**HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**School of Information and Communication Technology**

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**FINAL PROJECT REPORT**

**Group 1**

IT3100E – Object Oriented Programming

Class: 139411

Lecturer: PhD. Trinh Tuan Dat

Semester 20221

Hanoi, June 2023

1. **INTRODUCTION**

The course IT3100E – Object Oriented Programming provides students with object-oriented concepts, languages, principles, and techniques. Students are first introduced to object-oriented technology, the overview of Java programming language and Unified Modelling Language (UML). Four object-oriented programming principles, i.e., abstraction, encapsulation, inheritance, and polymorphism, are then delivered out also. Aggregation, association, abstract class, interface as well as generic programming, exception handling, and graphical user interface (GUI) programming with Java, during the course, are presented to students.

This hands-on project is assigned to groups of students along with the course to apply the knowledge related to the design of object-oriented programs to an object-oriented application solving real-world problems.

In this report, our group, under the guidance of Prof. Trinh Tuan Dat, will present the ways in which our group deal with the project assignment in details, which includes system design, application design, algorithms, GUI, technologies, etc. every component of our programme besides team contributions and project process management.

Our team members include:

|  |  |
| --- | --- |
| **Student’s name** | **Student’s ID** |
| Nguyen Trong Huy | 20210451 |
| Tran Duc Nam | 20215228 |
| Bui Phuong Nam | 20215227 |
| Trinh Giang Nam | 20215229 |
| Nguyen Chinh Minh | 20215224 |
| Hoang Minh Quan | 20215236 |

Figure 1 Team members

1. **PROBLEM DESCRIPTION**
2. **Study Case**

There are numerous websites that provide information about the history of Vietnam, such *as https://nguoikesu.com*, *Wikipedia*, *DBPedia*, and more. The task is to search and automatically gather data about the history of Vietnam from these websites and interlink the collected data. The entities to be collected include:

- Historical dynasties of Vietnam

- Historical figures of Vietnam

- Tourist destinations and historical landmarks

- Cultural festivals

- Historical events in Vietnam

Each entity needs to have an identifier and various attributes. Importantly, the entities should be interconnected.

Please note that:

- Data gathering process must be solved automatically.

- Consistency in naming attributes for each entity.

However, there are many criteria to evaluate your system:

- A diverse range of entities for each type from multiple sources.

- Ensure accuracy.

- Data integration from multiple sources is required.

For the final version of your application, the collected data needs to be stored in either JSON or CSV format. Subsequently, provide search functionality and display information for end users.

1. **Problem Solving Strategies**

In our very first stage to handle this problem, developing a strategy to develop our system serves as the bridge to the success of the project.

To facilitate the software development process under such requirements, we have detailed plans for each stage of developing our product for the study case in a period of 6 weeks of project. The way we allocate individuals to different jobs will be shown later in the appendix of this report.

|  |  |  |
| --- | --- | --- |
| **Stage** | **Description** | **Period** |
| Requirement Analysis | - Analyse the requirement of the study case.  - Feature the specific functionality that the system should have.  - Examine the websites that are helpful for data crawling.  - Study the process to crawl data from a website | 3-4 days |
| Design | - System design  - Programming design | 1 week |
| Implementation | - Coding  - GUI implementation | 3 weeks |
| Integration & Testing | - Integrate each component of system  - Mannual Testing | 4-5 days |
| Realease | - Deliver final report, source code, etc.  - Presentation & demo video | - |

Figure 2 Details of our development process

1. **Technologies, Frameworks, Libraries in use**

This table describes tools that we use to build up our program.

|  |  |
| --- | --- |
| **Tools** | **Objectives** |
| E(fx)clipse  Windows 64 bits | IDE |
| GitHub | Version Control |
| Asana | Project Management |
| SceneBuilder | GUI design |
| Java | Programming Language |
| CSS | Styling language |
| Maven Project | Java library management tool |
| Astah | UML design tool |

Figure 3 Technologies in use

Here are some Java libraries we use during the implementation process.

