SMART PLANTING

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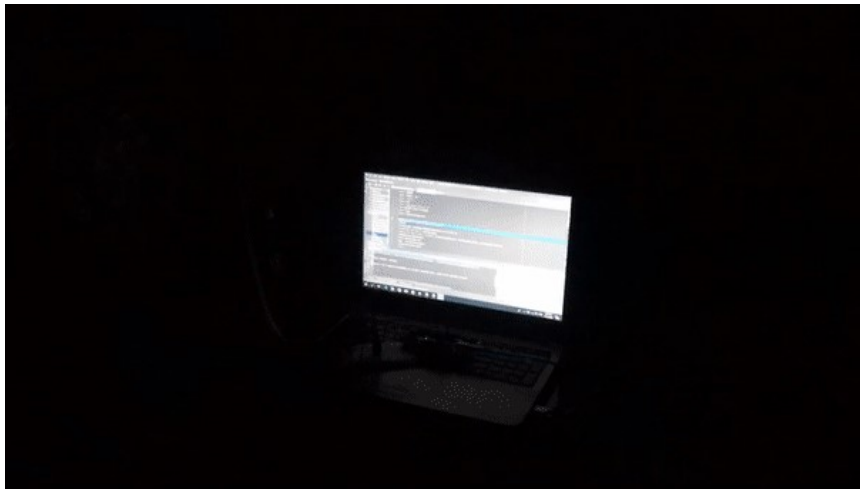
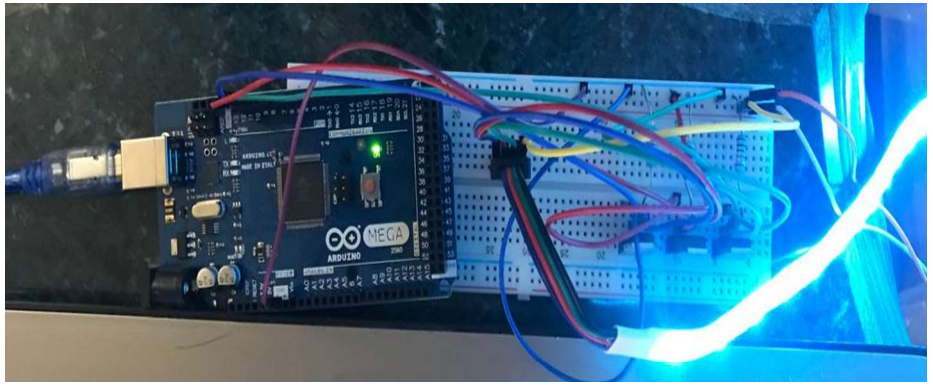
Introduction

- Our proposed system is an automated greenhouse system that control the LED lights, fans and detect some certain diseases using real time cameras. Our system is accompanied with a web application that enables the landowner to monitor their plant's growth health.

