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Course: COEN 280 Database Systems

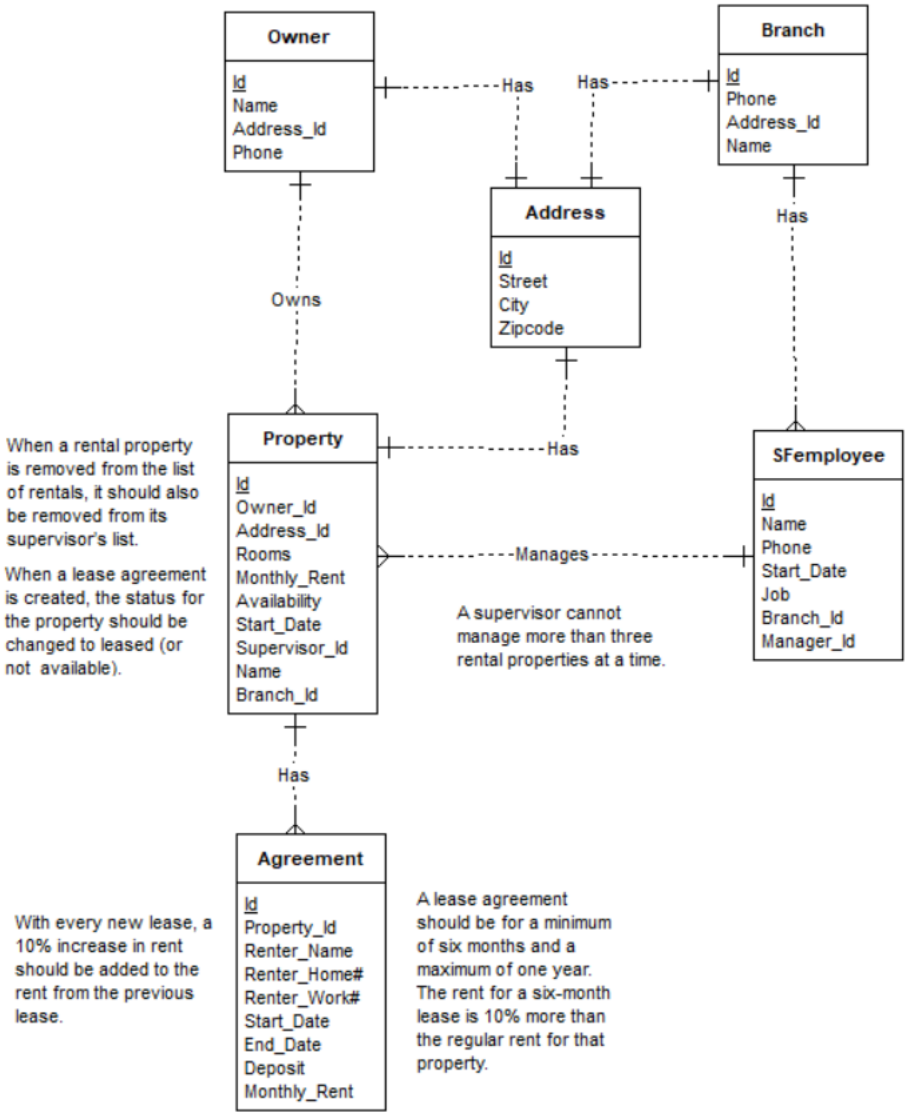
Project: StrawberryField’s Rental Management System

Report Date: 06/08/2023

1. Introduction

Design and implement a Rental Management System for StrawberryField’s Rental Management Inc, which manages rental properties. The system to be designed is to assist the rental manager to keep track of rental properties and lease agreements using a relational database for data and transaction management.

2. ER Diagram Design



When a rental property is removed from the list of rentals, it should also be removed from its supervisor's list.

When a lease agreement is created, the status for the property should be changed to leased (or not available).

A supervisor cannot manage more than three rental properties at a time.

With every new lease, a 10% increase in rent should be added to the rent from the previous lease.

