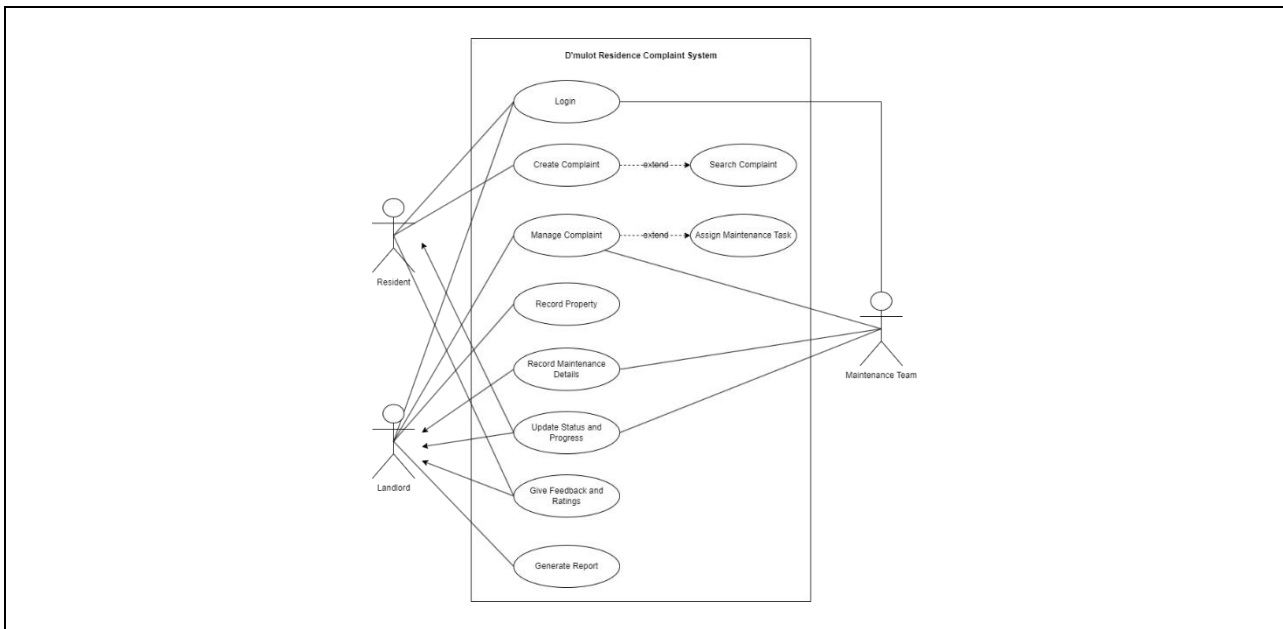

Figure 2 *Use Case Diagram for D'mulot Residence Complaint System*

The Login use case will manage the login process and registration process of all users. Besides, the Create Complaint use case will be used by the resident to create complaints and search existing complaints. Next, the Manage Complaint use case is to for landlord to manage complaint by assigning the task to maintenance team. The maintenance team will also be allowed to view the assigned task for them. Next, Record Property use case is for landlord to add new property or edit existing property details. Record Maintenance Details use case is for maintenance team to update any maintenance details such as material and labor charge during maintenance activity. The details can be viewed by the landlord. For Update Status and Progress use case, the maintenance team will be allowed to update any progress and status of the complaint which are 'In-progress', 'Pending', 'Postponed' and 'Resolved'. The status can be viewed by the resident and the landlord. Next, the Give Feedback and Ratings use case allows the resident to submit complaint's feedback and ratings. The landlord can view the

feedback and ratings given by the resident. Lastly, Generate Report use case is for the landlord to view report.

3.1.3 Activity diagram

An activity diagram represents the dynamic aspects of a system by modeling the flow of control from one activity to another. The detailed activity diagram for the system will be shown in Appendix A.

3.1.4 Sequence Diagram

A sequence diagram is a visual representation that illustrates the interactions and chronological order of messages exchanged between various objects or components within a system. The detailed activity diagram for the system will be shown in Appendix B.