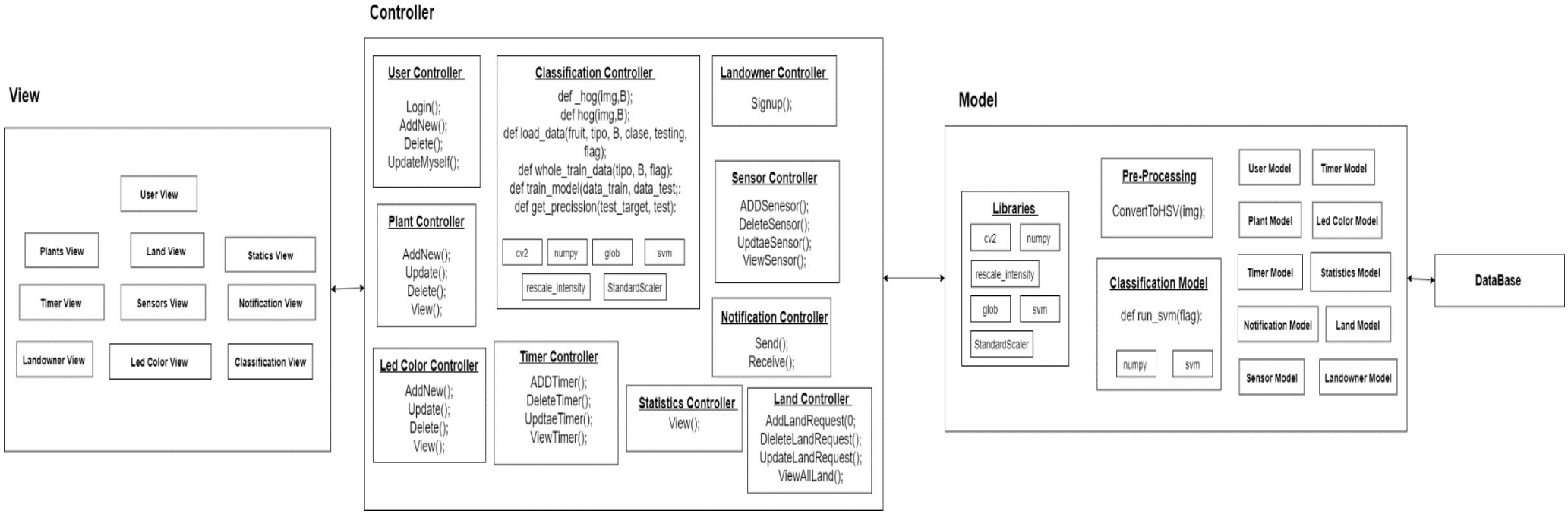




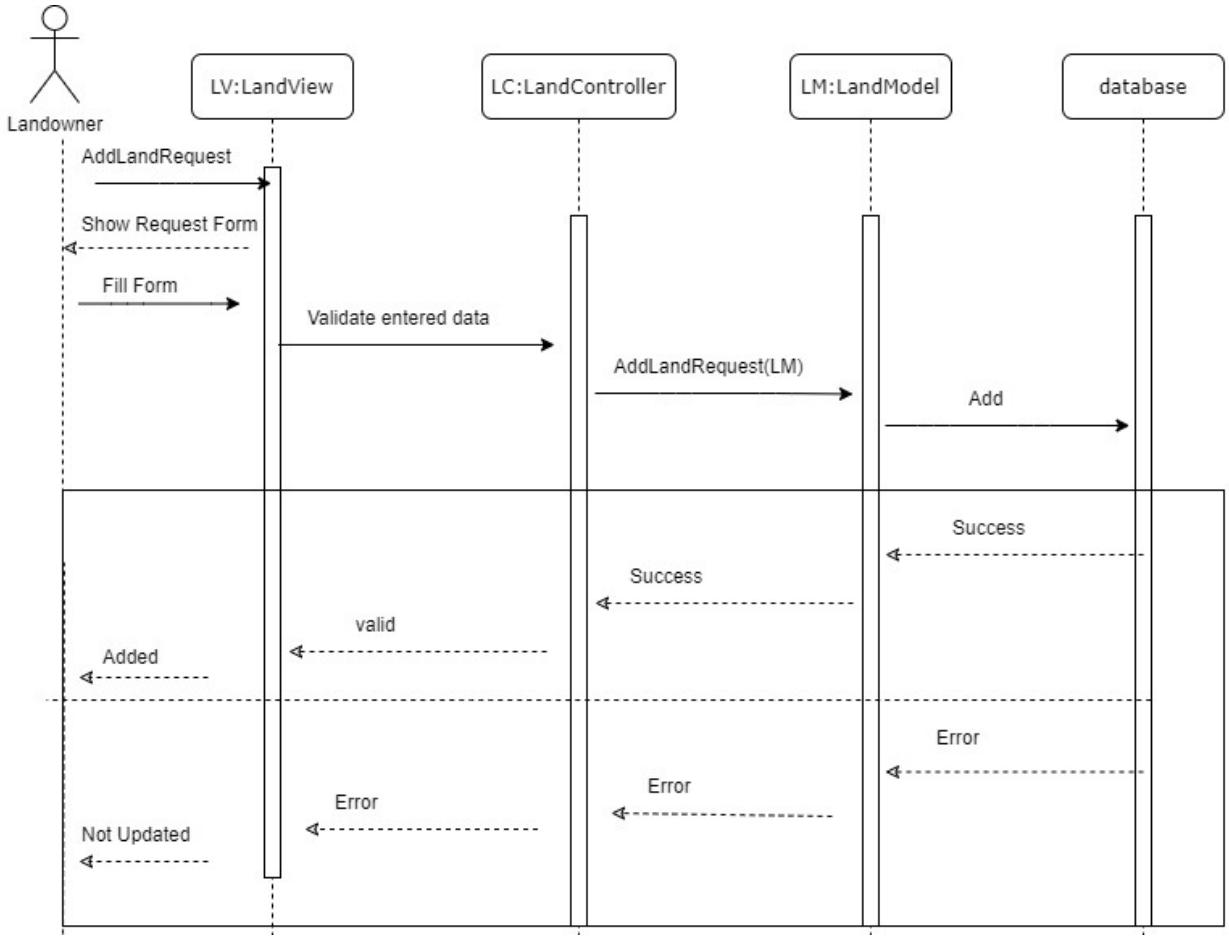
Objectives

- Automated detection of the plant in the greenhouse to classify its stage to start turning on the needed LED colour.
- Enhancing the system accuracy to be able to detect all the plant types in different fields in order to increase the plant's growth rate, reduce human effort and save time.