A lease agreement should be for a minimum of six months and a maximum of one year. The rent for a six-month lease is 10% more than the regular rent for that property.

3. Schema with PKs and FKs

Address(id, street, city, zipcode)

Branch(id, phone, addressId, name)
FK addressId references the Address relation

SFemployee(id, name, phone, startdate, job, branchId, managerId)
FK branchId references the Branch relation
FK managerId references the SFemployee relation

Owner(id, name, addressId, phone)
FK addressId references the Address relation

Property(id, name, ownerId, addressId, rooms, monthlyRent, availability, startdate, supervisorId, branchId)
FK addressId references the Address relation
FK ownerId references the Owner relation
FK supervisorId references the SFemployee relation
FK branchId references the Branch relation

Agreement(id, propertyId, rentername, renterhome#, renterwork#, startdate, enddate, deposit, monthlyRent
FK propertyId references the Property relation

4. Functional Dependencies

Address:
id → street, city, zipcode
Branch:
id → phone, addressId, name
SFemployee:
id → name, phone, startDate, job, branchId, managerId
Owner:
id → name, addressId, phone
Property:
id → name, ownerid, addressId, rooms, monthlyRent, availability, startDate, supervisorId, branchId

Agreement:

id → propertyId, rentername, renterhome#, renterwork#, startDate, endDate, deposit, monthlyRent

5. Normalization Process

Firstly, identify the need for an "address" table to store the details of each property's address. The address table had attributes like "ID," "STREET," "CITY," and "ZIPCODE." This allowed us to eliminate data duplication by referencing the address information using the "ADDRESSID" foreign key in other tables.

Next, create a "branch" table to keep track of their different branches. The branch table included attributes such as "ID," "PHONE," "ADDRESSID," and "NAME." The "ADDRESSID" foreign key referenced the address of each branch stored in the address table.

The agency also employed several employees, including managers and supervisors, and wanted to maintain their records. Then created the "SFemployee" table, which contained attributes like "ID," "NAME," "PHONE," "STARTDATE," "JOB," "BRANCHID," and "MANAGERID." The "BRANCHID" and "MANAGERID" attributes served as foreign keys, linking each employee to their respective branch and manager.

Moreover, the agency needed to keep track of property owners. So introduced the "owner" table, which stored information about the property owners, including attributes like "ID," "NAME," "ADDRESSID," and "PHONE." The "ADDRESSID" foreign key referenced the address of each owner stored in the address table.

To manage the properties efficiently, the agency created the "property" table. This table included attributes such as "ID," "NAME," "OWNERID," "ADDRESSID," "ROOMS," "MONTHLYRENT," "AVAILABILITY," "STARTDATE," "SUPERVISORID," and "BRANCHID." The "OWNERID," "ADDRESSID," "SUPERVISORID," and "BRANCHID" attributes were foreign keys, establishing relationships with the respective owner, address, supervisor, and branch records.

Lastly, the agency maintained agreements with tenants for property rentals. So established the "agreement" table, which contained attributes like "ID," "PROPERTYID," "RENTERNAME," "RENTERHOME#," "RENTERWORK#," "STARTDATE," "ENDDATE," "DEPOSIT," and "MONTHLYRENT." The "PROPERTYID" foreign key linked each agreement with the corresponding property.

By normalizing data into separate tables with appropriate primary and foreign keys, "StrawberryField's" improved data organization, reduced redundancy, and enhanced overall data management efficiency. With the new schema, it was well-prepared to continue providing excellent real estate services to the clients.

6. Constraints

(See the full constraints SQL code in the "Constraints" folder)

6.1 A supervisor cannot supervise more than three rental properties at a time

Add a new column called "PROPERTY_COUNT" to the "SFemployee" table to keep track of the number of rental properties supervised by each supervisor. Set the initial value of "PROPERTY_COUNT" to 0 for all supervisors.

Create a trigger that updates the "PROPERTY_COUNT" column whenever a rental property is assigned to a supervisor. The trigger should increment the "PROPERTY_COUNT" by 1 for the corresponding supervisor.

Create a check constraint that enforces the rule that a supervisor cannot supervise more than three rental properties at a time.

