Advanced Python Final Report

Water management system in Hanoi

Group 3 - ICT

University of Science and Technology of Hanoi

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Contents

1 Introduction

1.1 Overview

In recent years, there has been a rise in the amount of water usage in Hanoi. The Water management system is a new self-contained software product which is produced to overcome the problems that have occurred due to the current manual system. This system provides an easy access to the database, and it is user-friendly with attractive interfaces. The system can eliminate errors in calculations and complete almost all the tasks in a much convenient manner. Coding was handled through an Object-oriented approach. The methods mentioned above make project runs fast and easy to develop.

1.2 Motivation

Following are the main problem in managing water manually:

- Manually managing records is very time-consuming.
- Data is not always reliable as it is handwritten, and some human errors might have occurred, for example, wrong telephone number among others.
- Water information is not secured. It can be easily theft or altered. The amount of water can be changed easily, which will lead to an increased amount of money paid.
- Retrieval of water records is complicated. The user has to manually search each record to find the required information. It takes a lot of time.

1.3 Objective and Approach

1.3.1 Objective

As a result, we build a water management desktop application. The system we are about to develop will provide solutions to the problems that users, employees, and administrators are experiencing. Switching to our system can get advantages such as saving time and space wastage.

1.3.2 Approach

In this project, the tools that we used to finish the application are:

- **Python**: our main programming language.
- **SQlite**: the tool for the database (backend) because of its simplicity, portability.
- **Tkinter module**: the Python module in order to create a graphical interface for our application.

1.4 Authors

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2 Database

2.1 Schema

Our database contains a total of nine tables, which are **Employee, Supplier, Area, Service, Household, Service type, Billing, Address, and Login**. Here is the detailed description for each table.

Table	Description
Employee	Contains detailed information of employees who work in companies(FK:AreaId)
Area	Contains detailed information of districts in Hanoi(FK:SupplierId)
Supplier	Contains detailed information of water company in Hanoi
Household	Contains detailed information of households in Hanoi(FK:AddressId)
Address	Contains detailed information of specific address of household(FK:AreaId)
Servicetype	Contains detailed information of type of services
Login	Contains username and password for login function
Service	Contains detailed information of household's feedbacks (FK:HouseholdId, ServicetypeId)
Billing	Contains detailed information of household's water consumption and their paid money(FK: HouseholdId)

The picture below shows the database schema of our project:

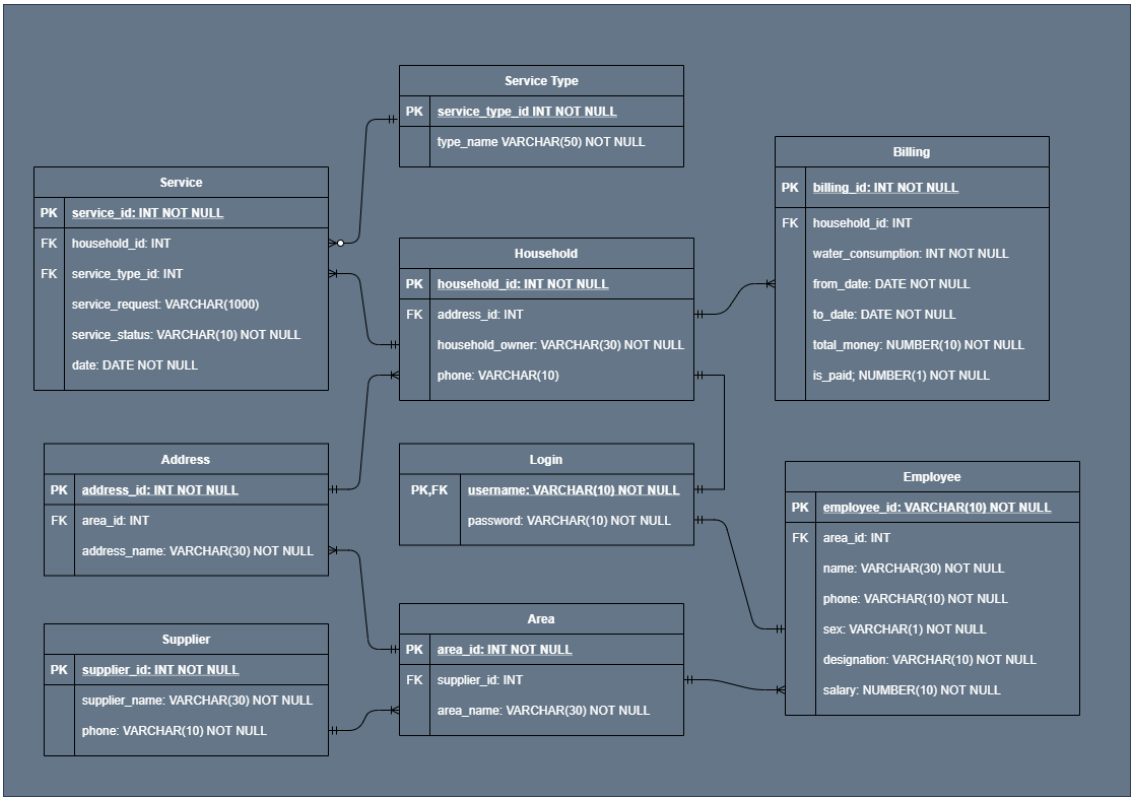


Figure 1: Database schema

2.2 Entity Relationship Diagram

Following with the schema in the previous section, here is our ERD for the database:

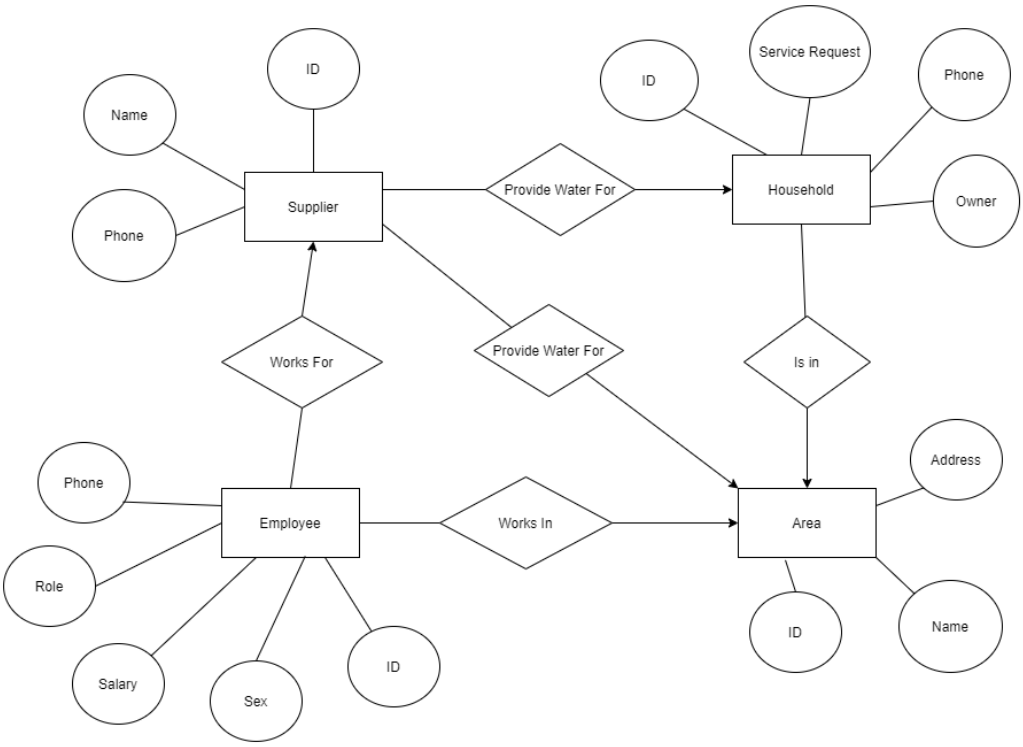


Figure 2: Entity Relationship Diagram

3 Remarkable Features

Our application contains a total of four screens which are **Login screen** to access into the water management system and other three screens that is depended on the authorization upon the account: **Admin's screen, Household's screen** and **Employee's screen**. Each screen is included four tabs:

- **Home** : Gives the user the general information that is related to the account owner.
- **Manage** : In this section, user can access, modify information within the database based on the access level of their role.
- **Setting** : This tab will help the user to change his/her password (and more in the future).