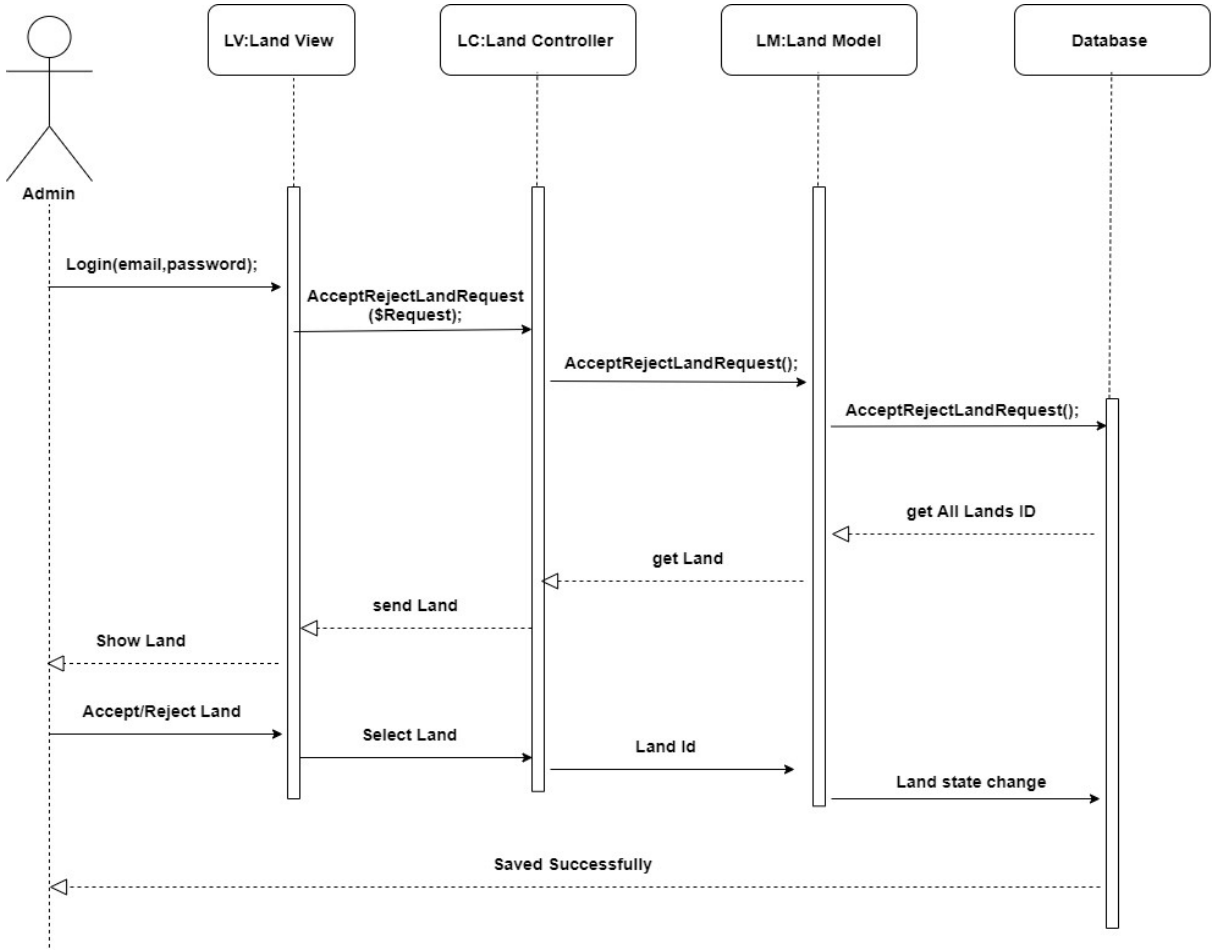
Architecture Design



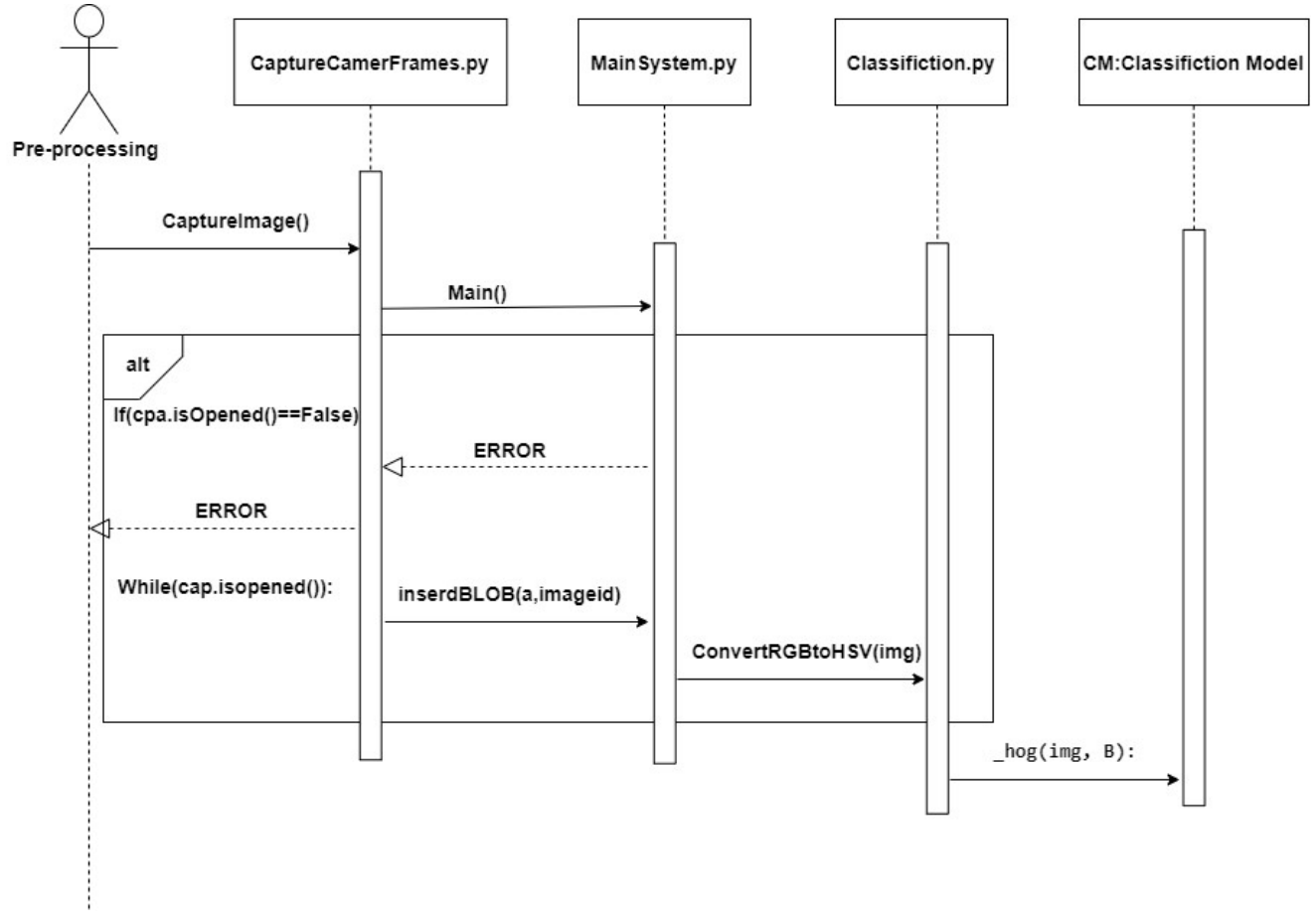
Sequence diagram(1/4)



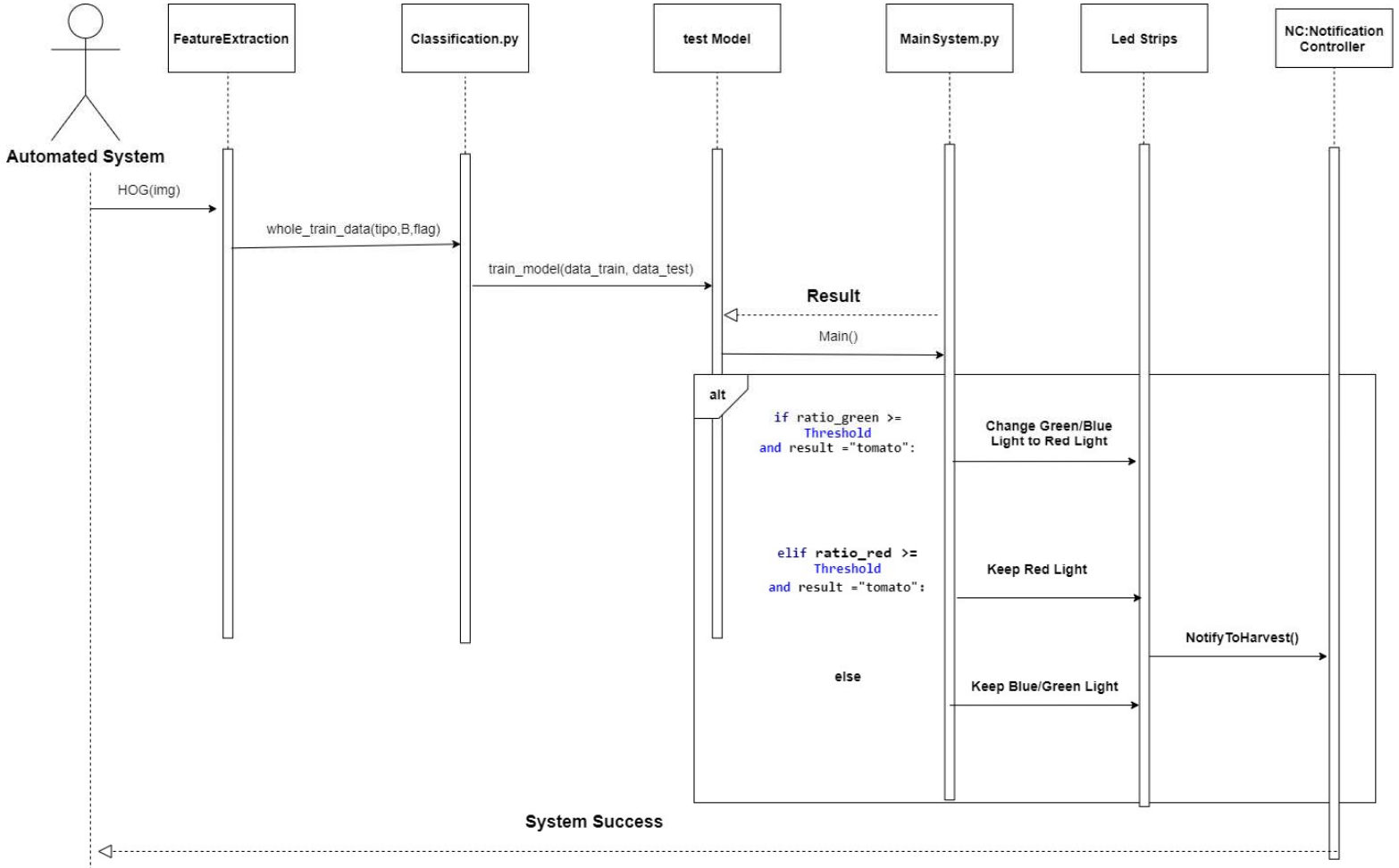
Sequence diagram(2/4)