|  |  |  |
| --- | --- | --- |
| **Library** | **Version** | **Description** |
| JDK | 19.0.0 | Java core library |
| gson | 2.9.0 | Converting Java objects to JSON |
| json-simple | 1.1.1 | Parsing and generating JSON |
| jsoup | 1.15.3 | Web scraping and HTML parsing |
| json | 20220320 | A lightweight data interchange format |
| javaFX | 16 | GUI coding (event handling, …) |

Figure 4 Java libraries

1. **REQUIREMENT ANALYSIS**
2. **Base data Specification**

When attempting to do a survey related to the entities, we realise that these entities should have the following information for the final system.

|  |  |  |
| --- | --- | --- |
| **Entity** | **Attribute** | **Description** |
| Thời kỳ  (Dynasties) | Tên (Name) | This enity depicts all dynasties of Viet Nam History |
| Kinh đô (Capital) |
| Các đời vua (Kings) |
| Người sáng lập (Founder) |
| Thời gian tồn tại (Period) |
| Quốc hiệu (Nation’s name) |
| Nhân vật lịch sử  (Figures) | Tên (Name) | This entity lists all Vietnamese historical figures, which may also include Vua (King) |
| Năm sinh (Year of birth) |
| Năm mất (Year of death) |
| Quê quán (Hometown) |
| Thời kỳ (dynasty) |
| Sự kiện lịch sử  (Events) | Tên (Name) | This concept shows information of Vietnamese historical events. This also includes Chiến Tranh (Vietnamese War) |
| Thời gian (Period) |
| Thời kỳ (Dynasty) |
| Nhân vật liên quan (Figure) |
| Nội dung (Content) |
| Lễ hội  (Festivals) | Tên (Name) | Describe Vietnamese historical festivals |
| Thời gian (Period) |
| Địa điểm (Place) |
| Nhân vật liên quan (Figure) |
| Di tích  (Relics) | Tên (Name) | List all Vietnamese relics |
| Địa điểm (Place) |
| Loại di tích (Classification) |
| Năm (Year of recognition) |
| Nhân vật liên quan (Figure) |

Figure 5 Base data

1. **Business process analysis**

To get into the process of the system, we first need to estimate the business requirement. Based on that, we then can divide the business process into two main processes: data viewing process and web scraping process. The first term describes the way end users could search for data in the final program, from that we can concentrate on GUI design that meet the user experience. While the later one describes the way the system could get the data from the website automatically and then supply the data for the backend process.

For each process analysis, we need to make enquiries about what the clients want for the final version of the system besides how the data could be obtained from the website to deliver the activity diagrams, which can be considered the foundation to system design.

By doing this stage, we can easily approach the system design and progamming design regarding client-oriented requirements and minimal error.

1. **Data searching process activity diagram**

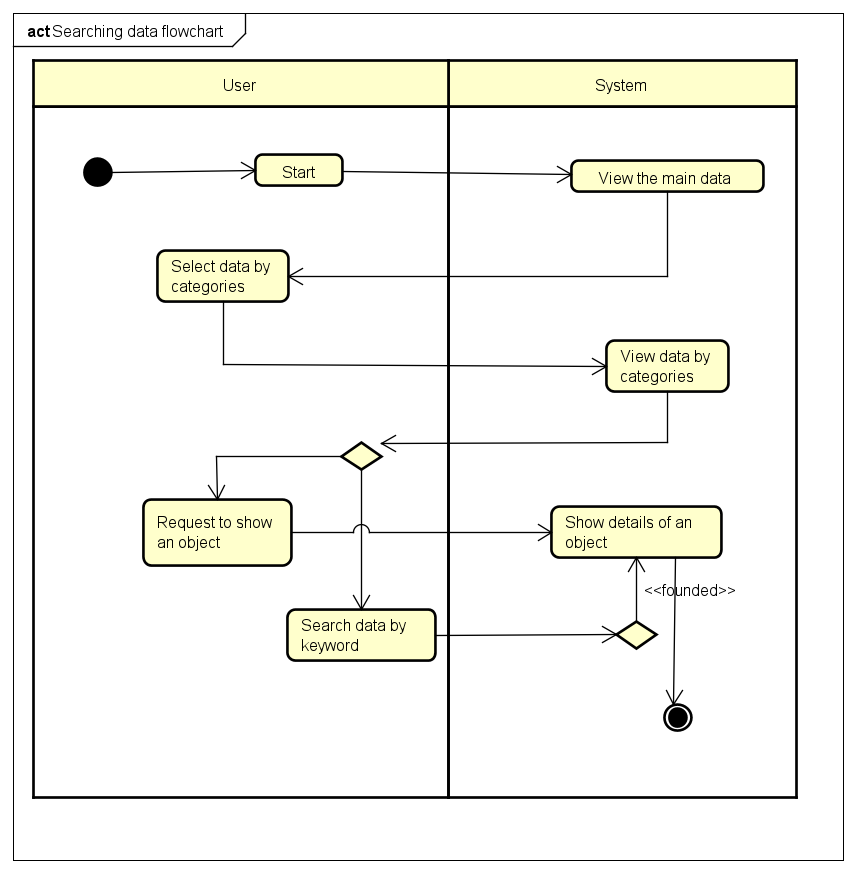
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Figure 6 Data viewing process analysis