- **Exit** : Uses to terminate the water management application.

For **Setting** and **Exit**, we will not mention it anymore in the details of each screen since the function of these two tabs is the same for all screens. On each inner screen, there exists a common **Logout** function for user return to the **Login screen** and change account. This function will also not be mentioned in the future because of its similarity sharing among the screens.

3.1 Login Screen

First of all, we have the login screen. There are three types of login:

- **As household** : The username start increasing from 1.
- **As employee** : The username start with prefix emp and continue with the id (eg: emp1).
- **As admin** : the username is admin.

Each type of login will lead to different screens with different level of access to the database.

3.2 Admin Screen

- **Home** displays the general information of the database that is connected to:
  - The numbers of households.
  - The numbers of employees.
  - The number of suppliers.
  - The number of areas.
- **Manage**: an admin has the full right to control over the database. The admin can:
  - **Fully access** to all tables inside of the database.
  - **Search** an exact or similar piece of information that is entered to extract a certain part of database.
  - **Add, Delete, Update** the information in the table that are focused on.
  - **Display chart** to achieve the statistical view of employee, area, billing, and household to see the trend, the percentage of it.

3.3 Household Screen

- **Home** shows the households an overview of his/her information, either personal information or his/her water usage:
  - Personal's information: household's ID, his/her full name, his/her area, and address.

- A calendar to organize its time and also for decoration.
- Two general bar charts show the amount of water/money that this household consumed/spent each month over the current year.

- **Manage** give the household owner the right to access the information of their bills, their water consumption stored in the database history. We will list some functions to be clearer:
  - Households can view their water consumption/their bills compared to the average amount of using/spending in a specific year, based on the household's choices.
  - Households can view their billing record to keep track of their money paid and water usage.

3.4 Employee Screen

- **Home** shows the general number related to the area, the customers that he is responsible for. It includes:
  - The employee's personal information.
  - The total number of employees in charge of the same area as him/her.
  - The number of unpaid bills that he has to take charge of it.
  - The number of households in the area that is under his responsibility.

- **Manage** gives access to a certain amount of database to the Employee (about the area he is working with, the household's information on that area, ...). The actions that he can commit are :
  - **Access to the database table** that that contains the information that his/her role can access to.
  - **Add, update, delete** billing records of any household that lives in his/her working area by submitting a form with new or update the information to the database.
  - **Search** for specific billing information of a specific household under his control.
  - **View charts** that shows the number of households in the area he/she is in charge of, the total amount of water and money spent on each household, or all the households in the specific area, and more.