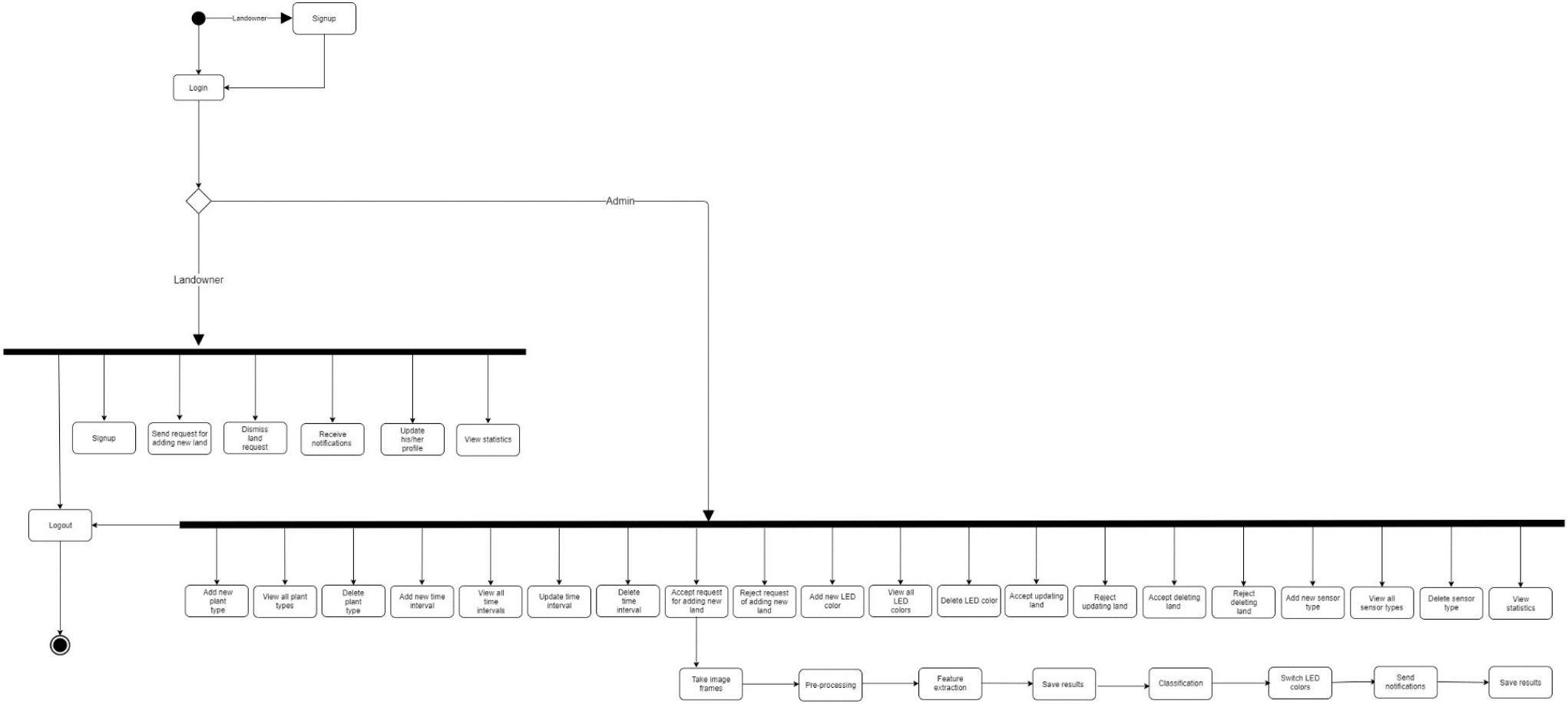
Sequence diagram(3/4)



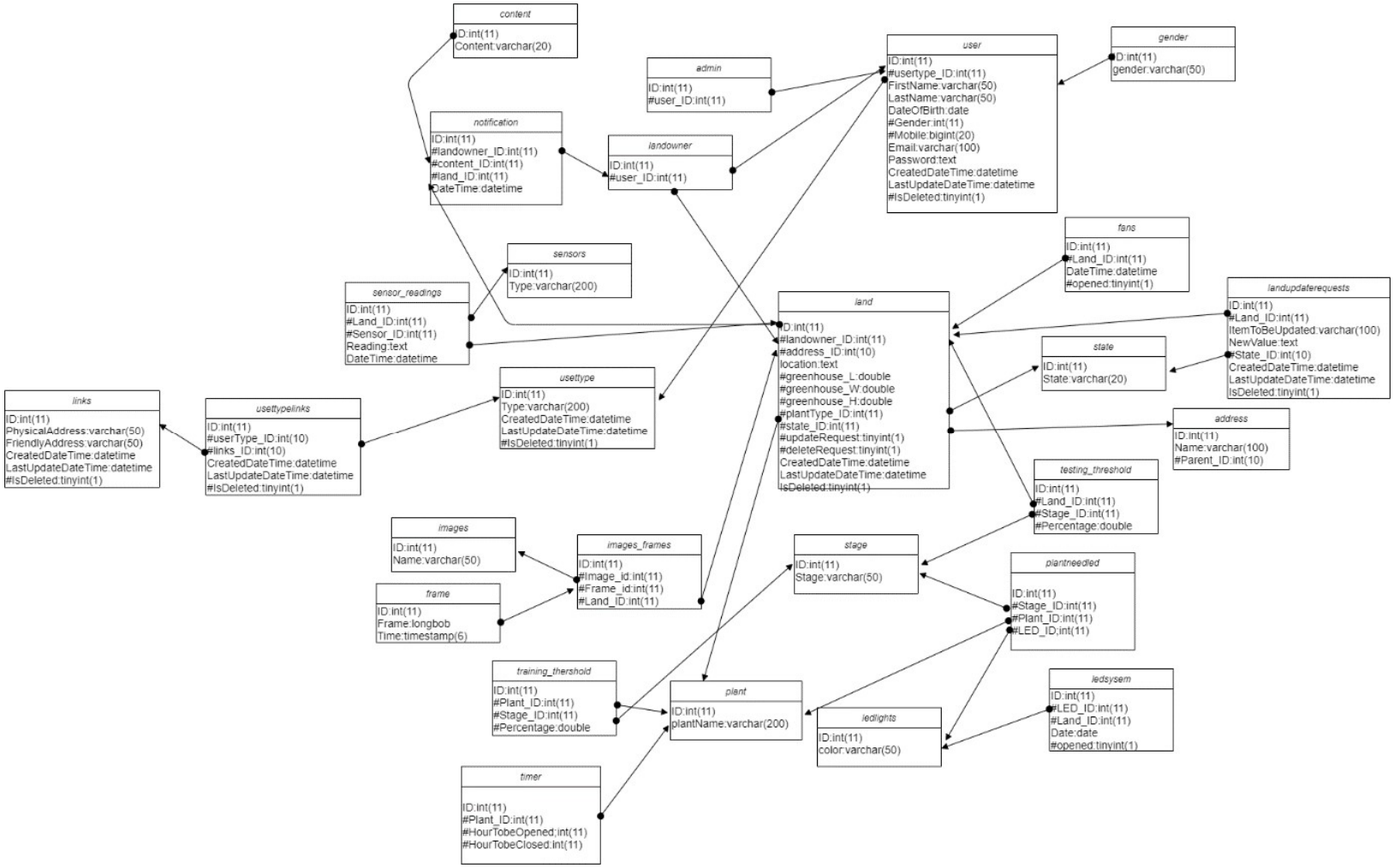
Sequence diagram(4/4)