6.2.1 A lease agreement should be for a minimum of six months and a maximum of one year.

Implemented in the PHP file, checked the start date and end date. Make sure they are valid before submitting to the database. Please refer to section 7.3.3.

6.2.2 The rent for a six-month lease is 10% more than the regular rent for that property.

Check the difference between the STARTDATE and ENDDATE, if the rent is for six months, the trigger will calculate the lease agreement rent by multiplying the regular rent by 1.1 (10% more) and update the "MONTHLYRENT" accordingly.

6.3 When a lease agreement is created, the status for the property should be changed to leased.

Create a trigger that updates the status of the property to "leased" whenever a new lease agreement is inserted.

6.4 When a rental property is removed from the list of rentals, it should also be removed from its supervisor's list.

Implemented in the normalization process. SupervisorId is one of the foreign keys of the Property.Whenever a rental property is removed from the Property table, it is automatically removed from the supervisor's list.

6.5 With every new lease, a 10% increase in rent should be added to the rent from the previous lease.

Create a stored procedure that calculates the new rent based on the previous lease and updates both the property and agreement rows.

Create a trigger that calls the stored procedure whenever a new lease agreement is inserted.

7. SQLs and Results

6.1 Generate Tables and Data

(See the “Generate Tables.txt” and “Tables with data.txt” in the “Tables and Data” folder)

6.2 Implement Transactions

(See the full SQLPLUS and output spool files in the “SQLPLUS files” folder)

The transactions numbered 1 to 11 correspond to the SQLPLUS scripts Q1.sql to Q11.sql, and their respective results are stored in the spool files Q1result.txt to Q11result.txt.

8. Bonus for Graphical User Interface(GUI)

7.1 Introduction

Implement a graphical user interface to offer a menu of transactions of the Rental Management System. For example, the main menu may consist of

- Show Properties available
- Create a lease Agreement
- Show a lease agreement

7.2 Tech Stack Support

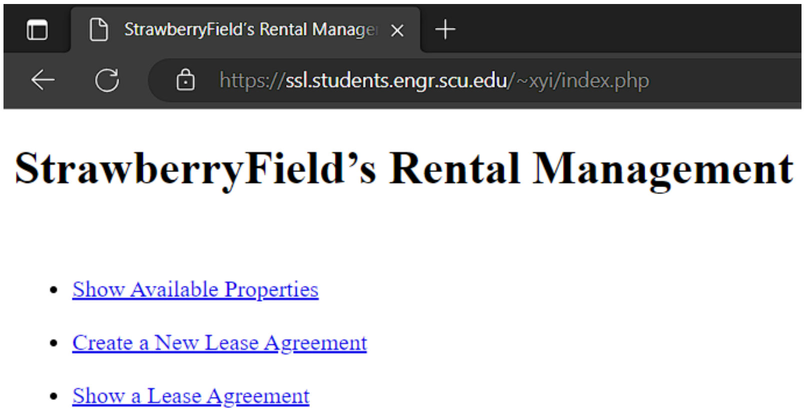
Languages: PHP, SQL, HTML, CSS
Server: remote SCU ECC Linux server
Database: Oracle on remote SCU ECC Linux server

(Please refer to the "Oracle_Help" folder for instructions on setting up Oracle and the server on the SCU ECC remote Linux server)