3.1.5 Class diagram

Figure 3 shows the class diagram for D'mulot Residence Complaint System.
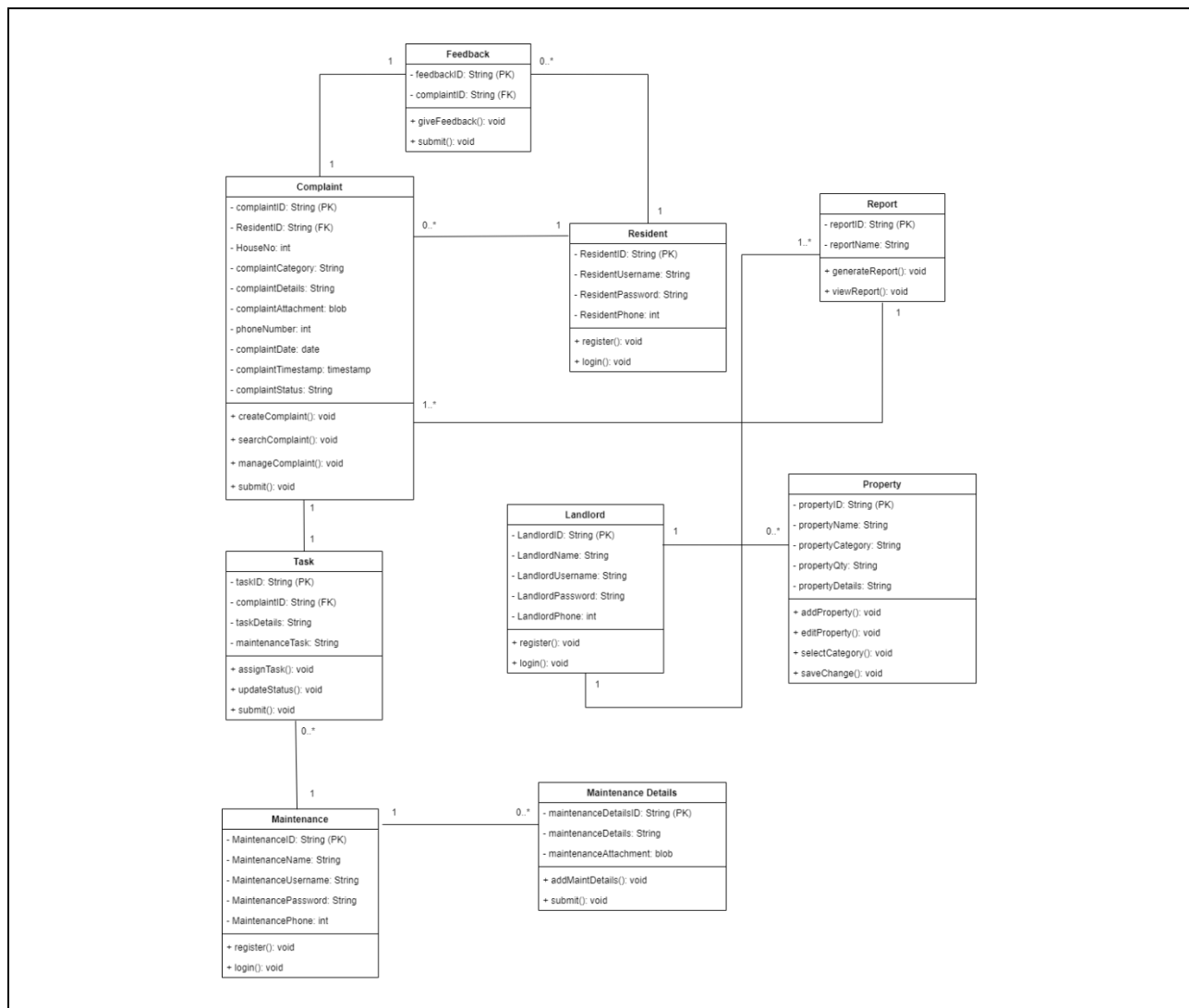
Figure 3 *Class Diagram for D'mulot Residence Complaint System*

3.1.6 Requirement definition

System requirement analysis is conducted to identify the criteria and expectations that the developed system should fulfil according to user needs. This process involves identifying both the functional and non-functional requirements necessary for the proposed system.

Functional requirements define the specific functionalities or features that a system must deliver. These requirements describe what the system is supposed to do and how it should perform certain tasks. The functional requirements of the D'mulot Residence Complaint System are shown in Table 3.