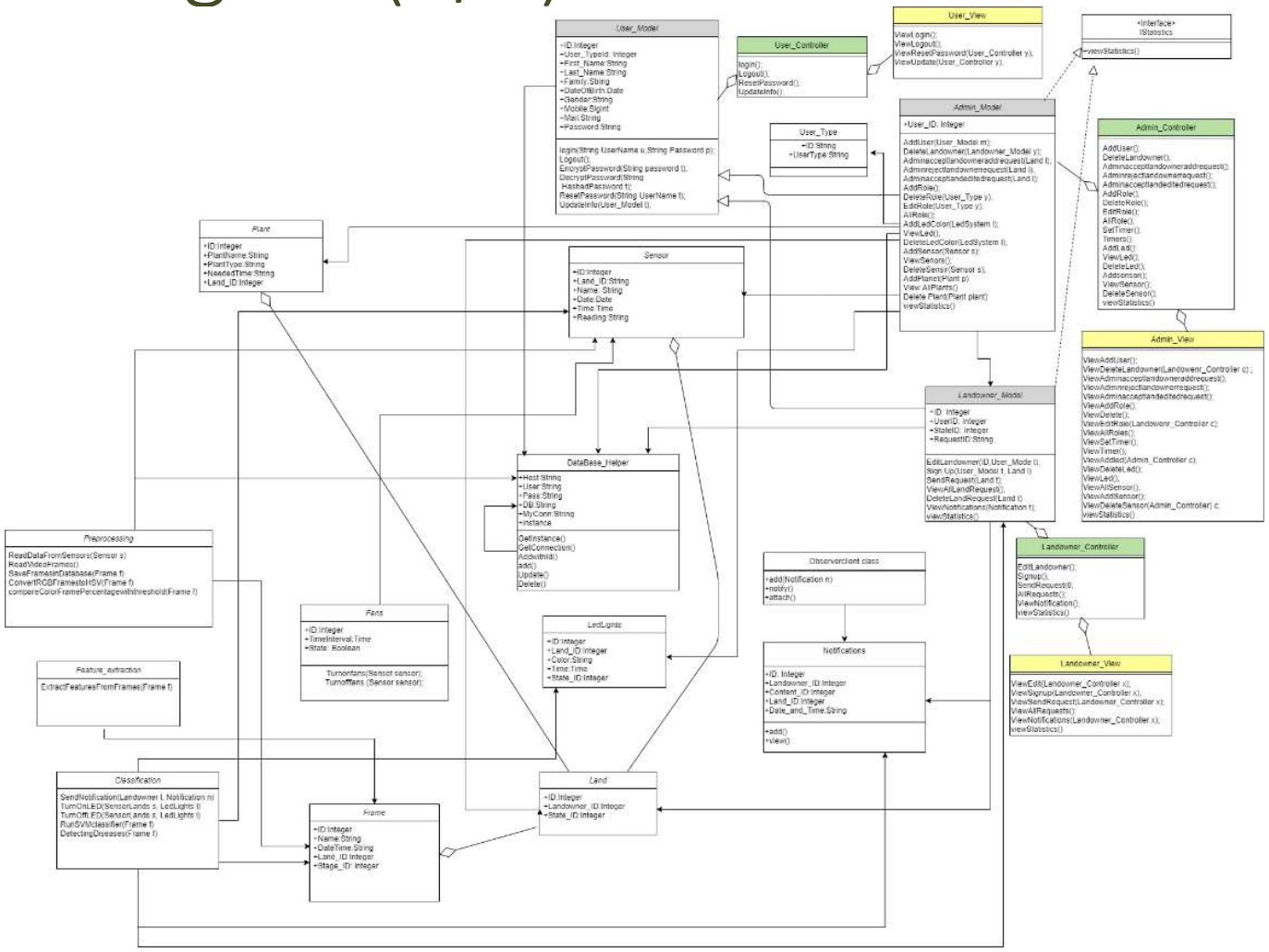
Activity Diagram



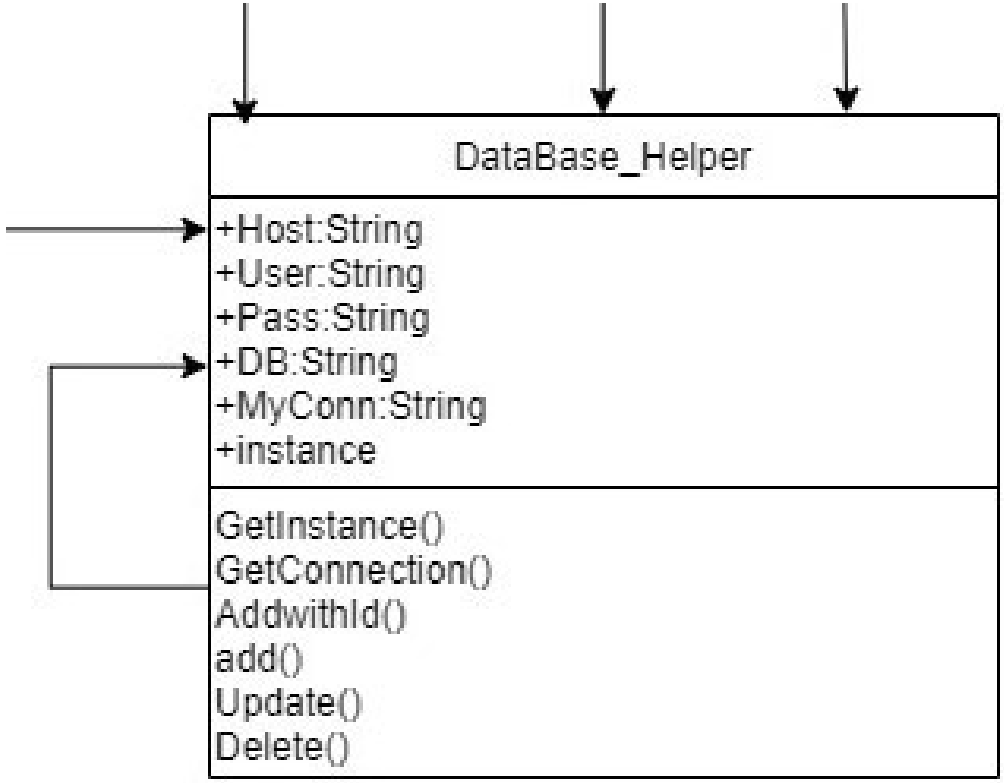
Database schema