7.3 GUI Pages

https://ssl.students.engr.scu.edu/~xyi/index.php

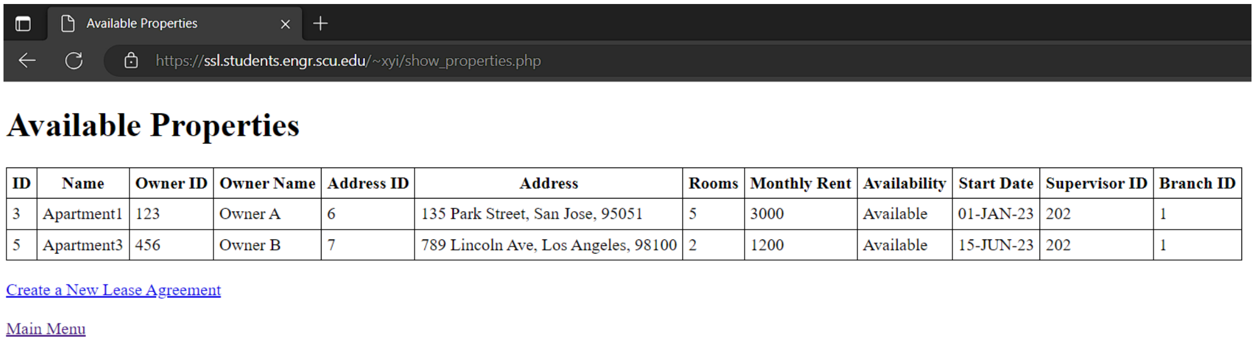
7.3.1 Main Menu


StrawberryField's Rental Manage
https://ssl.students.engr.scu.edu/~xyi/index.php

StrawberryField's Rental Management

- Show Available Properties
- Create a New Lease Agreement
- Show a Lease Agreement

7.3.2 Show All Available Properties



Available Properties

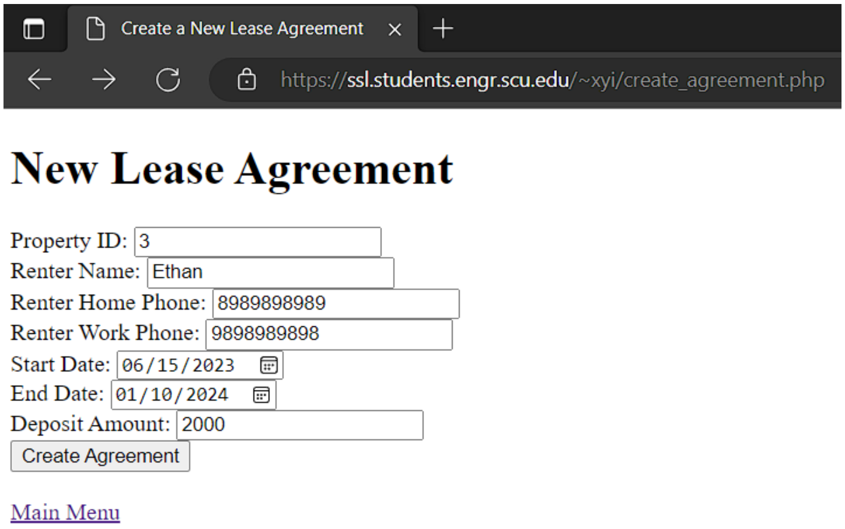
ID	Name	Owner ID	Owner Name	Address ID	Address	Rooms	Monthly Rent	Availability	Start Date	Supervisor ID	Branch ID
3	Apartment1	123	Owner A	6	135 Park Street, San Jose, 95051	5	3000	Available	01-JAN-23	202	1
5	Apartment3	456	Owner B	7	789 Lincoln Ave, Los Angeles, 98100	2	1200	Available	15-JUN-23	202	1

Create a New Lease Agreement

Main Menu

7.3.3 Create a New Lease Agreement

Offer a lease form that provides the input fields for the user to submit the input.


Create a New Lease Agreement
https://ssl.students.engr.scu.edu/~xyi/create_agreement.php