1. **Web scraping process activity diagram**

Based on what we discovered about the web scraping process, which shows below, we propose the web scraping process activity diagram.

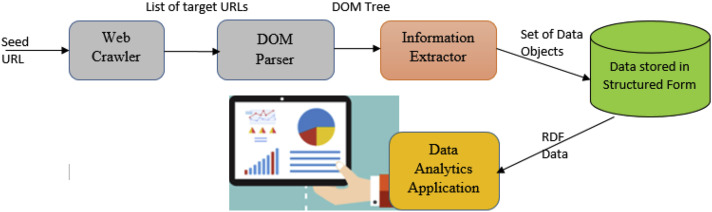


Figure 7 Actual web scraping process

This activity diagram might affect that way we develop class diagram for web scraping subsystem.

A screenshot of a computer screen

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Figure 8 Web scraping process activity diagram

1. **Use Case diagram**

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Figure 9 Use case diagram

Use case “View data” details:

|  |  |
| --- | --- |
| **UC** | View data |
| **Primary actor** | User |
| **Secondary actor** | No |
| **Pre-condition** | - The web data scraping process has been successfully completed.  - The scraped data has been stored in a structured format. |
| **Post-condition** | - The User is able to view the scraped data. |
| **Main flows** | 1. The data scraping process has been successfully completed. The scraped data has been stored in a structured format. 2. The application presents a list of available datasets or categories of scraped data to the users. 3. The user selects a specific data to view. 4. The user can navigate or search data in format. |
| **Regular variants** | - The user exits the program |
| **Exceptional flows** | No |

Figure 10 Use case "view data" details

Use case “Gather data” details:

|  |  |
| --- | --- |
| **UC** | Gather data |
| **Primary actor** | No |
| **Secondary actor** | Sources |
| **Pre-condition** | - The system requires to access the source to collect data |
| **Post-condition** | - Successful connection |
| **Main flows** | 1. After connecting successfully to the data source, it gathers the source code. 2. Extract source code which includes data. 3. Store data in structured format. |
| **Regular variants** | - No |
| **Exceptional flows** | - Failed connection  - Timeout request |

Figure 11 Use case "gather data" details

Use case “Scrap Web” details:

|  |  |
| --- | --- |
| **UC** | Scrap Web |
| **Primary actor** | Web Scraper |
| **Secondary actor** | No |
| **Pre-condition** | - Web Scraper has access to the target websites.  - The Web Scraper is configured with the necessary scraping rules or algorithms. |
| **Post-condition** | - Relevant data from the target websites has been scraped and extracted. |
| **Main flows** | 1. The Web Scraper identifies the target websites. 2. The Web Scraper establishes a connection with the target websites. 3. For each web page, the web scraper applies the defined scraping rules or algorithms to extract the desired data. 4. The web scraper stored data in structured format. |
| **Regular variants** | - No |
| **Exceptional flows** | - The Web Scraper logs the error or notifies the system administrator.  - The Web Scraper may attempt to retry the scraping process or skip the problematic web page.  - The Web Scraper detects changes in the target websites' structure or conten |

Figure 12 Use case "Scrap Web" details

1. **DESIGN ANALYSIS**
2. **System Design**

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