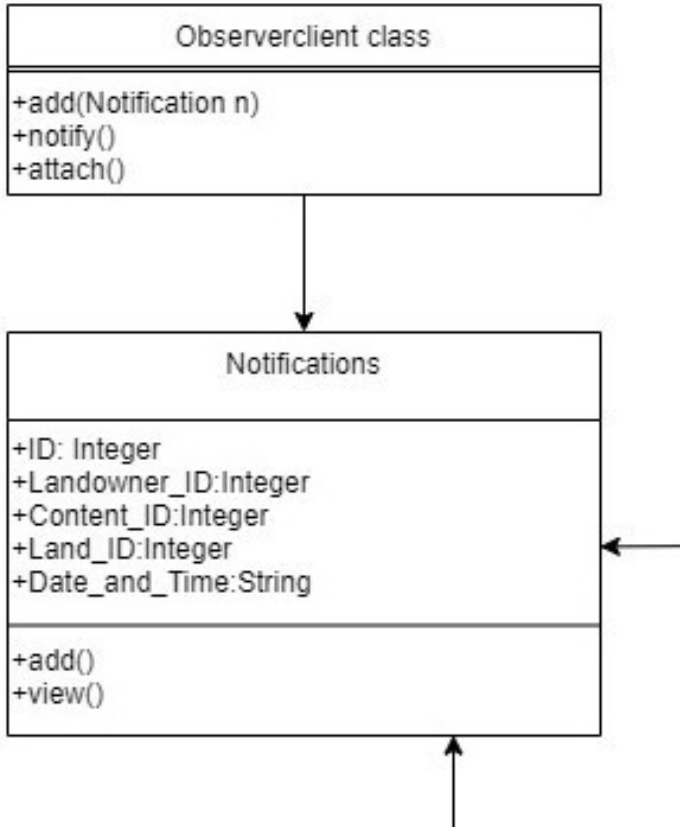
Class diagram(1/4)



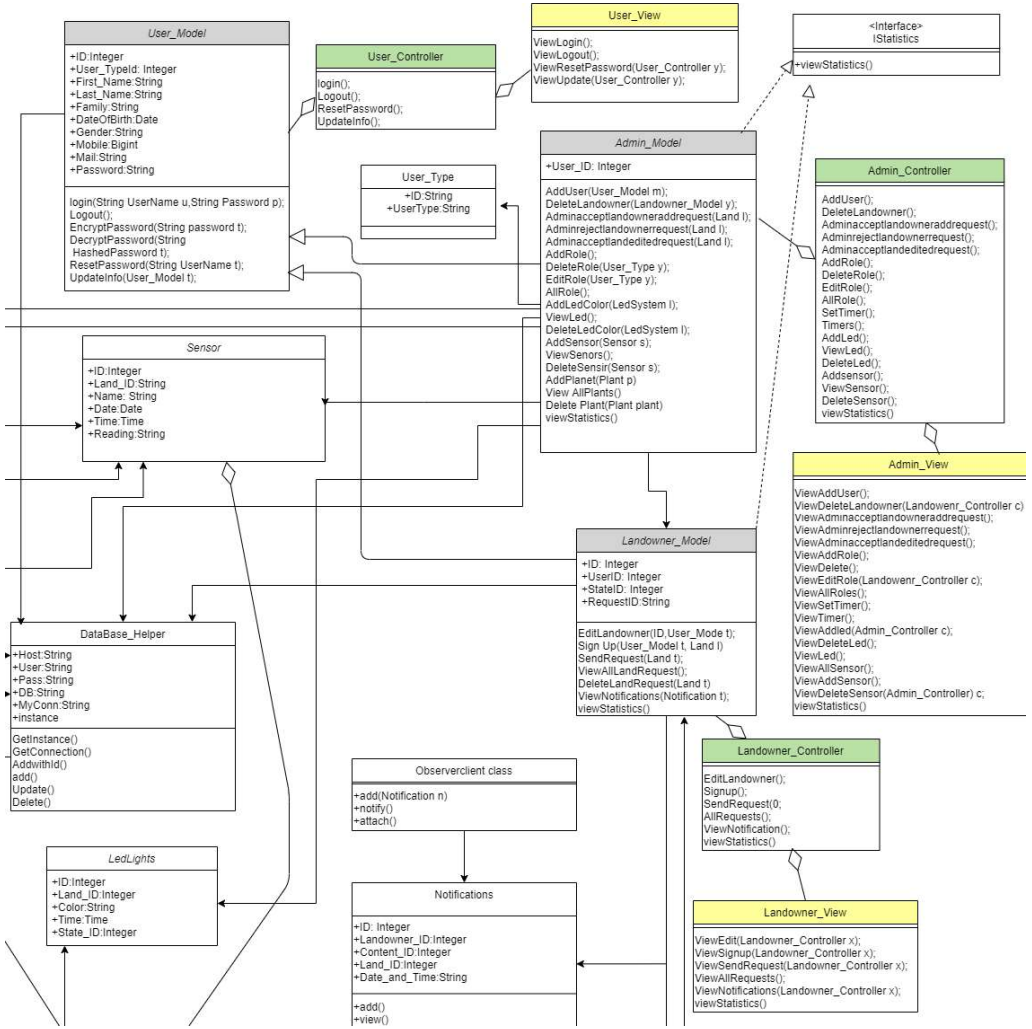
Class diagram(2/4) – Singleton design pattern



