COSC2440 Further Programming
Semester 3, 2024

Assignment Report

RENTAL AGREEMENTS MANAGEMENT

Lecturer: Mr. Minh Thanh Vu, Mr. Phong Ngo & Mr. Dung Nguyen

Student's name	:	Khong Quoc Khanh
Student's ID	:	4021494
Course	:	Further Programming
Github's repository	:	https://tinyurl.com/github-qckhanh

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I. Introduction

1. Application Description

This report analyzes the structure, system design, and algorithms implemented in Assignment 1: Build a Console Application. The project, developed using the Java programming language, focuses on creating a **Rental Agreement Management Application.**

The primary goal of this application is to enhance the efficiency and organization of rental agreement management processes. *It also provides administrative tools for managing associated entities, including Renters, Hosts, Owners, Properties, and Payments*.

The application leverages multiple design patterns, abstract data types (ADTs), algorithms, serialization techniques, and robust input validation mechanisms to ensure a seamless, reliable, and error-free user experience.

II. Application UML Class Diagram

1. UML Class Diagram

Due to the limitations of Word, a high-quality version of the UML Class Diagram can be accessed through this link: https://tinyurl.com/qckhanh-UML.

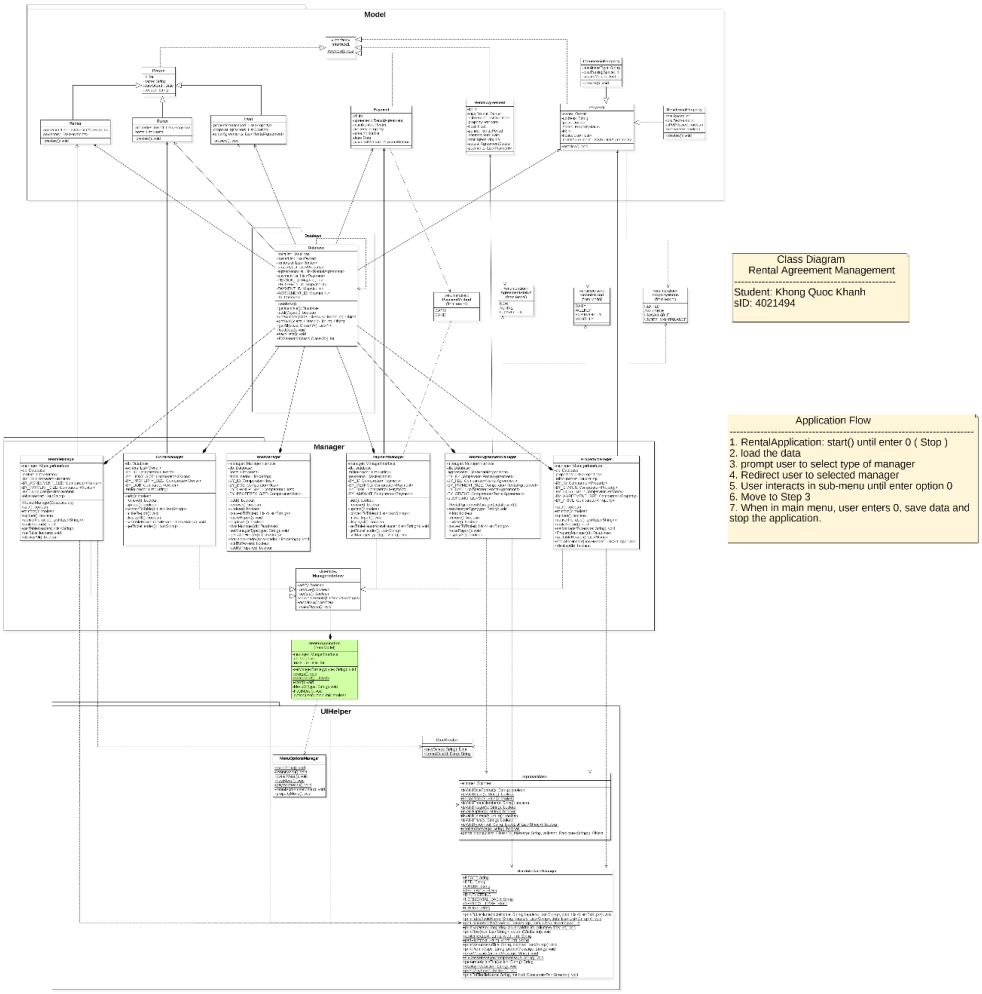


Figure 1: Class Diagram of Rental Agreements Application

2. System Design and Methodology Used

a. Strategy Pattern

To reduce code duplication in the `RentalApplication` class, I implemented the Strategy Pattern for managing different manager types (e.g., `RenterManager`, `OwnerManager`). By creating a `ManagerInterface` with common actions and using polymorphism, I enabled dynamic switching of manager types at runtime, streamlining the design.

```
public void setManagerType(String type) {
    switch (type) {
        case "renter" -> manager = new RenterManager(db);
        case "property" -> manager = new PropertyManager(db);
        case "host" -> manager = new HostManager(db);
        case "owner" -> manager = new OwnerManager(db);
        case "agreement" -> manager = new RentalAgreementManager(db);
        case "payment" -> manager = new PaymentManager(db);
        default -> throw new IllegalArgumentException("Invalid manager type");
    }
}
```

By applying the Strategy Pattern, code redundancy was minimized, and all option processing is now handled in a single method: `options(int userOption)`

```
private boolean option(int userOption){
    if(userOption == 0) return false;  // return false ==> back to main menu
    else if(userOption == 1) this.manager.add();
    else if(userOption == 2) this.manager.remove();
    else if(userOption == 3) this.manager.update();
    else if(userOption == 4) this.manager.displayAll();
    else if(userOption == 5) this.manager.makeReport();

    return true;  // always return true ==> continue in the submenu
}
```

b. Singleton Pattern

During development, I identified the need for the `Database` class to have a single instance throughout the program. To enforce this, I implemented the Singleton Pattern, ensuring only one instance of the `Database` class is created and preventing accidental instantiation with the new keyword.

```
private static  Database db;
private Database() {…} // constructor stuffs
public static Database getInstance(){
    return (db == null) ? db = new Database() : db;
}
```