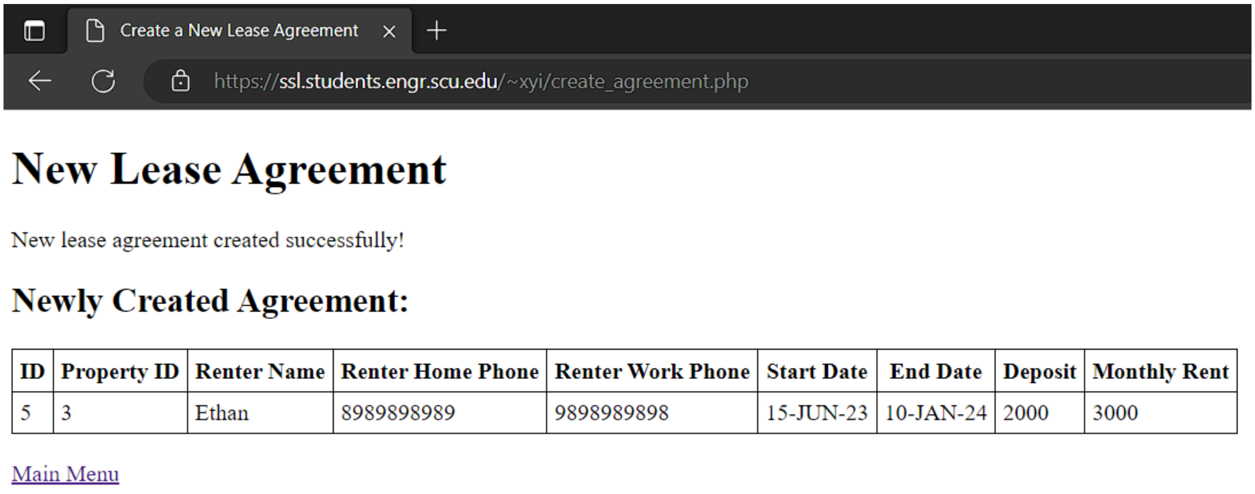
New Lease Agreement

Property ID: 3
Renter Name: Ethan
Renter Home Phone: 8989898989
Renter Work Phone: 9898989898
Start Date: 06/15/2023
End Date: 01/10/2024
Deposit Amount: 2000

Create Agreement

Main Menu

Display the new agreement once it was successfully created.


Create a New Lease Agreement
https://ssl.students.engr.scu.edu/~xyi/create_agreement.php

New Lease Agreement

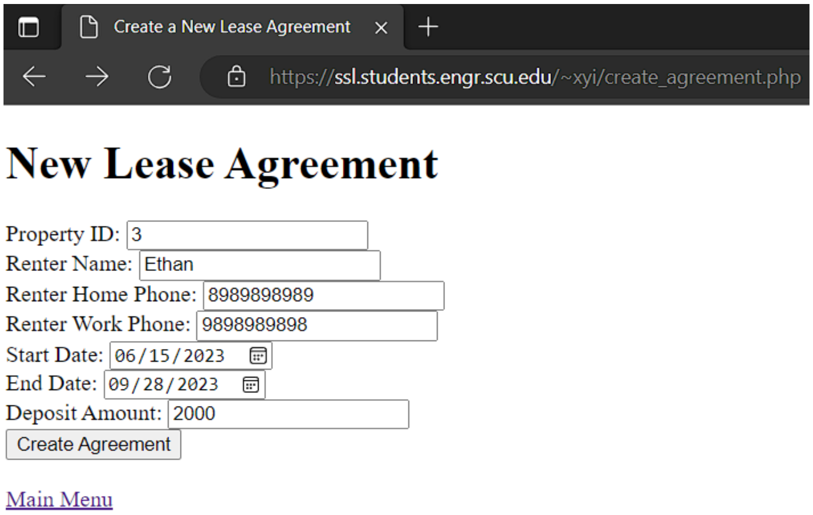
New lease agreement created successfully!

Newly Created Agreement:

ID	Property ID	Renter Name	Renter Home Phone	Renter Work Phone	Start Date	End Date	Deposit	Monthly Rent
5	3	Ethan	8989898989	9898989898	15-JUN-23	10-JAN-24	2000	3000

