SMART PLANTING

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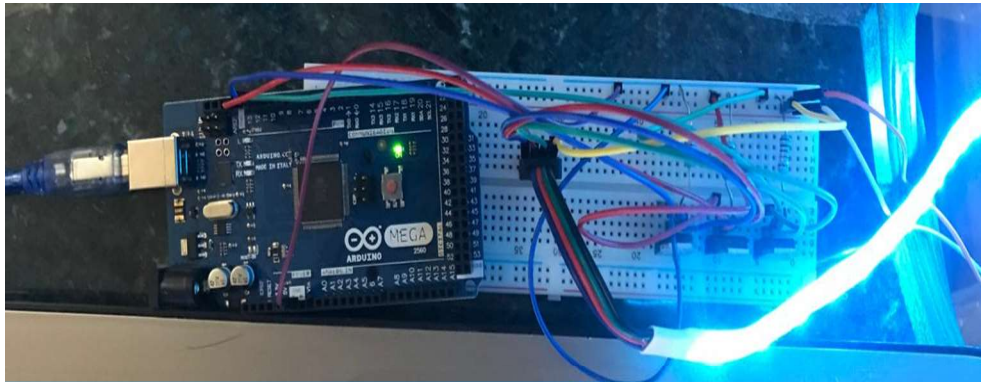
Introduction

Smart Planting system mainly monitor and control the plant under the effect of LED lights to increase the plants' growth rate. Our system also detect some certain diseases such as Early/Late Blight. Our system is associated with a website, for farmers and landowner to communicate with the system.



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.

Block diagram

Similar system - Remote Monitoring and Control System for Greenhouse Based on IoT

- They used a greenhouse model of size 120 × 60 cm.[1]
- They controlled the greenhouse using TFT LCD touch.
- They saved the data in the cloud.
- The experiment was operated on two types of flowers, strawberry and pepper.

References:

[1] Drakulić, Una, and Edin Mujčić. "Remote Monitoring and Control System for Greenhouse Based on IoT." International Symposium on Innovative and Interdisciplinary Applications of Advanced Technologies. Springer, Cham, 2019.

Functional requirements

Data Input	Admin	Landowner	Pre-processing	Feature extraction	Classification
• Read real time video frames • Save/Retrieve frames from database • Read data from sensors	• CRUD notification content, Landowner, sensor types plant types, user roles, LED colours, time intervals • Accept/Reject land requests. • Login • View growth statistics	• Signup • Login • View growth statistics • Add/delete land request • Update/view land • Receive notification	• RGB images to HSV • Compare the colour pixel percentage of the testing image with the threshold	• Extract feature from images (HOG)	• Run “one class SVM” Classifier • Detecting diseases • Turn on LED lights • Send notification