In the `RentalApplication` class, the `db` variable (holding the *Database* instance) is passed by reference to all managers via the `setManagerType` method. This guarantees that all managers share the same *Database* instance, maintaining consistency. The usage of `Database` invokes:

```
// This is in class RentalApplication.
private final Database db;
public RentalApplication() {
    db = Database.getInstance();
}
```

c. Options Optimization

While the Strategy Pattern allowed flexibility in changing manager types, I initially created six separate methods (e.g., `RenterMenu()`, `OwnerMenu()`) to handle user input and management tasks. Most of the code in these methods was repetitive, differing only in menu displays. To resolve this, I refactored the code for better efficiency and simplicity.

```
private void MenuOf(String type){
    if(type.equals("host")){
        hostMenu();
        return;
    }

    this.setManagerType(type);      // set the manager type
    while(true){
        switch (type) {       // select its corresponding menu
            case "renter" -> RenterManagerMenu();
            case "property" -> PropertyManagerMenu();
            case "owner" -> OwnerManagerMenu();
            case "agreement" -> AgreementManagerMenu();
            case "payment" -> PaymentManagerMenu();
            default -> throw new IllegalArgumentException("Invalid manager
type");
        }
        int opt = (int) InputValidator.getValidInput(
                Integer.class,
                "Enter your option: ",
                input->isValidOption(input, 0, MAX_OPTION)
        );
        if(!this.option(opt)) break;  // if this return false, break the loop
    }
}
```

***Discussion**: One exception was* `HostManager`*, which required two unique options,* `addToProperty` *and* `addToOwner`*. Incorporating these into the existing structure reduced code clarity. To maintain readability and organization, I handled these cases separately.*

d. ID Generator

Initially, I used a static variable to increment unique IDs with each constructor call. However, this caused issues with `Serialization`, since deserialization reset the static variable, leading to duplicate IDs for new objects.

To address this, I implemented a method to randomly generate IDs until IDs are not exited in the four `Map<Integer, Integer>` instances for different object types.

Example of using `IDGenerator()` method:

```
public Payment() {
    this.paymentId = Database.IDGenerator(Payment.class);
}
```

e. Database and Sorting in Report

In the `Database` class, I implemented generic methods for basic operations like `add`, `getByIndex`, `getByID`, `delete`, and `getAll`. This approach streamlined maintenance by eliminating the need to create separate methods for each of the six lists, reducing redundancy.

```
    //others methods
    public boolean delete(Object o) {…}
    public List<?> getAll(Class<?> c) {
        if(c.equals(Host.class)) return hostList;
        else if(c.equals(Owner.class)) return ownerList;
        else if(c.equals(Renter.class)) return renterList;
        else if(c.equals(Property.class)) return propertyList;
        else if(c.equals(RentalAgreement.class)) return rentalAgreementList;
        else if(c.equals(Payment.class)) return paymentList;
        else return List.of();        // try to do some clean code
    }
```

For report sorting, I used the `mergeSort()` algorithm, ensuring a time complexity of `O(nlogn)`. The `RentalApplication` class allows sorting parameters to be passed as

arguments, enabling custom sorting conditions adaptable to any data type. This design ensures flexibility and efficiency in handling diverse data.

f. Input Validation

To handle invalid input and incorrect format input, I have created a class named `Input Validator` to manage the input from the user and the condition of each input type (email, phone number, date, ...). Additionally, to reduce the repetition code, a generic method was used throughout the program:

```
public static Object getValidInput(Class<?> clazz, String message,
Predicate<String> validator)
```

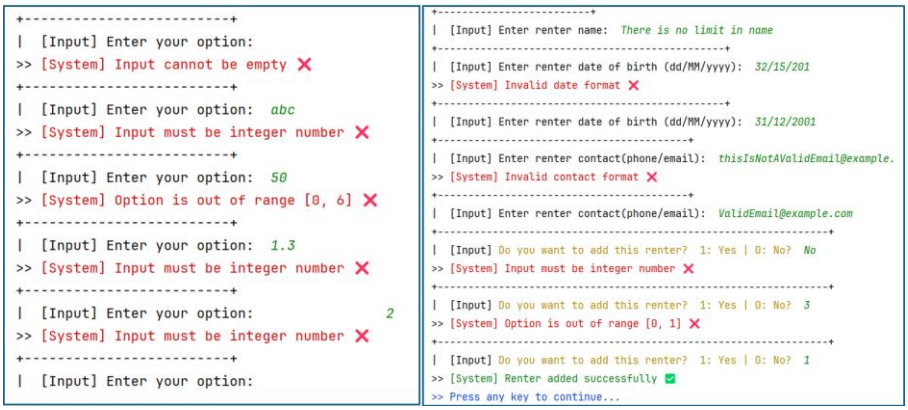


Figure 2: Example of using Input Validator

III. API List

Due to report size limitation, all getters, setters, and helper methods of classes will be excluded; only main-purpose and commonly-used methods will be mentioned.

Table 1: API List

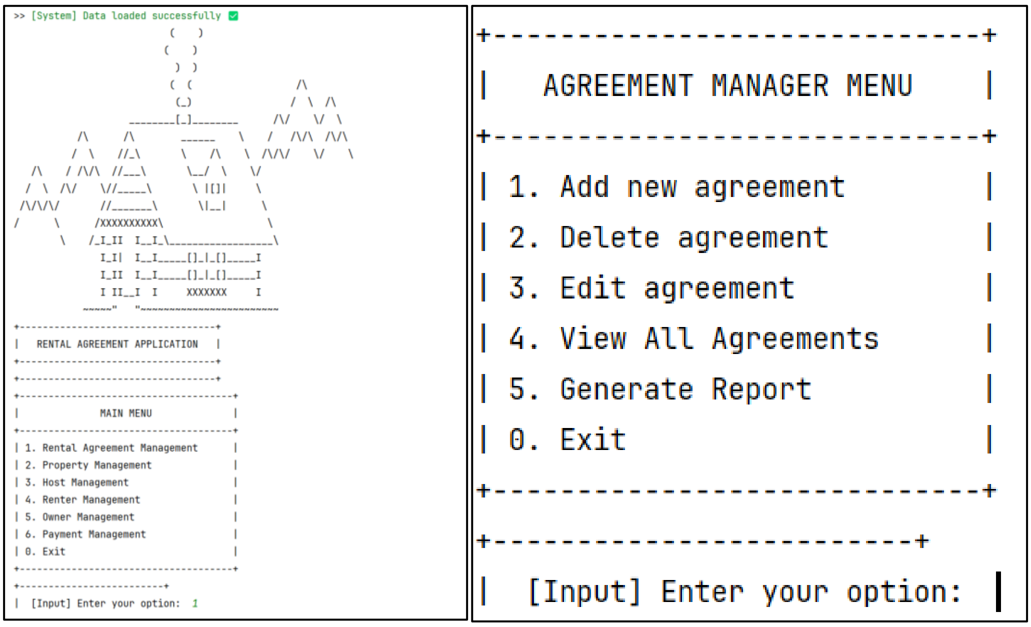
Class/Interface	Methods name	Purpose
Database	`loadData(): void`	To populate data from specified files.
	`saveDate(): void`	To save the program's data to specified files.
	`IDGenerator(Class<?> c): int`	To randomly generate ID for class parameters
	`add, delete, getAll, getByIndeex`	To retrieve data from database from specified class and criteria.
ManagerInterface's implementation	`add, remove, update, displayAll`	methods of interface to CRUD actions.
	`List<List<String>> convertToTable(List<?> objects)`	Convert the list of data to a 2D list with headers and data.
	`makeReport()`	To display sorted data and save files.
HostManager	`addToOwner()`	To cooperate Owner with the selected Owner
	`addToProperty()`	Specify properties that the host will manage.
Most "Manager" class	`setManagerType()`	[Strategy Pattern]: To change the manager type
Preview interface's implementation	`Preview()`	To briefly display information of class's instance.
Host	`addOwner`	To add the owner to the list and make reference with the owner