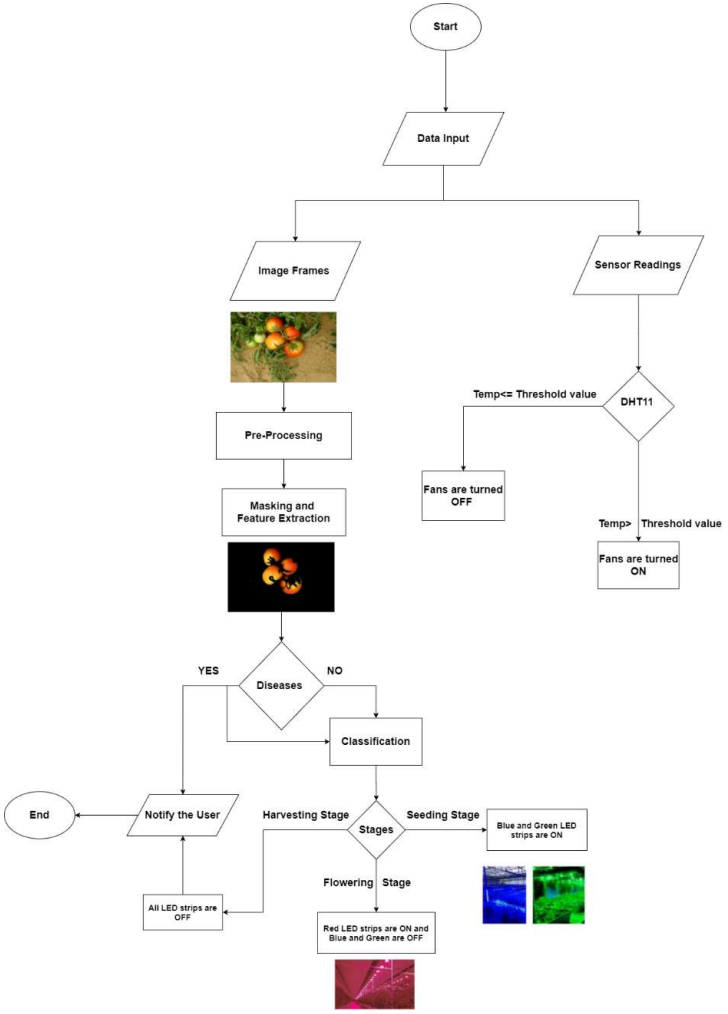
Class diagram(3/4) – Observer design pattern



Class diagram(4/4) – MVC design pattern



System Approach (1/4)



System Approach (2/4) – Data input and pre-processing

- There are two types of data inputs: the sensor readings using Arduino and a collection of image frames coming from a real time camera settled in our greenhouse.
- Pre-processing are operated on these frames as enhancements could be applied to image frames if needed, and that in order to remove any added noise in the frame to make it prepared for the processing stage in the system.

System Approach (3/4) - Processing

Masking

- The image frames are converted from RGB into HSV.

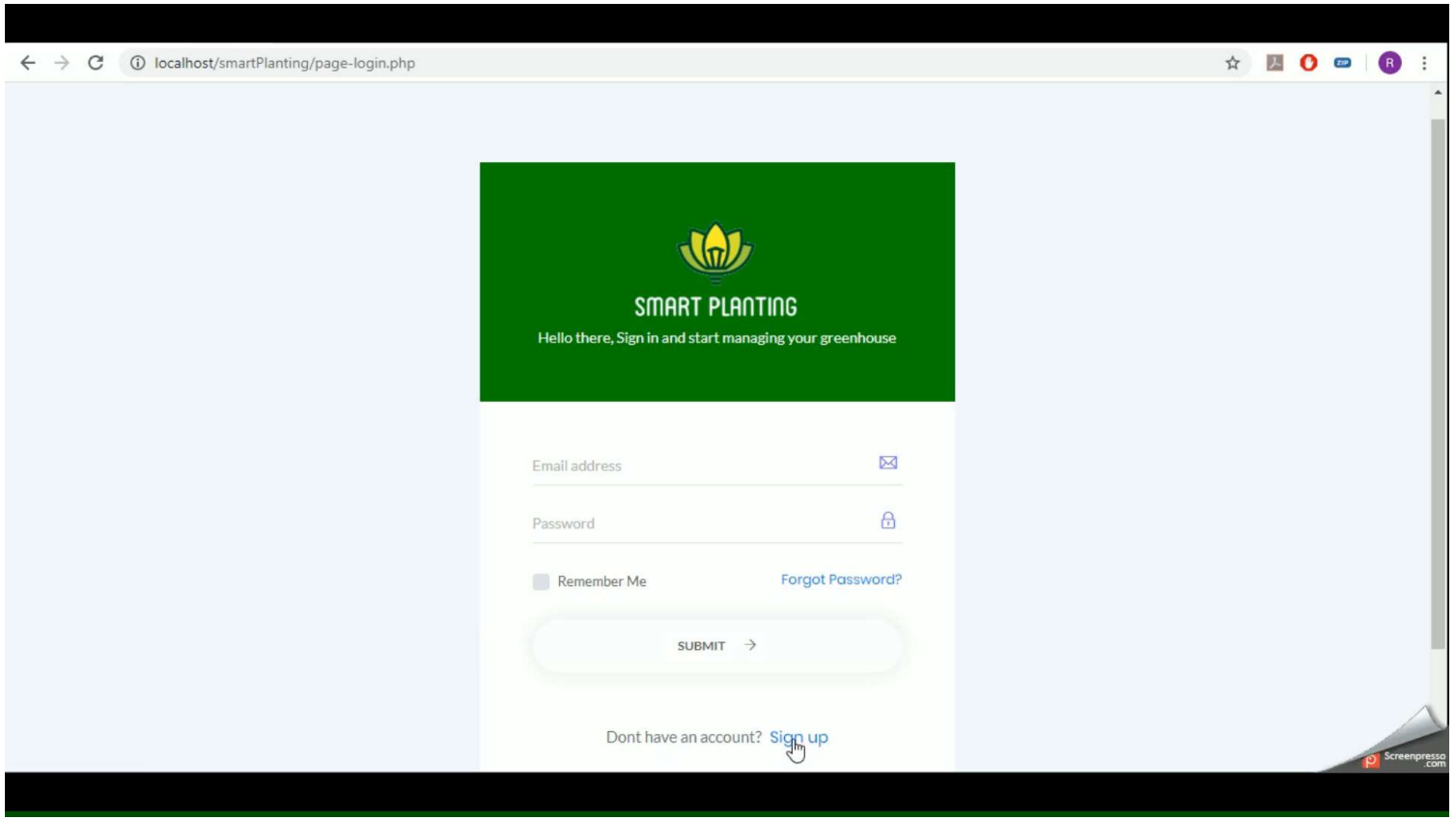
Feature extraction

- Feature extraction is done by the usage of HOG to extract features from the image frame.

System Approach (4/4) - Classification

- Classification is done by OC-SVM. The OC-SVM function returns 1 if there is any fruits/vegetables appeared while it returns -1 elsewhere. The model starts by detecting stages of the plants growth whether it’s seeding, flowering or harvesting stages. Also detect some diseases if they appeared on the fruit/vegetable to notify the user.

User Interface



Experimental results

- OC-SVM classifier reached 81.8% accuracy in the tomato's classification, 91.67% accuracy in Early Blight tomato's disease classification and 92.31% accuracy in Late Blight tomato's disease classification.
- Our plants in the greenhouse under the LED light effect has grown up and a small tomato appeared. On the other hand the plants in the balcony under the sunlight effect has no tomatoes appeared yet and the growth rate is slower.