4 Outputs and Results

4.1 Login screen

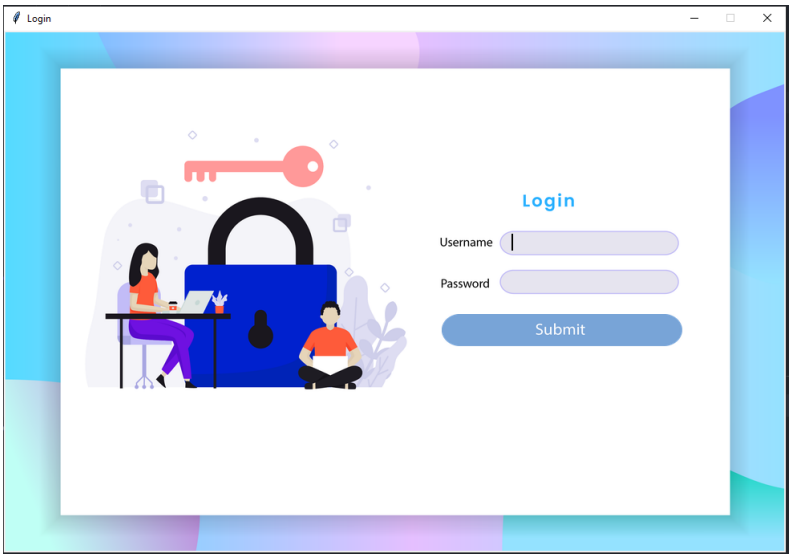


Figure 3: Login Screen

4.2 Admin Screen

Figure 4: Admin home screen

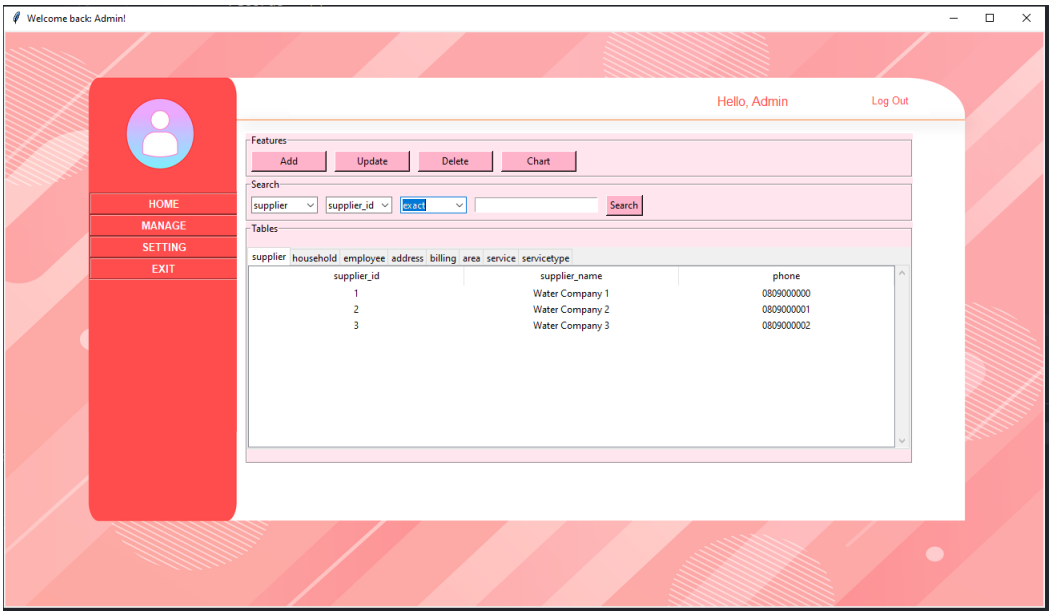