Table 3 *Functional Requirements for D'mulot Residence Complaint System*

NO.	MAIN FEATURES	FUNCTIONALITIES
1.	User Authentication and Registration	• The system should allow the users (residents, landlord, maintenance team) to create accounts. • The system should allow the users (residents, landlord, maintenance team) to log in to the system using a valid username and password securely. • The system should alert the users (residents, landlord, maintenance team) if the credential is invalid. • The system should allow the users (residents, landlord, maintenance team) to create new passwords if they click forgot password button. • The system should redirect users to their respective dashboard or homepage upon successful login.
2.	Make a Complaint	• The system should allow the users (residents) to submit complaints. • The system should allow the user (residents) to provide the details of the complaints by keying facilities to be complained. • The system should allow the user (residents) to search for specific complaints and filter them based on criteria. • The system should record the timestamp of the complaint submission. • The system should allow the users (residents) to track the status and progress of their submitted complaints.
3.	Record Property	• The system should allow the landlord to list all facilities available in each house. • The system should allow the landlord to create unique identifiers for addressing each property unit for easy reference.
4.	Record Maintenance Activities	• The system should allow the maintenance team to keep record details of any maintenance or renovations that have been done. • The system should allow the maintenance team to upload relevant documents related to the maintenance.
5.	Monitoring and Tracking Complaint	• The system should allow the landlord to monitor and track user complaints. • The system should allow the user (landlord) to manage and assign maintenance team to resolve maintenance complaint. • The system should allow the user (maintenance team) to update the complaint's status and progress.
6.	Predict Maintenance Cost	• The system will allow the users to provide complaint details. • The system will provide specific details about the rental property, such as its age, condition, and past maintenance history. • The system will consider external influences like inflation rates, market prices of materials, and labor charges in the cost prediction process. • The system will provide a reliable estimate of the expected maintenance cost for a given complaint. • The system will also provide a detailed cost breakdown, outlining the expected expenses for materials ,and labor.

Table 3 *(cont)*

NO.	MAIN FEATURES	FUNCTIONALITIES
7.	Generate Report	• The system will provide insights into the most common complaints for each house for different user types. • The system will also display the total complaints recorded, including those completed, in-progress, pending, and postponed. • The system will generate reports summarizing the most common complaints across all properties they oversee (daily, weekly, monthly, yearly). • The system should keep users informed about complaint updates and important system events. • The system should allow the users (Residents) to give feedback on the resolution process and landlord's performance.

Non-functional requirements specify the characteristics and qualities that a system must possess. Table 4 shows the non-functional requirements of the D'mulot Residence Complaint System.

Table 4 *Non-functional Requirements for D'mulot Residence Complaint System*

NO.	REQUIREMENTS	DESCRIPTION
1.	Performance	• The system should respond to user interactions within 5 seconds.
2.	Scalability	• The system should be scalable to handle an increasing number of users, complaints, and property records.
3.	Security	• The system should be accessible with valid username and password only.
4.	Usability	• The system should be user-friendly and easy to use.

3.2 Design

The design is expressed through four primary components, specifically the system architecture, system interfaces, and the outcomes of formulating the system database.

3.2.1 Interface Design

The user interface design of the D'mulot Residence Complaint System will be displayed in the Appendix C section.

3.2.2 Database Design

Database design is the process of defining the structure that will organize and store data in a database system. It involves determining the tables, relationships, keys, and constraints needed to represent and maintain the data in a way that meets the requirements of an application or system.

(a) Database schema
A database schema refers to the logical and visual configuration of the entire relational database. The database objects are often grouped and displayed as tables, functions, and relations. A schema describes the organization and storage of data in a database and defines the relationship between various tables [10]. Database schema will be shown in Appendix D.

(b) Data dictionaries
A data dictionary is a centralized repository of information that includes names, definitions, and attributes used within a database, providing a comprehensive reference for understanding the database's structure and the characteristics of its stored data. The detailed data dictionaries will be displayed in Appendix E.

4. Results and Discussion

5. Conclusion

Based on the findings, it is concluded that the D'Mulot Residence Complaint System has the potential to significantly improve the management of resident feedback and enhance the overall living experience within the community. This system enables residents to easily submit complaints, eliminating the need for traditional methods such as phone calls, letters, or emails. By developing this application, residents can efficiently communicate their concerns and grievances directly through the system. The D'Mulot Residence Complaint System also offers streamlined processes for administrators to verify and address complaints promptly. The system facilitates efficient task assignment and resolution, contributing to seamless management of resident feedback.

Acknowledgement

Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Nur Irdina Izzla Norazam, Noraini Ibrahim; **data collection:** Nur Irdina Izzla Norazam; **analysis and interpretation of results:** Nur Irdina Izzla Norazam, Noraini Ibrahim; **draft manuscript preparation:** Nur Irdina Izzla Norazam, Noraini Ibrahim.. All authors reviewed the results and approved the final version of the manuscript.*
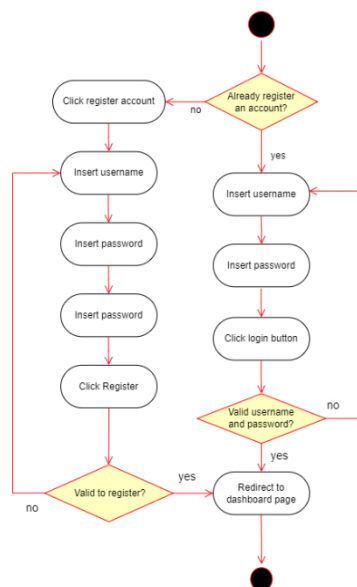
Appendix A