	`addProperty`	To add property to the list and make reference with property
Owner	`addProperty`	To add property to the list and make reference with property
Property	`Remove()`	To remove all connections to the property
RentalApplication	`option(int userOption)`	Direct use to slected option
	`start()`	To start the application
	`MenuOf(string type)`	To display the menu of the specified type
	`HostMenu()`	To display the menu of Host Manager
	`mergeSort()`	To sort the given data by the Merge Sort algorithm
	`Merge`	To merge two lists (a part of MergerSort)
DateCreator	`newDate`	To convert a string to a “Date” instance.
	`formatDate`	To convert a date to a string in “dd/mm/yyyy” format
InputValidator	`Object getValidInput(Class<?> clazz, String message, Predicate<String> validator)`	A generic method that validates the input with multiple validator methods returns an expected valid input.
	`All methods start with “is…”`	All these methods are thresholds/criteria for multiple inputs.
UserInterfaceManager	`printTableName`	Print the name of the table
	`printTable`	Display the table
	`getColums with`	Get the column maximums with a list of data.
	`printMenu`	Print the menu
	`successMessage`	Display a colored message to indicate the success.
	`errorMessage`	Display a colored message to indicate the failure.
	`pressAnyKeyToContinue`	This allows the user to enter any value before continuing the following action.
	`printToFile`	To redirect the output flow from the console display to the specified file.

IV. Application Screenshots

Due to the page limitations, only screenshots of Rental Agreements Management will be included.

1. Main Menu and sub-menu

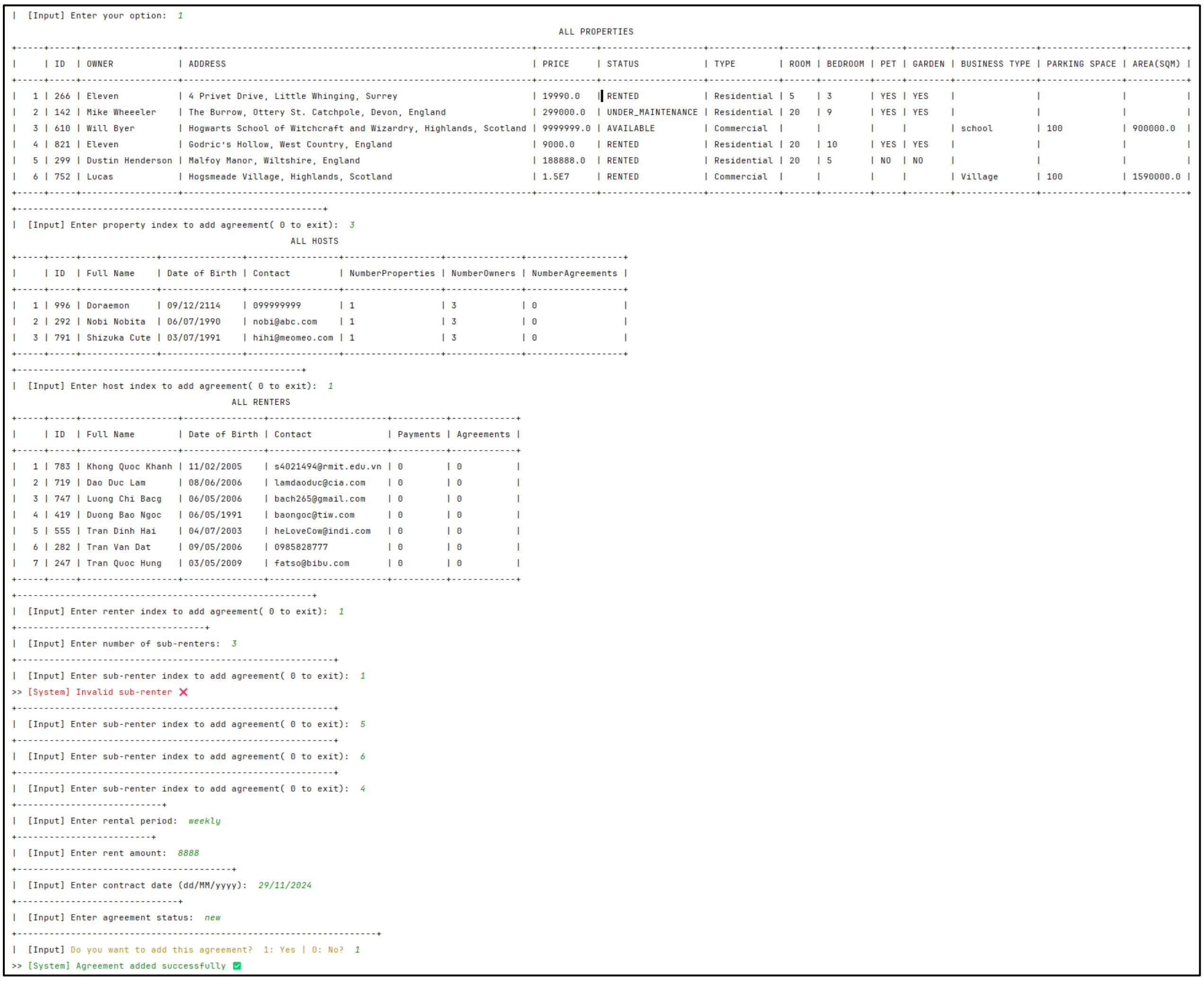


```
>> [System] Data loaded successfully ✅
                         (   )
                        (   )
                         ) )
                        ( (              /\
                         (_)           /  \  /\
                  ________[_]________    /\/    \/  \
         /\      /\       ______    \   /   /\/\  /\/\
        / \    //_\      \    /\    \  /\/\/    \/    \
  /\   / /\/\  //___\      \__/  \    \/
 / \  /\/    \//_____\       \ |[]|     \
/\/\/\/       //_______\       \|__|      \
/     \      /XXXXXXXXXX\                  \
       \    /_I_II  I__I_\__________________\
             I_I|  I__I_____[]_|_[]_____I
             I_II  I__I_____[]_|_[]_____I
             I II__I  I     XXXXXXX     I
          ~~~~~"   "~~~~~~~~~~~~~~~~~~~~~~~~~
+----------------------------------+
|   RENTAL AGREEMENT APPLICATION   |
+----------------------------------+
+----------------------------------+
+-------------------------------------+
|              MAIN MENU              |
+-------------------------------------+
| 1. Rental Agreement Management      |
| 2. Property Management              |
| 3. Host Management                  |
| 4. Renter Management                |
| 5. Owner Management                 |
| 6. Payment Management               |
| 0. Exit                             |
+-------------------------------------+
+-------------------------+
|  [Input] Enter your option:  1
```

```
+------------------------------+
|    AGREEMENT MANAGER MENU    |
+------------------------------+
| 1. Add new agreement         |
| 2. Delete agreement          |
| 3. Edit agreement            |
| 4. View All Agreements       |
| 5. Generate Report           |
| 0. Exit                      |
+------------------------------+
+-------------------------+
|  [Input] Enter your option:
```