Figure 5: Admin manage screen

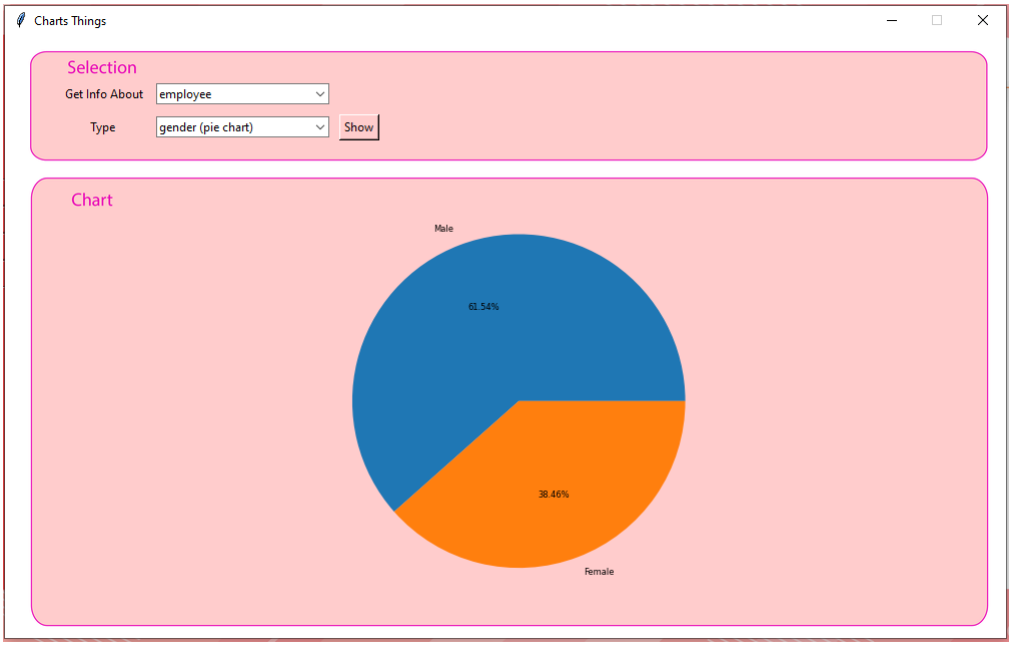


Figure 6: Admin chart view

4.3 Household screen

Figure 7: Household's home screen

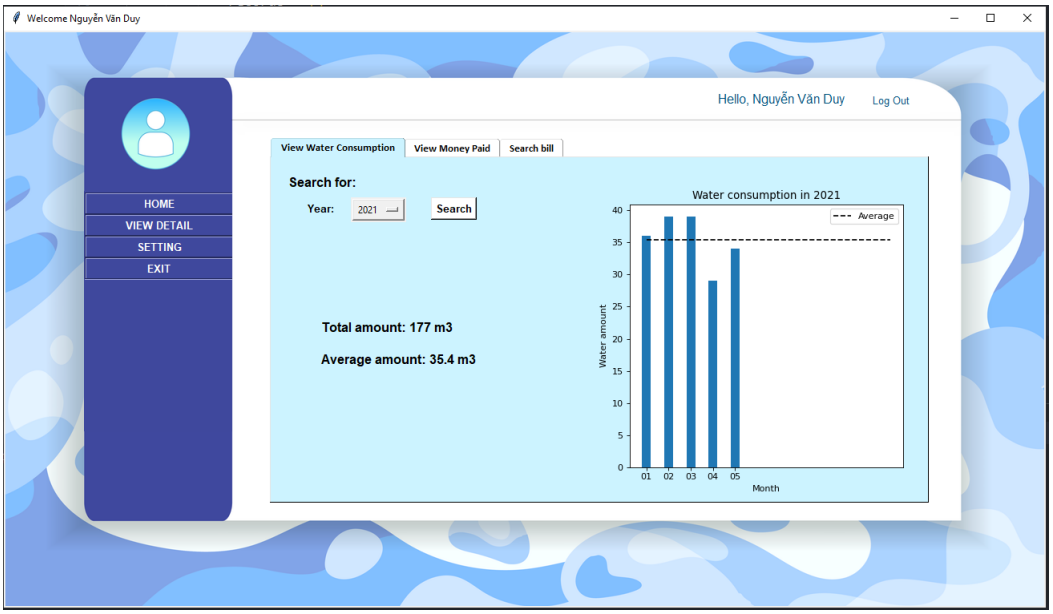


