LONDON METROPOLITAN UNIVERSITY

CS6P05ES Project

Interim Report

Aquatic Plants & Fish Health Management

(E-Aquascape)

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Date: Friday, 03 February 2023

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Second Supervisor: Akila Udara Akalanka

Declaration

Module: FC6P01 Deadline: Friday 03rd February 2023 at 11.59pm

Module Leader: Migara Alawatta Student ID: E180317

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(ii) Falsifying data in experimental results.

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Submission Information for Students

- Submit as a PDF file.

- Submit **BOTH** the Formal and Second submissions

- The report is a formal document and should be written in formal English

- Write for someone who is technically proficient but not necessarily familiar with your particular project

- Do not use ‘possessive words’ such as I, me, my, we… in reports

- Your report should cover everything as detailed in this template. You should delete the guidance notes before submission

Abstract

This research aims to build an advanced plants & fish health management system called "E-Aquascape." The E-Aquascape supports beginners in aquarium maintenance, such as home aquariums and fish farmers. Home aquarium is becoming popular in the world right now. Because people enter into an unprecedented aging society, many retired people have much leisure time. And during this pandemic, people cannot restore their mental health. Home aquarium is one of the options for restoring their mental health.

Younger generations also are interested in Aquascape as a hobby, healthy fish, and children's education. However, it is difficult for beginners to manage their home aquarium because of huge factors you must consider, such as fish health, weather, climate condition, etc.

The E-Aquascape supports manages', especially beginners' decisions with much information based on collected data by sensors and databases.

This paper aims to develop a support system of the Smart Aquarium that can 1) Plants and fish diseases are diagnosed using image processing, and 2) appropriate treatment is shown for the disease.

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1. Introduction

Aquascape is the leading manufacturer of water features, water garden and pond products. Aquatic plants have the most important role in Aquascape. They help sustain life in a planted tank as well as create a captivating display of lush green, red, and violet. The craft of Aquascape has become increasingly popular in recent years. A comprehensive definition of the term describes Aquascape as underwater gardening. Fishes add to their beauty.

Many people like to set up a planted tank with live plants. But they do not know how to diagnose plant diseases and manage plants' health. So, plants grow slowly and die. It can be from a deficiency in either CO2, poor lighting, temperature, or a lack of nutrients in the water. There are many instruments available in the world to measure temperature, CO2, light, and nutrient percentages. However, it is difficult for people to confirm the health of plants and diagnose diseases.

As many aquarium keepers will know, there are hundreds of bacterial, parasitic, and fungal infections that can affect the health and well-being of your fish. Contrary to popular belief, fish are highly sensitive animals, and environmental changes, no matter how minor, can trigger periods of stress and illness.

The system can detect plant health status, plant diseases, and fish diseases. The system provides solutions for increasing plant and fish health and how to treat them. The diseases are detected using image processing. Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which the input is an image, and the output may be an image or characteristics/features associated with that image.

1.1 Background and Motivation

Aquascape is becoming popular in the world right now. A study has suggested that people who spend time around planted tanks will see an improvement in their health and mood. However, it is difficult for beginners to manage their plants' health because of huge factors you must consider, such as co2, light conditions, temperature, nutrients, etc.

All the plants in my first planted tank died because of poor health management. Been trying to grow live plants for a long time and every time I tried all the plants died. I had to spend a lot of money to purchase plants and equipment. Finally collected data to set up the tank using the internet and managed the plants' health. It is the main reason and motivation for the development of the system.

Most fish diseases are the result of stress, and poor water quality plays a large factor in this. Unfortunately, most diseases are difficult to diagnose and treat, however, spotting the signs early is often crucial to recovery.

If we do have not any idea about Aquascape, users can quickly improve their plant's and fish's health management skills from this E-aquascape application. This system will provide an ideal solution to help the manual process overcome the obstacles mentioned above while ensuring the users have an enjoyable and comfortable experience in Aquascape through the application.

1.2 Problem in brief

The whole Aquascape process may seem difficult to accomplish in the beginning. People like to set up a planted tank with live plants. But they do not know how to diagnose plant diseases and manage plants' health. So, plants grow slowly and die. Aquatic plants are expensive. However, people spend a lot of money to buy those plants. If the plants die, it's a loss.