Figure 3: Screenshot of Menu and Submenu

2. Create a new rental agreement



```
|  [Input] Enter your option:  1
                                                                             ALL PROPERTIES
+-----+-----+------------------+-----------------------------------------------------------------+-----------+-------------------+-------------+------+---------+-----+--------+---------------+---------------+-----------+
|     | ID  | OWNER            | ADDRESS                                                         | PRICE     | STATUS            | TYPE        | ROOM | BEDROOM | PET | GARDEN | BUSINESS TYPE | PARKING SPACE | AREA(SQM) |
+-----+-----+------------------+-----------------------------------------------------------------+-----------+-------------------+-------------+------+---------+-----+--------+---------------+---------------+-----------+
|   1 | 266 | Eleven           | 4 Privet Drive, Little Whinging, Surrey                         | 19990.0   | RENTED            | Residential | 5    | 3       | YES | YES    |               |               |           |
|   2 | 142 | Mike Wheeeler    | The Burrow, Ottery St. Catchpole, Devon, England                | 299000.0  | UNDER_MAINTENANCE | Residential | 20   | 9       | YES | YES    |               |               |           |
|   3 | 610 | Will Byer        | Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland | 9999999.0 | AVAILABLE         | Commercial  |      |         |     |        | school        | 100           | 900000.0  |
|   4 | 821 | Eleven           | Godric's Hollow, West Country, England                          | 9000.0    | RENTED            | Residential | 20   | 10      | YES | YES    |               |               |           |
|   5 | 299 | Dustin Henderson | Malfoy Manor, Wiltshire, England                                | 188888.0  | RENTED            | Residential | 20   | 5       | NO  | NO     |               |               |           |
|   6 | 752 | Lucas            | Hogsmeade Village, Highlands, Scotland                          | 1.5E7     | RENTED            | Commercial  |      |         |     |        | Village       | 100           | 1590000.0 |
+-----+-----+------------------+-----------------------------------------------------------------+-----------+-------------------+-------------+------+---------+-----+--------+---------------+---------------+-----------+
+-----------------------------------------------------------+
|  [Input] Enter property index to add agreement( 0 to exit):  3
                                                 ALL HOSTS
+-----+-----+--------------+---------------+-----------------+------------------+--------------+------------------+
|     | ID  | Full Name    | Date of Birth | Contact         | NumberProperties | NumberOwners | NumberAgreements |
+-----+-----+--------------+---------------+-----------------+------------------+--------------+------------------+
|   1 | 996 | Doraemon     | 09/12/2114    | 099999999       | 1                | 3            | 0                |
|   2 | 292 | Nobi Nobita  | 06/07/1990    | nobi@abc.com    | 1                | 3            | 0                |
|   3 | 791 | Shizuka Cute | 03/07/1991    | hihi@meomeo.com | 1                | 3            | 0                |
+-----+-----+--------------+---------------+-----------------+------------------+--------------+------------------+
+-------------------------------------------------------+
|  [Input] Enter host index to add agreement( 0 to exit):  1
                                         ALL RENTERS
+-----+-----+------------------+---------------+----------------------+----------+------------+
|     | ID  | Full Name        | Date of Birth | Contact              | Payments | Agreements |
+-----+-----+------------------+---------------+----------------------+----------+------------+
|   1 | 783 | Khong Quoc Khanh | 11/02/2005    | s4021494@rmit.edu.vn | 0        | 0          |
|   2 | 719 | Dao Duc Lam      | 08/06/2006    | lamdaoduc@cia.com    | 0        | 0          |
|   3 | 747 | Luong Chi Bacg   | 06/05/2006    | bach265@gmail.com    | 0        | 0          |
|   4 | 419 | Duong Bao Ngoc   | 06/05/1991    | baongoc@tiw.com      | 0        | 0          |
|   5 | 555 | Tran Dinh Hai    | 04/07/2003    | heLoveCow@indi.com   | 0        | 0          |
|   6 | 282 | Tran Van Dat     | 09/05/2006    | 0985828777           | 0        | 0          |
|   7 | 247 | Tran Quoc Hung   | 03/05/2009    | fatso@bibu.com       | 0        | 0          |
+-----+-----+------------------+---------------+----------------------+----------+------------+
+---------------------------------------------------------+
|  [Input] Enter renter index to add agreement( 0 to exit):  1
+----------------------------------+
|  [Input] Enter number of sub-renters:  3
+-------------------------------------------------------------+
|  [Input] Enter sub-renter index to add agreement( 0 to exit):  1
>> [System] Invalid sub-renter ❌
+-------------------------------------------------------------+
|  [Input] Enter sub-renter index to add agreement( 0 to exit):  5
+-------------------------------------------------------------+
|  [Input] Enter sub-renter index to add agreement( 0 to exit):  6
+-------------------------------------------------------------+
|  [Input] Enter sub-renter index to add agreement( 0 to exit):  4
+--------------------------+
|  [Input] Enter rental period:  weekly
+-------------------------+
|  [Input] Enter rent amount:  8888
+-----------------------------------------+
|  [Input] Enter contract date (dd/MM/yyyy):  29/11/2024
+----------------------------+
|  [Input] Enter agreement status:  new
+--------------------------------------------------------------------+
|  [Input] Do you want to add this agreement?  1: Yes | 0: No?  1
>> [System] Agreement added successfully ✅
```

Figure 4: Screenshot of "Add a new agreement"