Figure 8: Water consumption screen

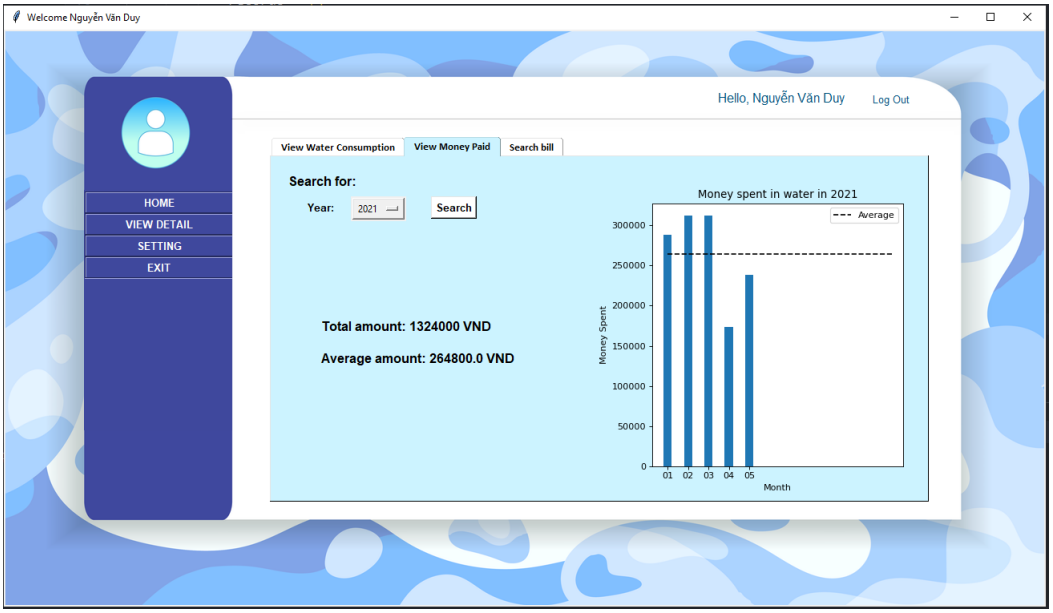


Figure 9: Money spent screen

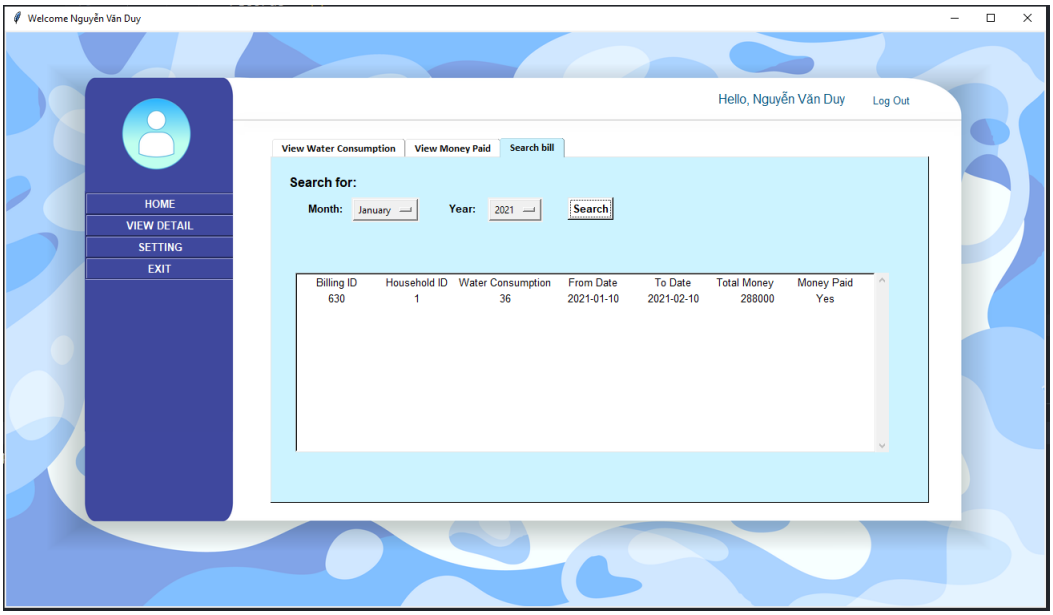
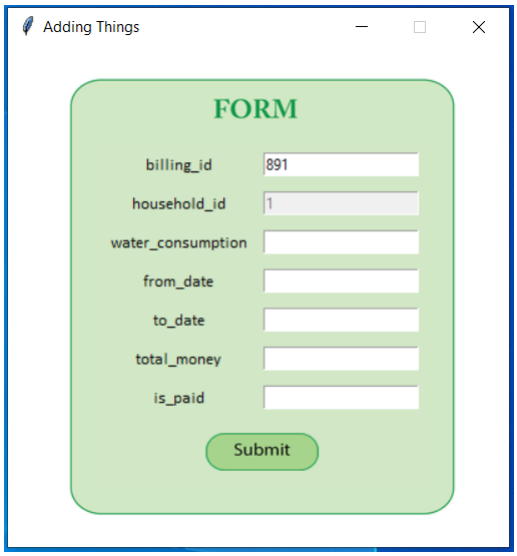