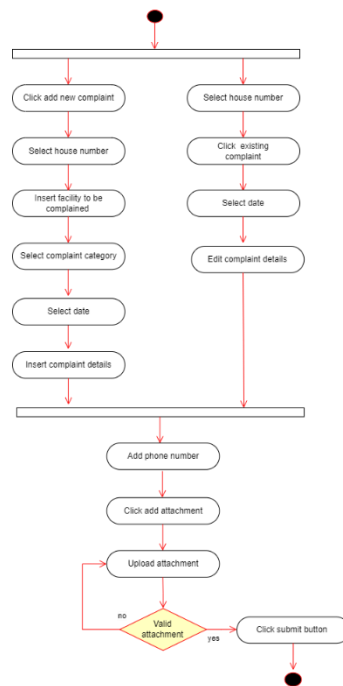**Figure Appendix A.1** *Activity diagram for Login use case*

Figure Appendix A.2 *Activity diagram for Create Complaint use case*
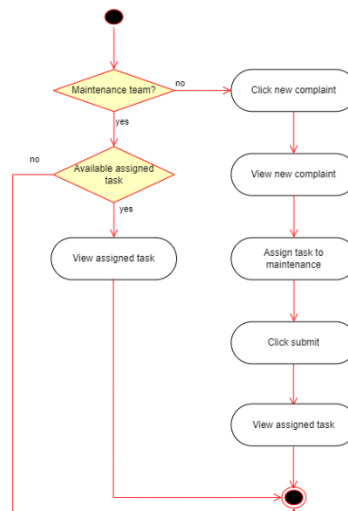

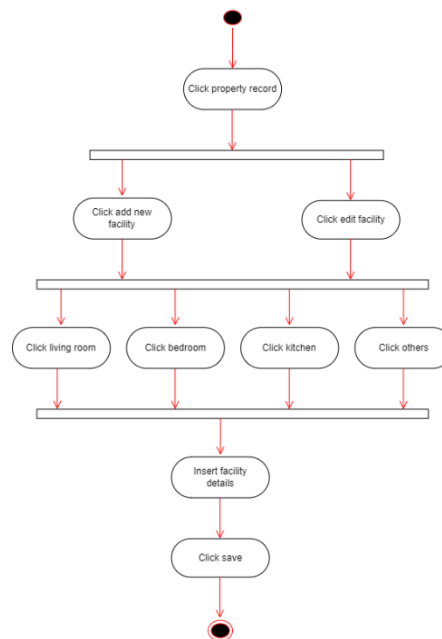**Figure Appendix A.3** *Activity diagram for Manage Complaint use case*

Figure Appendix A.4 *Activity diagram for Record Property use case*
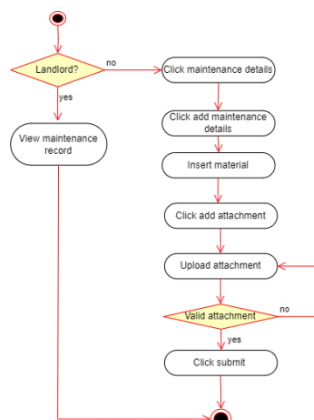

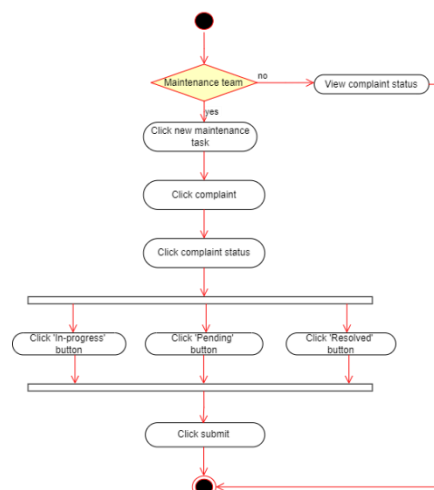**Figure Appendix A.5** *Activity diagram for Record Maintenance Details use case*