3. Remove a rental agreement

```
|  [Input] Enter your option:  2
                                                        ALL AGREEMENTS
+-----+--------------+------------------+------------+------------+--------------+---------+---------------+-------------+-----------+
|     | Agreement ID | Main Tenant      | SubTenants | PropertyID | Host         | Period  | Contract Date | Renting Fee | Status    |
+-----+--------------+------------------+------------+------------+--------------+---------+---------------+-------------+-----------+
|   1 | 627          | Khong Quoc Khanh | 3          | 610        | Doraemon     | WEEKLY  | 05/11/2026    | 8888.0      | NEW       |
|   2 | 609          | Dao Duc Lam      | 1          | 266        | Nobi Nobita  | DAILY   | 03/06/2025    | 100000.0    | COMPLETED |
|   3 | 705          | Duong Bao Ngoc   | 2          | 266        | Shizuka Cute | MONTHLY | 03/09/2025    | 9987.0      | ACTIVE    |
+-----+--------------+------------------+------------+------------+--------------+---------+---------------+-------------+-----------+
+-------------------------------------------------+
|  [Input] Enter agreement index to remove (0 to exit):  1
+-------------------------------------------------------------------------------+
|                              Agreement Information                            |
+-------------------------------------------------------------------------------+
| 1. Agreement ID: 627                                                          |
| 2. Main Tenant: Khong Quoc Khanh                                              |
| 3. Sub Tenants: 3                                                             |
| 4. Property: Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland |
| 5. Host: Doraemon                                                             |
| 6. Period: WEEKLY                                                             |
| 7. Contract Date: 05/11/2026                                                  |
| 8. Renting Fee: 8888.0                                                        |
| 0. Status: NEW                                                                |
+-------------------------------------------------------------------------------+
                      Sub Tenants
+-----+-----------+----------------+--------------------+
|     | Tenant ID | Name           | Contact            |
+-----+-----------+----------------+--------------------+
|   1 | 555       | Tran Dinh Hai  | heLoveCow@indi.com |
|   2 | 282       | Tran Van Dat   | 0985828777         |
|   3 | 419       | Duong Bao Ngoc | baongoc@tiw.com    |
+-----+-----------+----------------+--------------------+
+-------------------------------------------------+
|  [Input] Do you want to delete?  1: Yes | 0: No?  1
>> [System] Cannot remove active agreement ❌
```

Figure 5: Screenshot of "Delete an agreement"