Most fish diseases are difficult to diagnose and treat, however, spotting the signs early is often crucial to recovery. When the user passes by their fish tank, the user may notice their fish behaving strangely or showing abnormal physical characteristics. These are clues that their fish is suffering from some type of disease and will need treatment. But they do not know how to diagnose and treat fish diseases.

In most cases, problems with aquarium plant and fish diseases are difficult to diagnose. Unfortunately, many aquarium hobbyists do not understand these basic needs and, thus, they end up experiencing problems with keeping their plants and fish alive. It will aid if the user can diagnose the disease and how to treat it by processing the images.

1.3 Aims and Objectives

To develop a system to addressing plant and fish health with the use of image processing. The Application is a simple solution to manage all major and minor aquascape processes.

The objectives of this system include:

- Predicting and showing growth rate.
- Shows the future health plan.
- Plants and fish diseases are diagnosed using image processing.
- Appropriate treatment is shown for the disease.
- Users can learn about aquascape tips and all details of aquatic plants.

1.4 Resource Requirements

The following technologies and resources will be used for the web application development process.

1.4.1 Software Requirements

- MYSQL (Database)
- Laravel (Backend)
- Python
- Visual Studio Code (IDE)

1.4.2 Hardware Requirements

- Mobile Device or Desktop computer

1.5 Functional and Non-Functional requirements

Functional	**Non-Functional**
Authentication of a user when the user tries to log into the system.	Performance
Manage plants and fish	Security
Check plants & fish diseases	Reliability
Show diagnosis & treat for the diseases	Data Integrity
Manage orders	Maintainability
System shutdown in the case of a cyber attack.	
Verification email is sent to user whenever the system user registers for the first time on some software system	

2. Background

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3. Work Completed

The developer analyzed the project requirements and decided on Methodology and technologies to implement this system from the beginning.

After a complete requirement analysis, the developer planned the project and gathered the needed research documents. And developer decided on Agile Methodology to develop this application.

Agile Methodology is a practice that encourages continuous repetition of development and testing throughout the life cycle of project software development. For the Agile model in software testing, both the development and testing functions are the same, unlike the Waterfall model.

The developer mainly chose Unity Software, Python, Machine Learning, and PHP language to develop this system.

Then the developer researched the main project research areas. AI technologies and fish & plants diseases are the central parts of "E- Aquascape" application search areas, And the developer collected all the details for the project. After that, the developer created Use Case Diagram, Entity Relationship diagram, and other needed diagrams for this system.