Main Menu

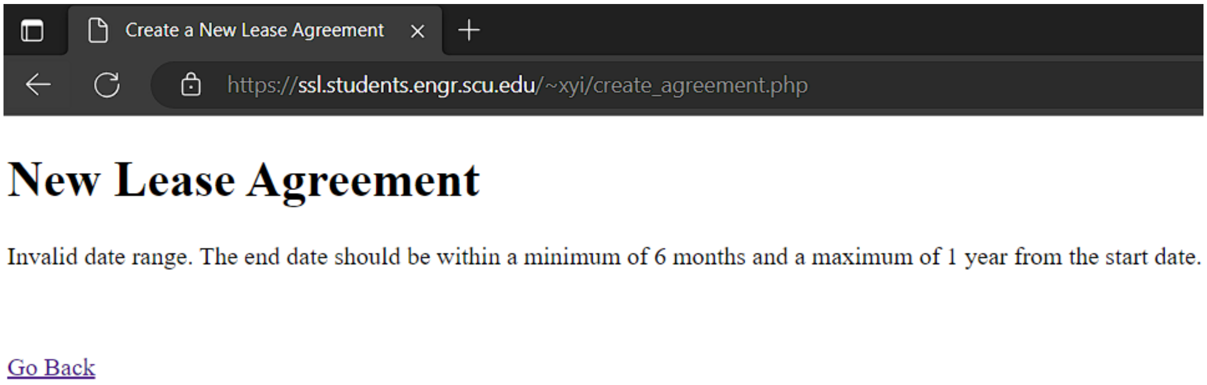
If the rental length is less than six months or greater than one year. Error message displayed.


Create a New Lease Agreement
https://ssl.students.engr.scu.edu/~xyi/create_agreement.php

New Lease Agreement

Property ID: 3
Renter Name: Ethan
Renter Home Phone: 8989898989
Renter Work Phone: 9898989898
Start Date: 06/15/2023
End Date: 09/28/2023
Deposit Amount: 2000

Main Menu

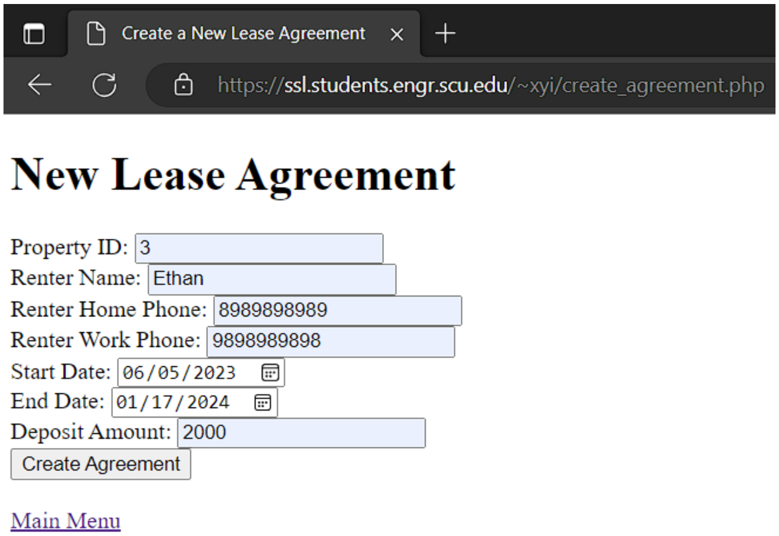

Create a New Lease Agreement
https://ssl.students.engr.scu.edu/~xyi/create_agreement.php

New Lease Agreement

Invalid date range. The end date should be within a minimum of 6 months and a maximum of 1 year from the start date.

Go Back

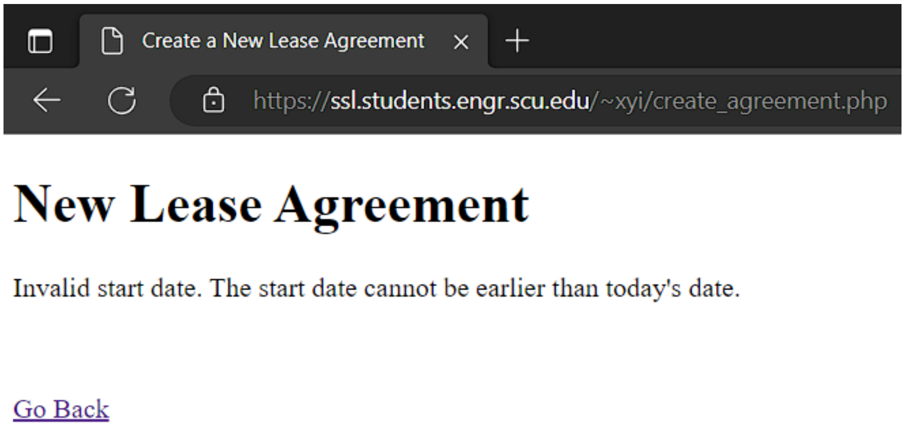
If the start date is earlier than today. Error message displayed.