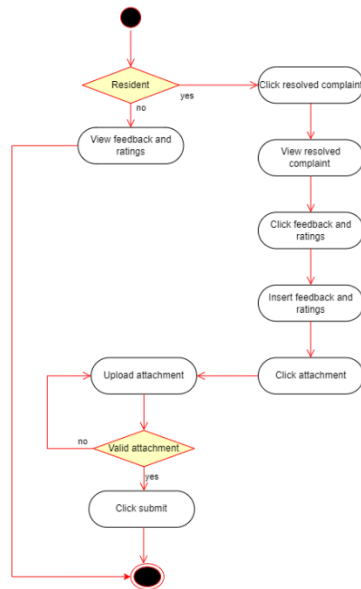**Figure Appendix A.6** *Activity diagram for Update Status and Progress use case*

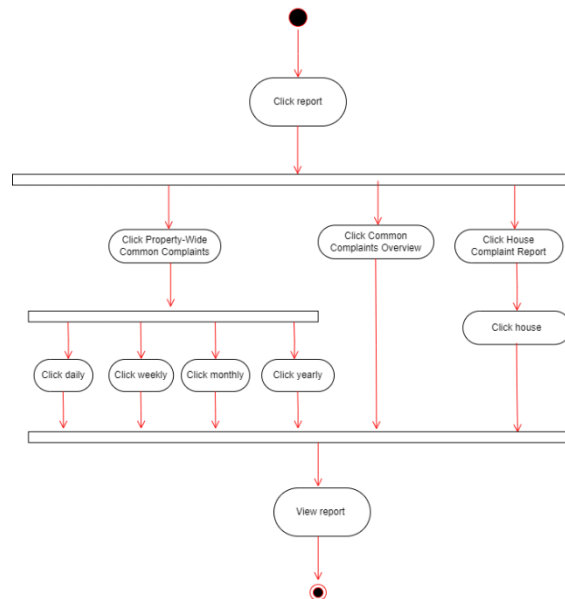**Figure Appendix A.7** *Activity diagram for Give Feedback and Ratings use case*

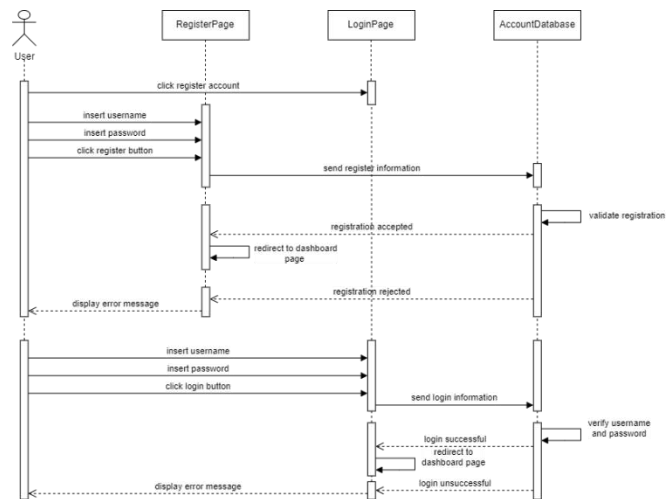**Figure Appendix A.8** *Activity diagram for Generate Report use case*

Appendix B

Figure Appendix B.1 *Sequence diagram for Login use case*
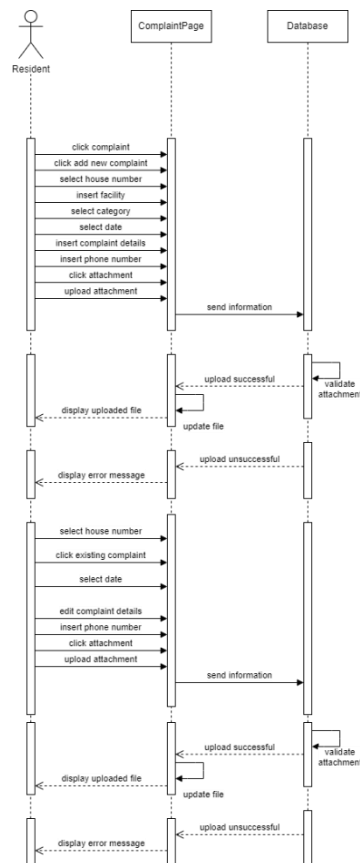

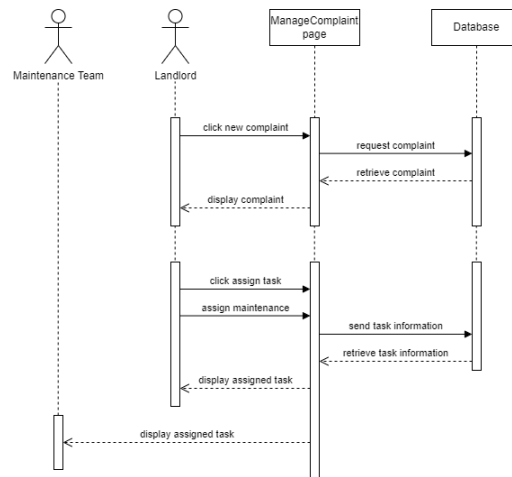**Figure Appendix B.2** *Sequence diagram for Create complaint use case*