Demo

Demo(1/4) – Plant growth across the previous weeks in the greenhouse

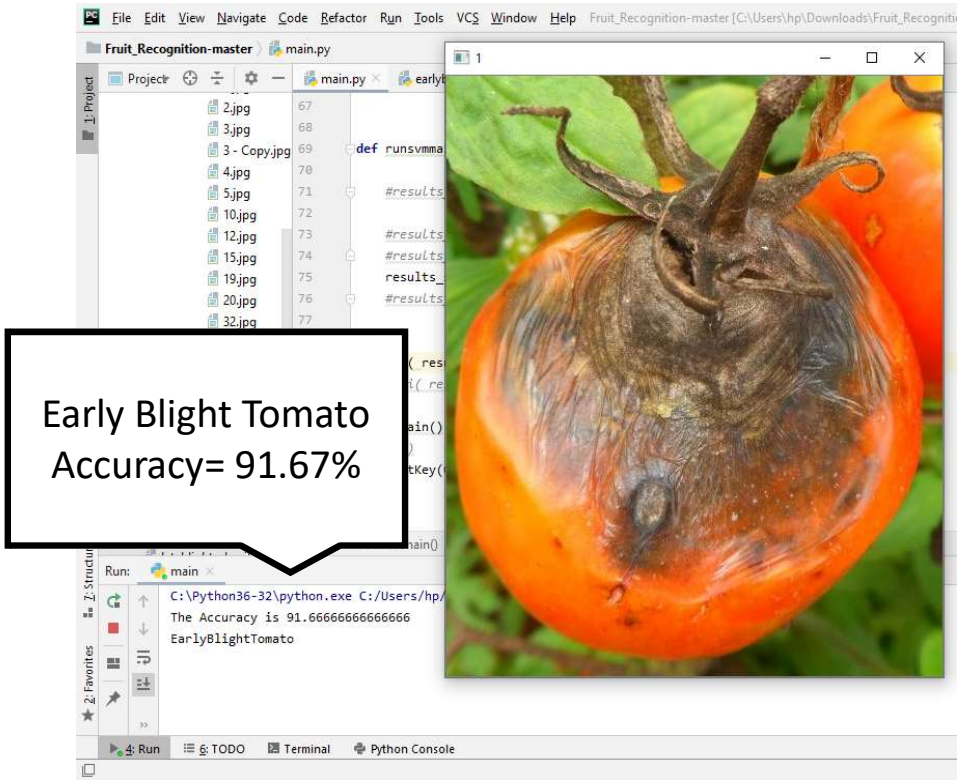
Demo(2/4) – Plant growth across the previous weeks in the balcony

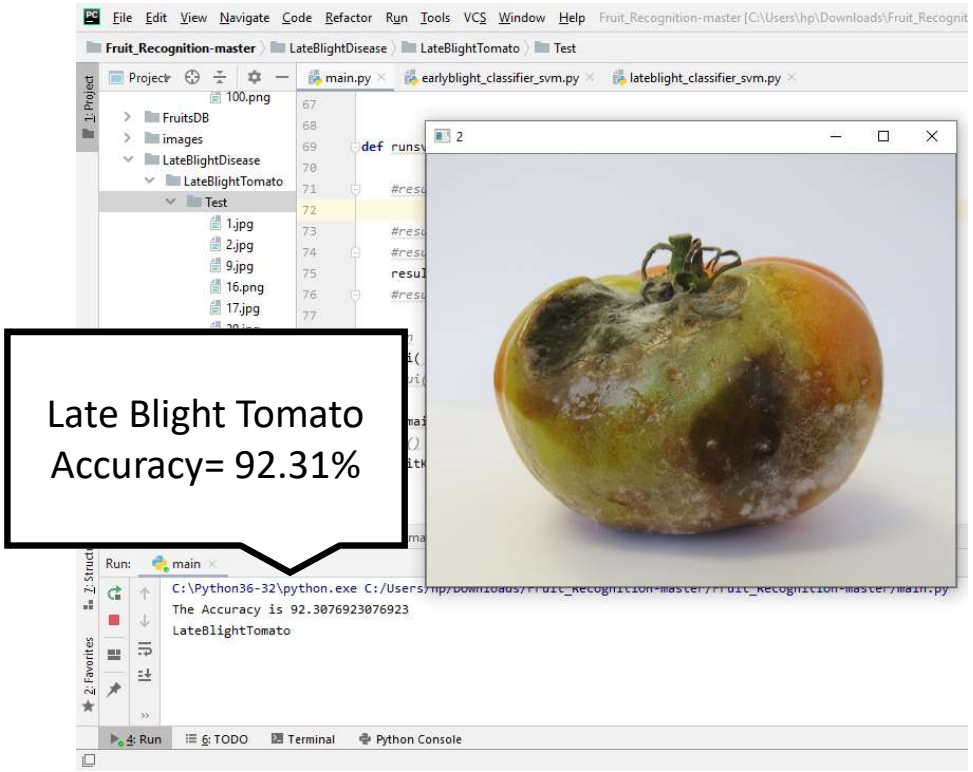
Week 1

Week 5

Demo(3/4) – LED lights with tomatoes

Demo(4/4) – Diseases Classification





Contribution paper status

- Our conference paper is accepted in "***2020 9th International Conference on Software and Information Engineering (ICSIE 2020)"*** organized in the British university in Egypt.

Notification of Acceptance of ICSIE 2020

April 14-16, 2020
The British University in Egypt, Cairo, Egypt
http://www.icsie.org/

Dear Randa Osama, Nour El-Huda Ashraf, Amina Yasser, Salma Abdelfatah, Noha El Masry and Ashraf Abdelraouf,

Paper ID: E042
Paper Title: *Control and Monitor the Plant Growth in the Greenhouse under the Effect of LED Lights*

Congratulations! The review processes for 2020 9th International Conference on Software and Information Engineering (ICSIE 2020) has been completed. Based on the recommendations of the reviewers and the Technical Program Committees, we are pleased to inform you that your paper identified above has been accepted for publication and oral presentation. You are cordially invited to present the paper orally at ICSIE 2020 to be held during **April 14-16, 2020** in **The British University in Egypt, Cairo, Egypt**.

ICSIE 2020

Any questions?

Thank you

Appendix(1/3)

Appendix(2/3)

Appendix(3/3)

- Why Tomatoes? [2]

Egypt is considered as one of the largest tomatoes' producers in the world; but unfortunately more than 50% of the tomatoes are being wasted. So the production of the tomatoes decrease.[1]

- Why LED lights? [3]

1. Small in size.
2. Produce light in the part of spectrum that drives photosynthesis without producing infra-red radiation.
3. Energy consumption.

References:

[2] El-Sherif, M. “Egypt", Food and Agriculture Organization of the United Nations, http://www.fao.org/3/v9978e/v9978e0e.htm#targetText=Tomatoes are grown in three,and late blight, and nematodes.

[3] Watson, Richard T., Marie-Claude Boudreau, and Marc W. van Iersel. "Simulation of greenhouse energy use: An application of energy informatics." Energy Informatics 1.1 (2018): 1.