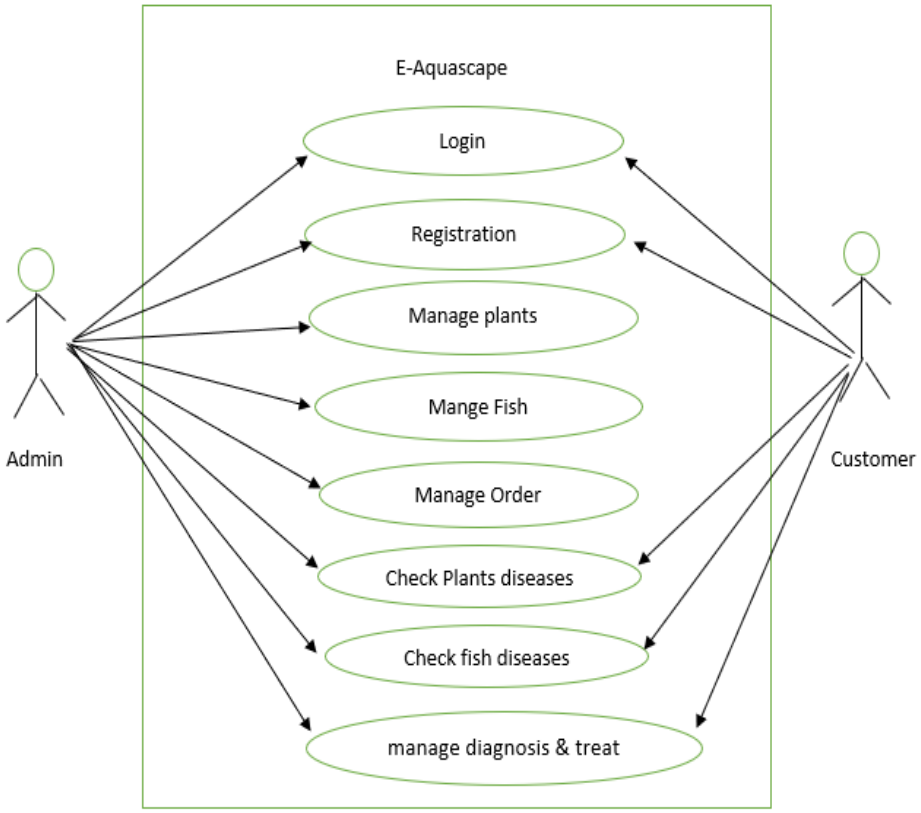

Figure 1 Use Case Diagram

In this "E-Aquascape" application, the customer's most apparent factor. Other actor admin can be controlling all system parts from the backend.

A customer will need to check plants and fish diseases, check diagnosis & treat for the diseases, and similar functions in this system. Admin will need to Manage all plants and fish, manage orders, Manage all customers, View Reports, and similar operations. So, all of these can be considered as use cases.