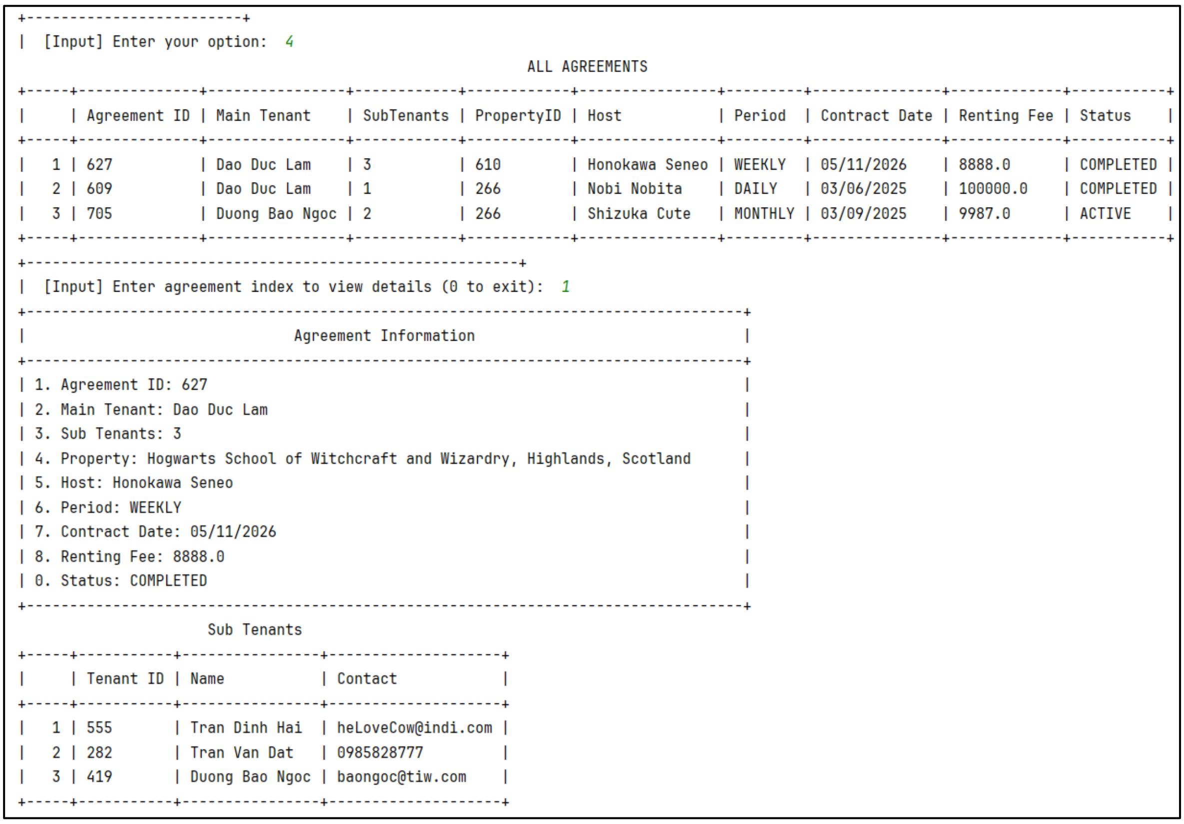
4. Edit a rental agreement

```
+-------------------------+
|  [Input] Enter your option:  3
                                                        ALL AGREEMENTS
+-----+--------------+------------------+------------+------------+--------------+---------+---------------+-------------+-----------+
|     | Agreement ID | Main Tenant      | SubTenants | PropertyID | Host         | Period  | Contract Date | Renting Fee | Status    |
+-----+--------------+------------------+------------+------------+--------------+---------+---------------+-------------+-----------+
|   1 | 627          | Khong Quoc Khanh | 3          | 610        | Doraemon     | WEEKLY  | 05/11/2026    | 8888.0      | NEW       |
|   2 | 609          | Dao Duc Lam      | 1          | 266        | Nobi Nobita  | DAILY   | 03/06/2025    | 100000.0    | COMPLETED |
|   3 | 705          | Duong Bao Ngoc   | 2          | 266        | Shizuka Cute | MONTHLY | 03/09/2025    | 9987.0      | ACTIVE    |
+-----+--------------+------------------+------------+------------+--------------+---------+---------------+-------------+-----------+
+-------------------------------------------------+
|  [Input] Enter agreement index to update (0 to exit):  1
+-------------------------------------------------------------------------------+
|                              Agreement Information                            |
+-------------------------------------------------------------------------------+
| 1. Agreement ID: 627                                                          |
| 2. Main Tenant: Khong Quoc Khanh                                              |
| 3. Sub Tenants: 3                                                             |
| 4. Property: Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland |
| 5. Host: Doraemon                                                             |
| 6. Period: WEEKLY                                                             |
| 7. Contract Date: 05/11/2026                                                  |
| 8. Renting Fee: 8888.0                                                        |
| 0. Status: NEW                                                                |
+-------------------------------------------------------------------------------+
                      Sub Tenants
+-----+-----------+----------------+--------------------+
|     | Tenant ID | Name           | Contact            |
+-----+-----------+----------------+--------------------+
|   1 | 555       | Tran Dinh Hai  | heLoveCow@indi.com |
|   2 | 282       | Tran Van Dat   | 0985828777         |
|   3 | 419       | Duong Bao Ngoc | baongoc@tiw.com    |
+-----+-----------+----------------+--------------------+
+-----------------------------------------------------------------+
|  [Input] Do you want to update main renter?  1: Yes | 0: No?  1
                                    ALL RENTERS
+-----+-----+------------------+---------------+---------------------+----------+------------+
|     | ID  | Full Name        | Date of Birth | Contact             | Payments | Agreements |
+-----+-----+------------------+---------------+---------------------+----------+------------+
|   1 | 783 | Khong Quoc Khanh | 11/02/2005    | s4021494@rmit.edu.vn | 0        | 2          |
|   2 | 719 | Dao Duc Lam      | 08/06/2006    | lamdaoduc@cia.com   | 0        | 1          |
|   3 | 747 | Luong Chi Bacg   | 06/05/2006    | bach265@gmail.com   | 0        | 0          |
|   4 | 419 | Duong Bao Ngoc   | 06/05/1991    | baongoc@tiw.com     | 0        | 2          |
|   5 | 555 | Tran Dinh Hai    | 04/07/2003    | heLoveCow@indi.com  | 0        | 2          |
|   6 | 282 | Tran Van Dat     | 09/05/2006    | 0985828777          | 0        | 2          |
|   7 | 247 | Tran Quoc Hung   | 03/05/2009    | fatso@bibu.com      | 0        | 0          |
+-----+-----+------------------+---------------+---------------------+----------+------------+
+-------------------------------------------------------------+
|  [Input] Enter renter index to update main renter (0 to exit):  2
```

```
+-------------------------------------------------------------+
|  [Input] Enter renter index to update main renter (0 to exit):  2
+-----------------------------------------------------------------+
|  [Input] Do you wan to update sub-renters?  1: Yes | 0: No?  0
+----------------------------------------------------------------+
|  [Input] Do you want to update property?  1: Yes | 0: No?  0
+-------------------------------------------------------------+
|  [Input] Do you want to update host?  1: Yes | 0: No?  1
                                                ALL HOSTS
+-----+-----+----------------+---------------+-----------------+------------------+--------------+------------------+
|     | ID  | Full Name      | Date of Birth | Contact         | NumberProperties | NumberOwners | NumberAgreements |
+-----+-----+----------------+---------------+-----------------+------------------+--------------+------------------+
|   1 | 996 | Doraemon       | 09/12/2114    | 099999999       | 2                | 3            | 1                |
|   2 | 292 | Nobi Nobita    | 06/07/1990    | nobi@abc.com    | 2                | 3            | 1                |
|   3 | 791 | Shizuka Cute   | 03/07/1991    | hihi@meomeo.com | 2                | 3            | 1                |
|   4 | 628 | Honokawa Seneo | 09/08/1990    | 0125848888      | 0                | 0            | 0                |
|   5 | 444 | Goda Takeshi   | 01/08/1990    | jaien@abc.com   | 0                | 0            | 0                |
|   6 | 582 | Upin           | 01/01/2000    | upin@malai.com  | 0                | 0            | 0                |
|   7 | 147 | Ipin           | 01/01/2000    | ipin@malai.com  | 0                | 0            | 0                |
|   8 | 954 | Ros            | 02/02/1992    | 0325959669      | 0                | 0            | 0                |
+-----+-----+----------------+---------------+-----------------+------------------+--------------+------------------+
+---------------------------------------------+
|  [Input] Enter host index to update (0 to exit):  4
+-------------------------------------------------------------------+
|  [Input] Do you want to update rental period?  1: Yes | 0: No?  0
+-------------------------------------------------------------------+
|  [Input] Do you want to update contract date?  1: Yes | 0: No?  0
+-----------------------------------------------------------------+
|  [Input] Do you want to update rent price?  1: Yes | 0: No?  0
+-------------------------------------------------------------------------+
|  [Input] Do you want to update agreement status?  1: Yes | 0: No?  1
+------------------------------+
|  [Input] Enter agreement status:  completed
+-------------------------------------------------------------+
|  [Input] Do you want to save changes?  1: Yes | 0: No?  1
>> [System] Agreement updated successfully ✅
```

Figure 6: Screenshot of "Edit an agreement"