Create a New Lease Agreement
https://ssl.students.engr.scu.edu/~xyi/create_agreement.php

New Lease Agreement

Property ID: 3
Renter Name: Ethan
Renter Home Phone: 8989898989
Renter Work Phone: 9898989898
Start Date: 06/05/2023
End Date: 01/17/2024
Deposit Amount: 2000

Create Agreement
Main Menu

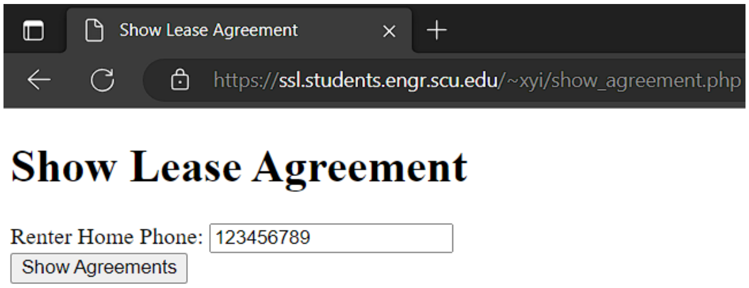

Create a New Lease Agreement
https://ssl.students.engr.scu.edu/~xyi/create_agreement.php

New Lease Agreement

Invalid start date. The start date cannot be earlier than today's date.

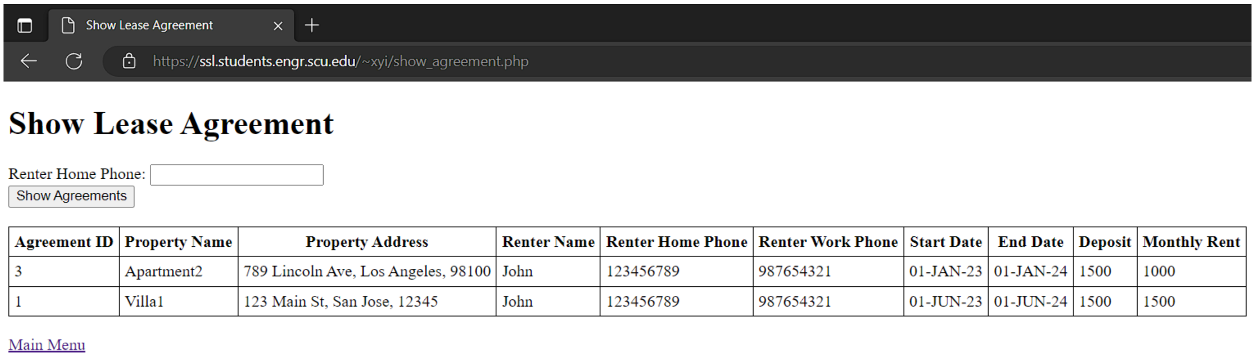
7.3.3 Show a Lease Agreement

Display existing agreement by providing renter’s home phone number.



Show Lease Agreement

Renter Home Phone: 123456789



Show Lease Agreement

Renter Home Phone:

Agreement ID	Property Name	Property Address	Renter Name	Renter Home Phone	Renter Work Phone	Start Date	End Date	Deposit	Monthly Rent
3	Apartment2	789 Lincoln Ave, Los Angeles, 98100	John	123456789	987654321	01-JAN-23	01-JAN-24	1500	1000
1	Villa1	123 Main St, San Jose, 12345	John	123456789	987654321	01-JUN-23	01-JUN-24	1500	1500

7.3 Source Code

(See all the full source code in the “PHP Server” folder)

7.4 Future Improvements

Integrate more rental management features into the main menu page.