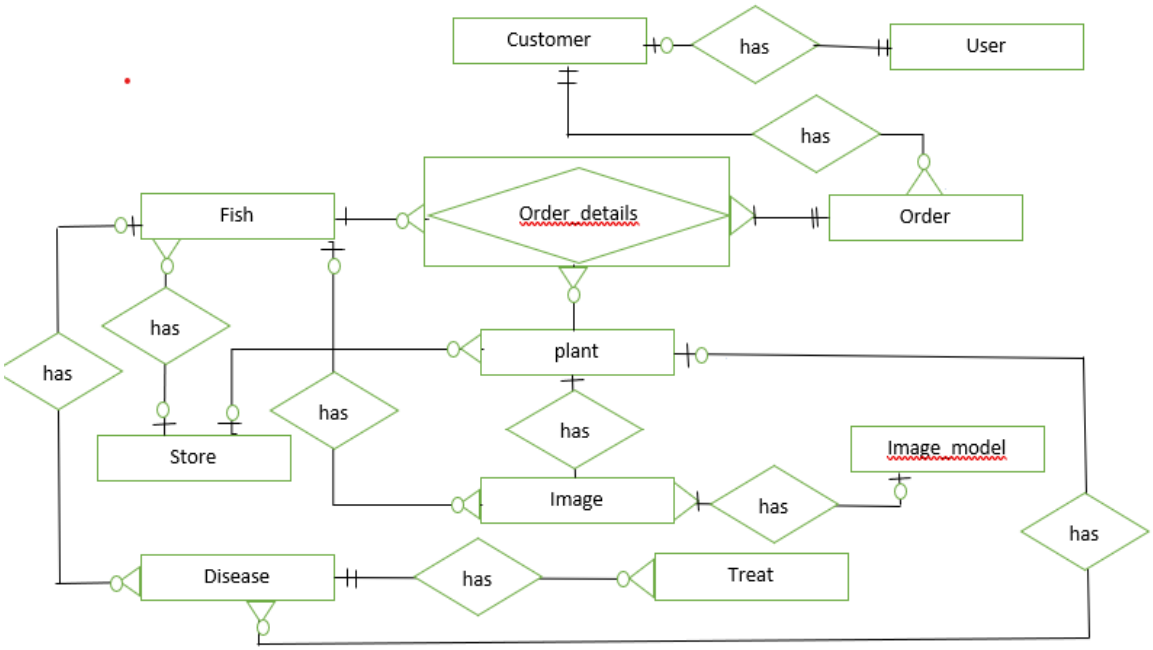

Figure 2 Entity Relation Diagram

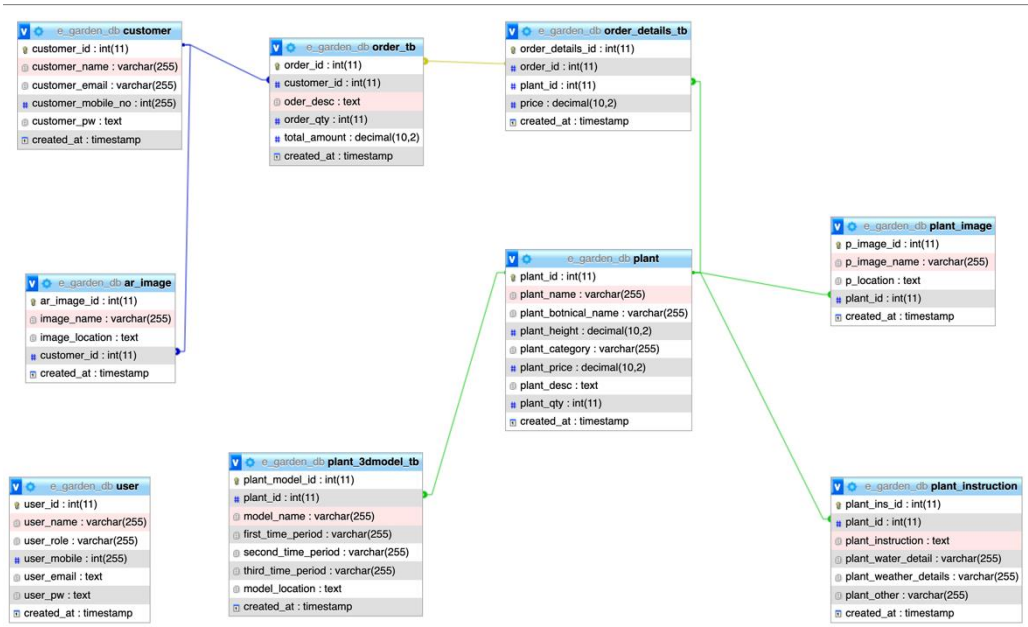

Figure 3 Database Logical Schema

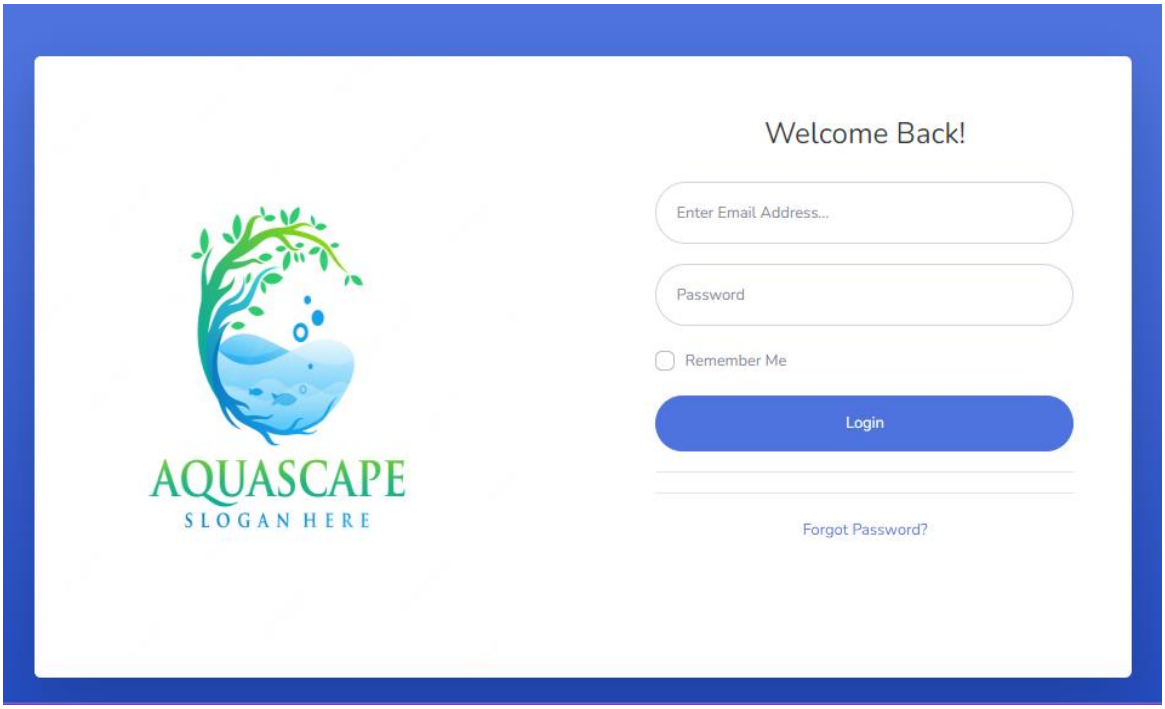

Figure 4 Login Page

This is the customer login page UI. Customers can log in to "E-Aquascape," fill in all blanks and press the login button. If a customer hasn't an account in this system Customer need to create the account. Using the Sign-Up button, customers can register as a customer of "E-Aquascape."

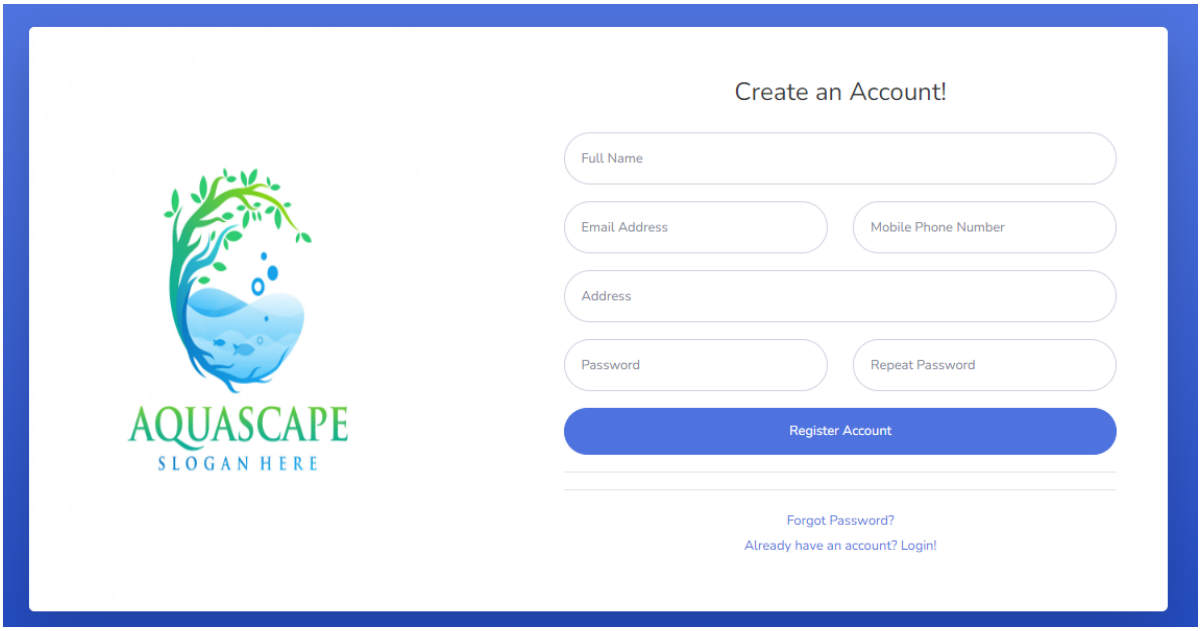

Figure 5 Customer Registration Page

Customers can register for this application using this UI page. Customers can fill in all the blank and hit the Sign Up, and customers can log in to the "E-Aquascape" system.

The developer has completed the below tasks so far.

- Project Planning and Project Documentation
- Project Proposal Submission
- Research on AI technology for Web Application
- Research On Fish & Plants diseases
- Plan the platform to be used for Image processing.
- Gather All Information and Plan Project
- Creating Project Structure
- Design All needed Diagrams
- Design Database Architecture
- Admin Backend Implement
- Admin Frontend Implement
- Web Application UI Design
- Module train using Image processing (AI)
- Unit Testing 01
- Unit Testing 02

4. Further Work

Below tasks are need to implement in the system. These parts are main part of the system. Developer needs to focus on deeply to these tasks.