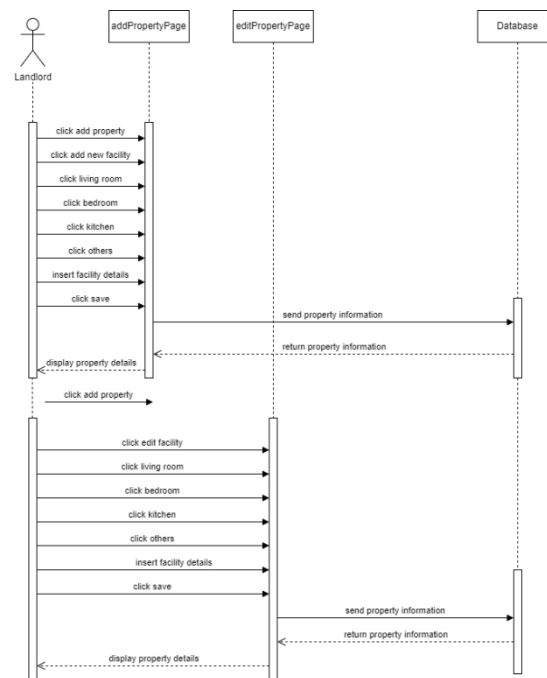**Figure Appendix B.3** *Sequence diagram for Manage complaint use case*

Figure Appendix B.4 *Sequence diagram for Record Property use case*
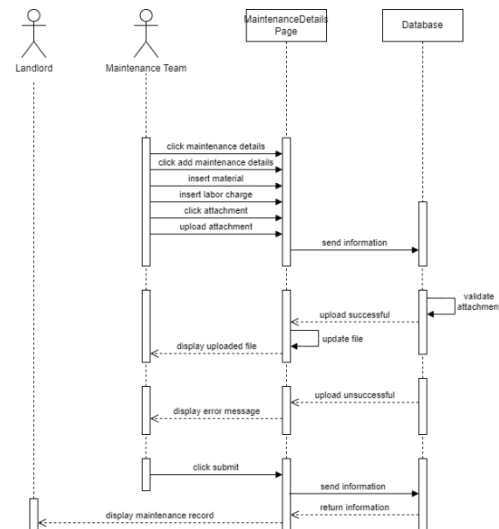
Figure Appendix B.5 *Sequence diagram for Record Maintenance Details use case*
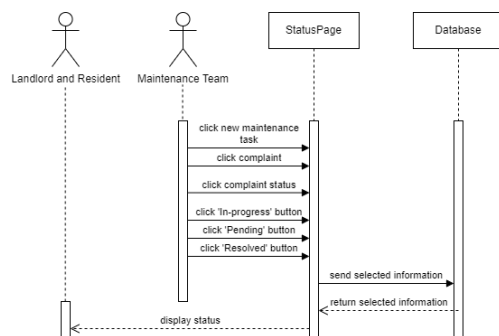
Figure Appendix B.6 *Sequence diagram for Update Status and Progress use case*
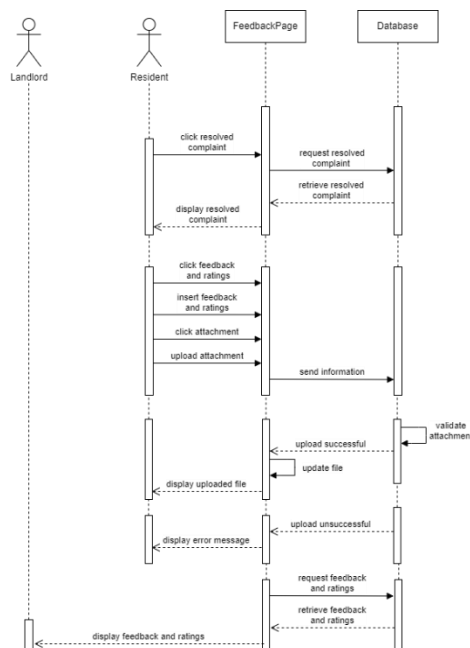