5. View information on a rental agreement

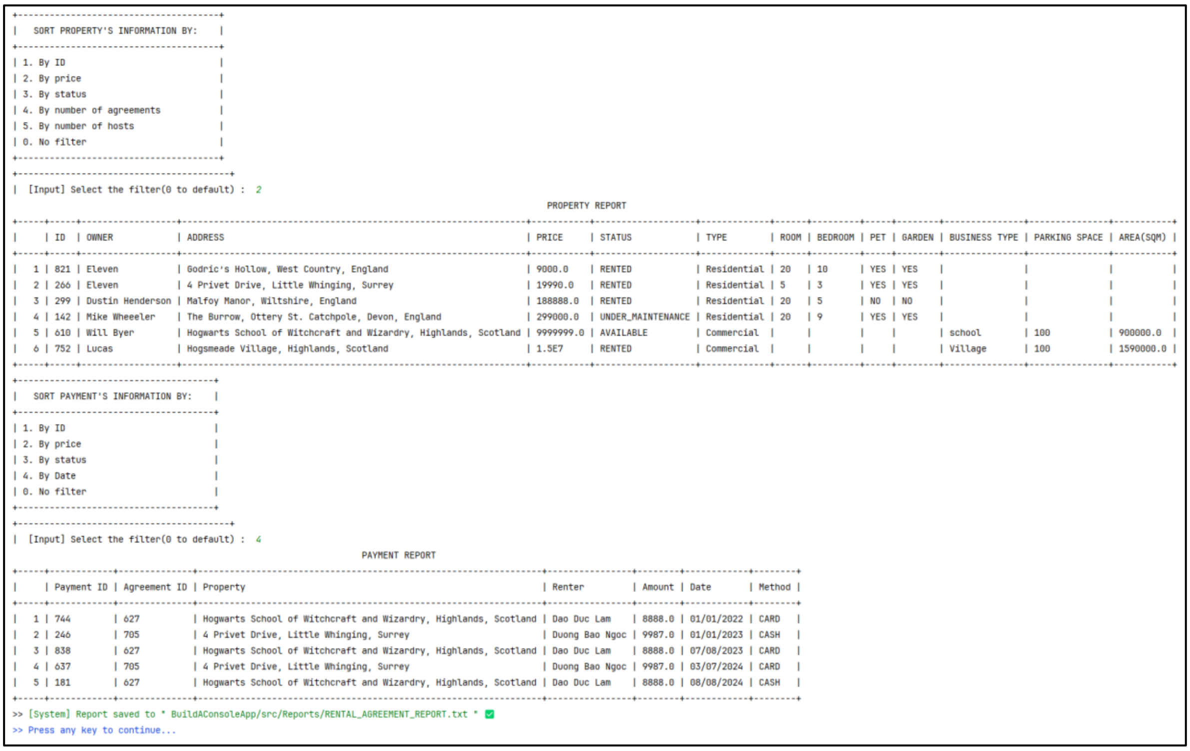


```
+-------------------------+
|  [Input] Enter your option:  4
                                                    ALL AGREEMENTS
+-----+--------------+----------------+------------+------------+----------------+---------+---------------+-------------+-----------+
|     | Agreement ID | Main Tenant    | SubTenants | PropertyID | Host           | Period  | Contract Date | Renting Fee | Status    |
+-----+--------------+----------------+------------+------------+----------------+---------+---------------+-------------+-----------+
|   1 | 627          | Dao Duc Lam    | 3          | 610        | Honokawa Seneo | WEEKLY  | 05/11/2026    | 8888.0      | COMPLETED |
|   2 | 609          | Dao Duc Lam    | 1          | 266        | Nobi Nobita    | DAILY   | 03/06/2025    | 100000.0    | COMPLETED |
|   3 | 705          | Duong Bao Ngoc | 2          | 266        | Shizuka Cute   | MONTHLY | 03/09/2025    | 9987.0      | ACTIVE    |
+-----+--------------+----------------+------------+------------+----------------+---------+---------------+-------------+-----------+

+----------------------------------------------------------+
|  [Input] Enter agreement index to view details (0 to exit):  1
+-----------------------------------------------------------------------------------+
|                                Agreement Information                              |
+-----------------------------------------------------------------------------------+
| 1. Agreement ID: 627                                                              |
| 2. Main Tenant: Dao Duc Lam                                                       |
| 3. Sub Tenants: 3                                                                 |
| 4. Property: Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland      |
| 5. Host: Honokawa Seneo                                                           |
| 6. Period: WEEKLY                                                                 |
| 7. Contract Date: 05/11/2026                                                      |
| 8. Renting Fee: 8888.0                                                            |
| 0. Status: COMPLETED                                                              |
+-----------------------------------------------------------------------------------+
                       Sub Tenants
+-----+-----------+----------------+--------------------+
|     | Tenant ID | Name           | Contact            |
+-----+-----------+----------------+--------------------+
|   1 | 555       | Tran Dinh Hai  | heLoveCow@indi.com |
|   2 | 282       | Tran Van Dat   | 0985828777         |
|   3 | 419       | Duong Bao Ngoc | baongoc@tiw.com    |
+-----+-----------+----------------+--------------------+
```

Figure 7: Screenshot of "View an agreement"

6. Generate Report



```
+-------------------------------------+
|   SORT PROPERTY'S INFORMATION BY:   |
+-------------------------------------+
| 1. By ID                            |
| 2. By price                         |
| 3. By status                        |
| 4. By number of agreements          |
| 5. By number of hosts               |
| 0. No filter                        |
+-------------------------------------+
+---------------------------------------+
|  [Input] Select the filter(0 to default) :  2
                                                                                                    PROPERTY REPORT
+-----+-----+------------------+-----------------------------------------------------------------+-----------+-------------------+-------------+------+---------+-----+--------+---------------+---------------+-----------+
|     | ID  | OWNER            | ADDRESS                                                         | PRICE     | STATUS            | TYPE        | ROOM | BEDROOM | PET | GARDEN | BUSINESS TYPE | PARKING SPACE | AREA(SQM) |
+-----+-----+------------------+-----------------------------------------------------------------+-----------+-------------------+-------------+------+---------+-----+--------+---------------+---------------+-----------+
|   1 | 821 | Eleven           | Godric's Hollow, West Country, England                          | 9000.0    | RENTED            | Residential | 20   | 10      | YES | YES    |               |               |           |
|   2 | 266 | Eleven           | 4 Privet Drive, Little Whinging, Surrey                         | 19990.0   | RENTED            | Residential | 5    | 3       | YES | YES    |               |               |           |
|   3 | 299 | Dustin Henderson | Malfoy Manor, Wiltshire, England                                | 188888.0  | RENTED            | Residential | 20   | 5       | NO  | NO     |               |               |           |
|   4 | 142 | Mike Wheeeler    | The Burrow, Ottery St. Catchpole, Devon, England                | 299000.0  | UNDER_MAINTENANCE | Residential | 20   | 9       | YES | YES    |               |               |           |
|   5 | 610 | Will Byer        | Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland | 9999999.0 | AVAILABLE         | Commercial  |      |         |     |        | school        | 100           | 900000.0  |
|   6 | 752 | Lucas            | Hogsmeade Village, Highlands, Scotland                          | 1.5E7     | RENTED            | Commercial  |      |         |     |        | Village       | 100           | 1590000.0 |
+-----+-----+------------------+-----------------------------------------------------------------+-----------+-------------------+-------------+------+---------+-----+--------+---------------+---------------+-----------+
+-----------------------------------+
|   SORT PAYMENT'S INFORMATION BY:   |
+-----------------------------------+
| 1. By ID                          |
| 2. By price                       |
| 3. By status                      |
| 4. By Date                        |
| 0. No filter                      |
+-----------------------------------+
+---------------------------------------+
|  [Input] Select the filter(0 to default) :  4
                                                     PAYMENT REPORT
+-----+------------+--------------+-----------------------------------------------------------------+----------------+--------+------------+--------+
|     | Payment ID | Agreement ID | Property                                                        | Renter         | Amount | Date       | Method |
+-----+------------+--------------+-----------------------------------------------------------------+----------------+--------+------------+--------+
|   1 | 744        | 627          | Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland | Dao Duc Lam    | 8888.0 | 01/01/2022 | CARD   |
|   2 | 246        | 705          | 4 Privet Drive, Little Whinging, Surrey                         | Duong Bao Ngoc | 9987.0 | 01/01/2023 | CASH   |
|   3 | 838        | 627          | Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland | Dao Duc Lam    | 8888.0 | 07/08/2023 | CARD   |
|   4 | 637        | 705          | 4 Privet Drive, Little Whinging, Surrey                         | Duong Bao Ngoc | 9987.0 | 03/07/2024 | CARD   |
|   5 | 181        | 627          | Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland | Dao Duc Lam    | 8888.0 | 08/08/2024 | CASH   |
+-----+------------+--------------+-----------------------------------------------------------------+----------------+--------+------------+--------+
>> [System] Report saved to " BuildAConsoleApp/src/Reports/RENTAL_AGREEMENT_REPORT.txt " ✅
>> Press any key to continue...
```