4.1 Documentation

The developer needs to finalize all the final documents versions and research modules for the documentation.

4.2 Backend Development

In the backend implementation, the developer has to develop Main Dashboard Services, Plant & fish Management Services, Module train using Image processing, Plant Store Management Services, Services Integration with Ui, testing, and bug fixing parts.

The developer has suggested new additional feature to the application customers can upload or capture plant images to recognize plants & fish details.

4.3 Front End Development

In the Front-end implementation, the Developer has to develop web Customer login, Register UIs, Main Dashboard UI Designs, Plant Management UIs, Fish Management UIs, Plants & fish diseases detect UIs, Plant Store UIs, testing, and bug fixing parts. And Developer will be focusing on UI design to attract all the customers.

5. Progress Review

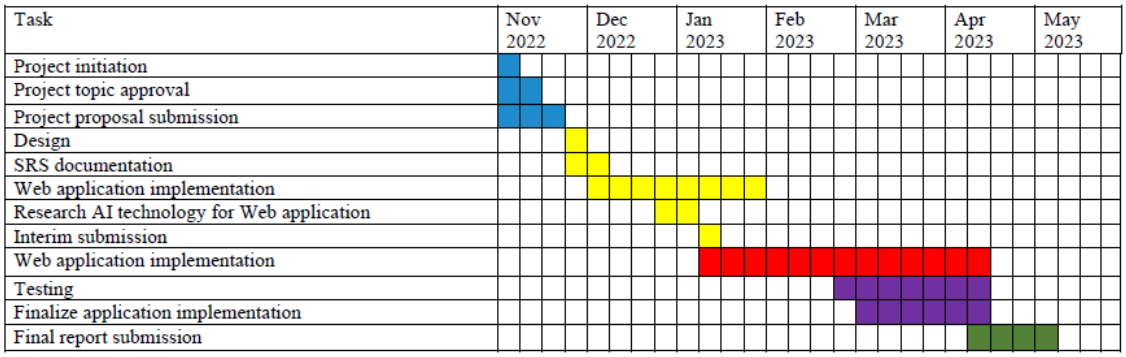

Figure 6 Proposed Gantt Chart

Task	Started date	Status
Project Planning	11/10/2022	Complated
Project Document	30/10/2022	Complated
Project Proposal submission	1/11/2022	Complated
Research on image processing for web application	7/11/2022	Complated
Research on plants & fish diseases	10/11/2022	Complated
Plan the platform to be used for Image processing	15/11/2022	Complated
Gather all information and plan project	25/11/2022	Complated
Creating project Structure	30/11/2022	Complated
Design all needed diagrams	1/12/2022	Complated
Design database architecture	20/12/2022	Complated
Unit testing 01	25/12/2022	Complated
Admin backend implement	5/1/2023	Complated
User registration and Login Service Implementation	15/01/2023	Complated
Home page UI design	30/01/2023	Pending
Admin Frontend implement	20/02/2023	Pending
Unit Testing 02	25/02/2023	Pending
Plants management Service implement	30/02/2023	Incomplated
Image processing module train	5/3/2023	Incomplated
All AI services Implement	15/03/2023	Incomplated
Other All services Implement	25/03/2023	Incomplated
All services Intergrations	28/03/2023	Incomplated
Testing and bug fixing	30/03/2023	Incomplated
Finalizing Documentation	10/4/2023	Incomplated

Figure 7 Progress Chart

Project initiation, Project topic approval, Project proposal submission, Design, SRS documentation, Admin Web application implementation, Research AI technology, were implemented on web application and first testing round with web application (admin portal), PHP backend services and customer web application were done.

The web application should add report analytics in the dashboard for the admin. Plants & fish cart manage services like product qty increment, remove, remove all, and checkout services should be implemented in the web application. After covering all the features in the ecommerce application, test the web application and admin portal. after completed second testing round, should be implemented feature to the web application.

After implementing all the features on the web application should do as much testing as possible to clarify there are no bugs and finalize both web application and admin portal.

The icons, texts, font family and UI layout probably will change when finalizing the web application.

The developer has completed 45% of the project, and 55% of pending tasks are to implement. The project can be delivered to campus within the deadline because the progress is on time.

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