Figure Appendix B.7 *Sequence diagram for Feedback and Ratings use case*
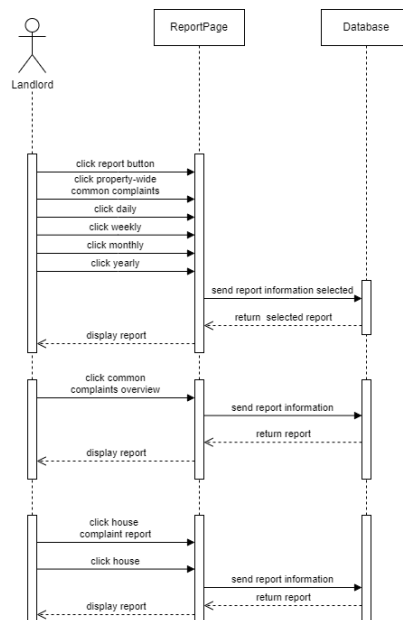
Figure Appendix B.8 *Sequence diagram for Generate Report use case*

Appendix C

Figure Appendix C.1 *Landing Page*

Landing page of D'mulot Residence Complaint System is shown in Appendix C.1. If user click on the login button, the user will be redirected to login page.

(a)   (b)

Figure Appendix C.2 *Login and Sign Up Account (a) Login page; (b) Sign Up page*

In the login page, users need to insert valid username and password to enter the system. User can create account by clicking on create account link in the login page. In the sign up page, users will be asked to enter valid username and password to sign up their new account. After a successful registration, users will be redirected to dashboard page.

Figure Appendix C.3 *Create Complaint page for Resident*

User (resident) can create new complaint as shown in Appendix C.3. To create a new complaint, user needs to choose house number, then enter facility that they want to complain. After that, user can choose complaint category from the option list and date from the calendar. User can also fill in the complaint details in the empty field given. Users need to insert their phone number and lastly, user can add attachment before submitting the complaint form.

Appendix C.4 *Manage Complaint page for Landlord*

In this page, the landlord can manage complaints by overseeing the complaints and prioritize urgent complaint first. Complaints will be assigned to maintenance team.

Figure Appendix C.5 *Maintenance Details page for Maintenance Team*

Appendix C.5 shows the Maintenance Details page for Maintenance Team. Maintenance can record maintenance details in this form. User needs to insert materials used and labor charges. Details of the maintenance details can also be included. Any relevant attachment can also be uploaded before submitting the details.

Figure Appendix C.6 *Feedback and Ratings page for Resident*

In this page, the user (resident) will be able to submit rating and any comment on the complaints that has been resolved.

Appendix D

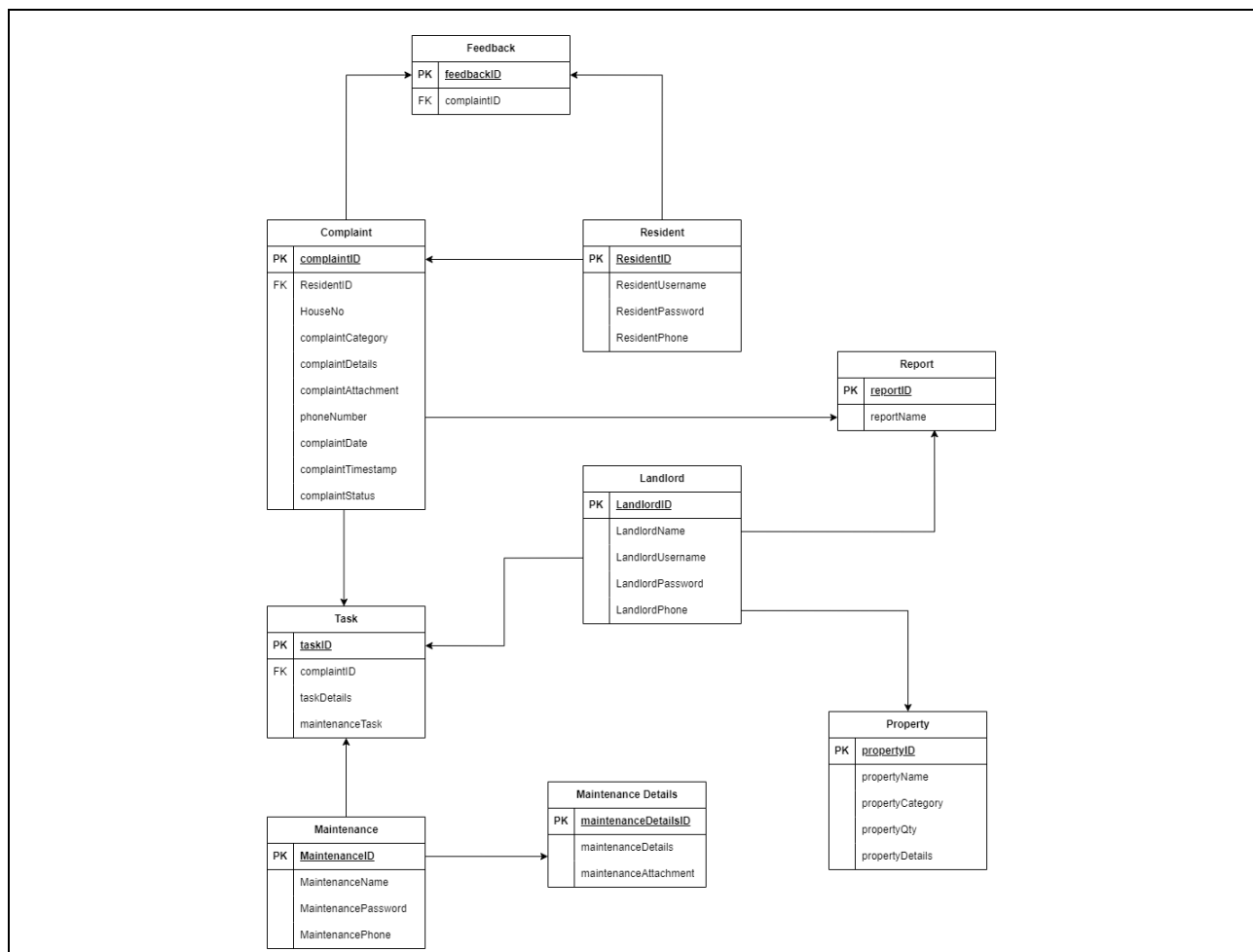Appendix D shows the database schema for D'mulot Residence Complaint System.