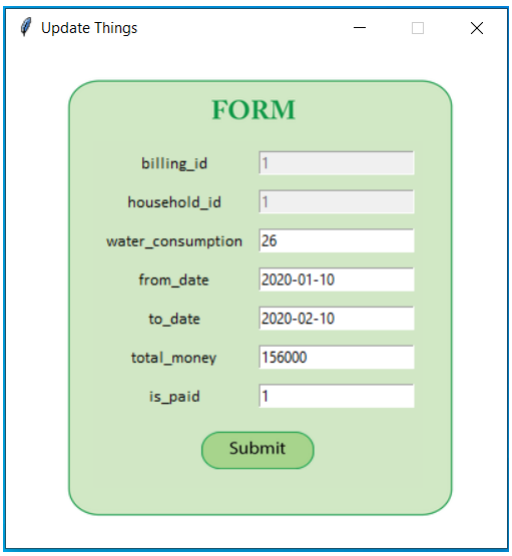
Figure 10: Specific bill record result

4.4 Employee Screen

Figure 11: Employee home screen



(a) Add Method



(b) Update method

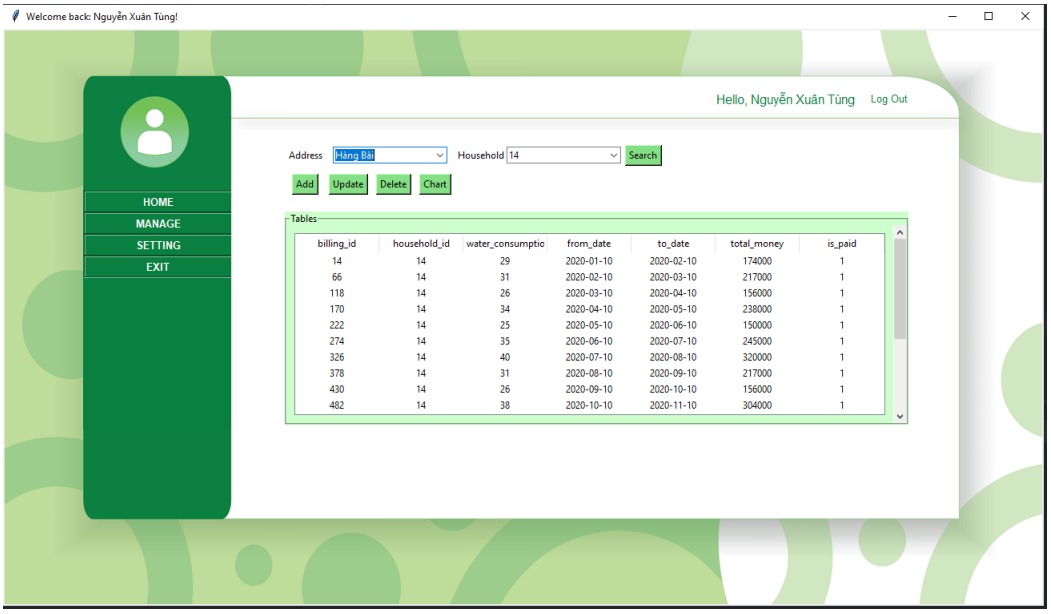


Figure 13: Employee's search result

5 Conclusion and Future work

5.1 Conclusion

In conclusion, this report has shown specific details and information in regard to the application. Currently, the app can manage different types of data with proper authentication and authorization. Depending on the given accesses and roles, users can add, update and delete records, or search and show results in the form of tables and charts. The application runs smoothly with no bugs found yet; however, several things need to be done or can be improved in the future, which will be noted in the next section.

5.2 Future Work

Many adaptations, extensions have been left for the future due to lack of time. Some of the components that can be improved are the password (which should be hashed into a different string to make it more safe and secure), the setting screen (which should be used to change the profile, not only the password). Some additional features can be developed in the future: printing the bills and exporting charts.