Figure 8: Screenshot of "Generate Report"

RENTAL_AGREEMENT_REPORT.txt

File Edit View

```
+-------------------------------------------------------------------------------+
|                    ASSIGMENT 1: BUILD A CONSOLE APPLICATION                   |
+-------------------------------------------------------------------------------+
| 1. Name: Khong Quoc Khanh                                                     |
| 2. Student ID: s4021494                                                       |
| 3. Course: Further Programming                                                |
| 4. Lecturers and Tutors: Dr. Minh Vu Thanh, Dr. Dung Nguyen, Dr. Phong Ngo    |
| 0. Date: 20/11/2024                                                           |
+-------------------------------------------------------------------------------+
```

ALL RENTAL AGREEMENT

	Agreement ID	Main Tenant	SubTenants	PropertyID	Host	Period	Contract Date	Renting Fee	Status
1	627	Dao Duc Lam	3	610	Honokawa Seneo	WEEKLY	05/11/2026	8888.0	NEW
2	705	Duong Bao Ngoc	2	266	Shizuka Cute	MONTHLY	03/09/2025	9987.0	ACTIVE
3	609	Dao Duc Lam	1	266	Nobi Nobita	DAILY	03/06/2025	100000.0	COMPLETED

ALL RENTERS

	ID	Full Name	Date of Birth	Contact	Payments	Agreements
1	419	Duong Bao Ngoc	06/05/1991	baongoc@tiw.com	2	2
2	555	Tran Dinh Hai	04/07/2003	heLoveCow@indi.com	0	2
3	783	Khong Quoc Khanh	11/02/2005	s4021494@rmit.edu.vn	0	1
4	747	Luong Chi Bacg	06/05/2006	bach265@gmail.com	0	0
5	719	Dao Duc Lam	08/06/2006	lamdaoduc@cia.com	3	2
6	282	Tran Van Dat	09/05/2006	0985828777	0	2
7	247	Tran Quoc Hung	03/05/2009	fatso@bibu.com	0	0

ALL HOSTS

	ID	Full Name	Date of Birth	Contact	NumberProperties	NumberOwners	NumberAgreements
1	996	Doraemon	09/12/2114	099999999	2	3	0
2	444	Goda Takeshi	01/08/1990	jaien@abc.com	0	0	0
3	582	Upin	01/01/2000	upin@malai.com	0	0	0
4	147	Ipin	01/01/2000	ipin@malai.com	0	0	0
5	954	Ros	02/02/1992	0325959669	0	0	0
6	292	Nobi Nobita	06/07/1990	nobi@abc.com	2	3	1
7	791	Shizuka Cute	03/07/1991	hihi@meomeo.com	2	3	1
8	628	Honokawa Seneo	09/08/1990	0125848888	1	1	1

ALL OWNERS

	ID	Full Name	Date of Birth	Contact	NumberProperties	NumberHosts
1	243	Max Mayfiled	05/11/1972	max@min.com	0	0
2	537	Jim Hopper	02/02/1942	copper@usa.com	0	0
3	261	Nancy Wheeler	01/08/1966	abc@abc.com	0	0
4	930	Steve Harrington	04/12/1966	hihi@bac.com	0	0
5	736	Mike Wheeeler	08/06/1971	mike@abc.com	1	1
6	156	Will Byer	09/05/1971	0985889899	1	4
7	817	Dustin Henderson	05/07/1971	teeth@meomeo.com	1	1
8	32	Lucas	03/12/1972	0985858888	1	1
9	473	Eleven	06/05/1972	strangerThings@chars.com	2	3

ALL PROPERTIES

	ID	OWNER	ADDRESS	PRICE	STATUS	TYPE	ROOM	BEDROOM	PET	GARDEN	BUSINESS TYPE	PARKING SPACE	AREA(SQM)
1	821	Eleven	Godric's Hollow, West Country, England	9000.0	RENTED	Residential	20	10	YES	YES			
2	266	Eleven	4 Privet Drive, Little Whinging, Surrey	19990.0	RENTED	Residential	5	3	YES	YES			
3	299	Dustin Henderson	Malfoy Manor, Wiltshire, England	188888.0	RENTED	Residential	20	5	NO	NO			
4	142	Mike Wheeeler	The Burrow, Ottery St. Catchpole, Devon, England	299000.0	UNDER_MAINTENANCE	Residential	20	9	YES	YES			
5	610	Will Byer	Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland	9999999.0	AVAILABLE	Commercial					school	100	900000.0
6	752	Lucas	Hogsmeade Village, Highlands, Scotland	1.5E7	RENTED	Commercial					Village	100	1590000.0

ALL PAYMENTS

	Payment ID	Agreement ID	Property	Renter	Amount	Date	Method
1	744	627	Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland	Dao Duc Lam	8888.0	01/01/2022	CARD
2	246	705	4 Privet Drive, Little Whinging, Surrey	Duong Bao Ngoc	9987.0	01/01/2023	CASH
3	838	627	Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland	Dao Duc Lam	8888.0	07/08/2023	CARD
4	637	705	4 Privet Drive, Little Whinging, Surrey	Duong Bao Ngoc	9987.0	03/07/2024	CARD
5	181	627	Hogwarts School of Witchcraft and Wizardry, Highlands, Scotland	Dao Duc Lam	8888.0	08/08/2024	CASH

Figure 9: Screenshot of output file

V. Limitations and Future Developments

Table 2: Limitations and Future Developments

Limitations	Future Development
Only Console UI	Develop an enhanced graphical user interface (GUI) to provide a more attractive and user-friendly experience.
Text-based database	Implement a database system (e.g., SQL, MongoDB) to support more efficient and scalable data storage and retrieval.
No Account Information	Introduce a login and logout feature to enable user authentication and provide a more personalized experience.
Data Analyze	Develop a feature for advanced data analysis, allowing users to generate reports and insights based on rental agreements and transactions.

--The end--