Figure Appendix D *Database Schema for D'mulot Residence Complaint System*

Appendix E

Table Appendix E.1 *Table Resident*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
ResidentID	String	-	No	PK	Resident unique id
ResidentUsername	String	-	No	-	Resident username
ResidentPassword	String	-	No	-	Resident password
ResidentPhone	int	11	No	-	Resident phone number

Table Appendix E.2 *Table Landlord*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
LandlordID	String	-	No	PK	Landlord unique id
LandlordName	String	-	No	-	Landlord name
LandlordUsername	String	-	No	-	Landlord username
LandlordPassword	String	-	No	-	Landlord password
LandlordPhone	int	11	No	-	Landlord phone number

Table Appendix E.3 *Table Maintenance*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
MaintenanceID	String	-	No	PK	Maintenance team unique id
MaintenanceName	String	-	No	-	Maintenance team name
MaintenancePassword	String	-	No	-	Maintenance team password
MaintenancePhone	int	11	No	-	Maintenance team phone number

Table Appendix E.4 *Table Complaint*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
complaintID	String	-	No	PK	Complaint unique id
ResidentID	String	-	No	FK	Resident unique id
HouseNo	int	2	No	-	House number of complainant
complaintCategory	String	-	No	-	Complaint category
complaintDetails	String	-	No	-	Complaint details
complaintAttachment	blob	65535	No	-	Complaint attachment
phoneNumber	int	11	No	-	Complainant phone number
complaintDate	date	-	No	-	Date creation of the complaint
complaintTimestamp	timestamp	-	No	-	Time creation of the complaint
complaintStatus	String	-	No	-	Complaint status

Table Appendix E.5 *Table Task*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
taskID	String	-	No	PK	Task unique id
complaintID	String	-	No	FK	Complaint unique id
taskDetails	String	-	No	-	Task details
maintenanceTask	String	-	No	-	Maintenance task

Table Appendix E.6 *Table Property*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
propertyID	String	-	No	PK	Property unique id
propertyName	String	-	No	-	Property name
propertyCategory	String	-	No	-	Property category
propertyQty	String	-	No	-	Property quantity
propertyDetails	String	-	No	-	Property details

Table Appendix E.7 *Table Maintenance Details*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
maintenanceDetailsID	String	-	No	PK	Maintenance details unique id
maintenanceDetails	String	-	No	-	Maintenance details
maintenanceAttachment	blob	65535	No	-	Maintenance attachment

Table Appendix E.8 *Table Report*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
reportID	String	-	No	PK	Report unique id
reportName	String	-	No	-	Report name

Table Appendix E.9 *Table Feedback*

Attribute Name	Datatype	Size	Constraints		Description
			Null	Key	
feedbackID	String	-	No	PK	Feedback unique id
complaintID	String	-	No	FK	Complaint unique id

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