Non-Functional requirements

Security

⇩

Password encryption/ decryption

Reliability

⇩

Electric generators

Maintainability

⇩

MVC, SingleTon & Observer design patterns

Portability

⇩

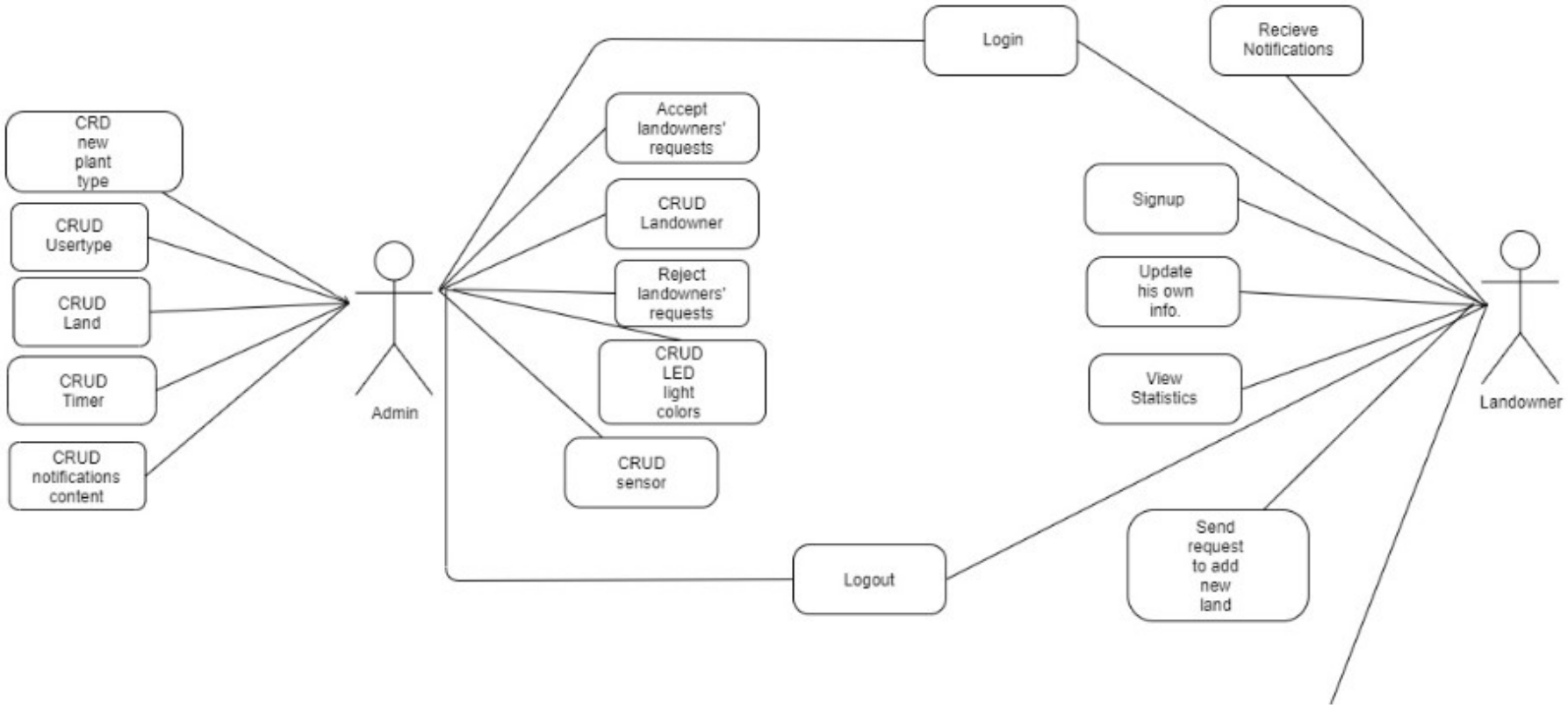
Different platforms

Usability

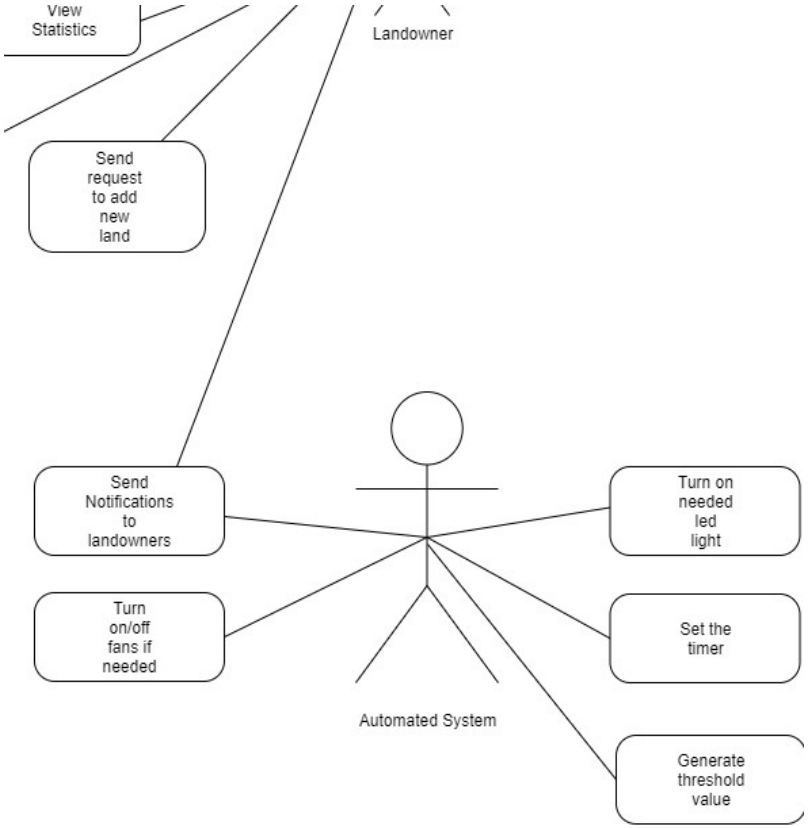
⇩

Interface is easy to be learned by the user

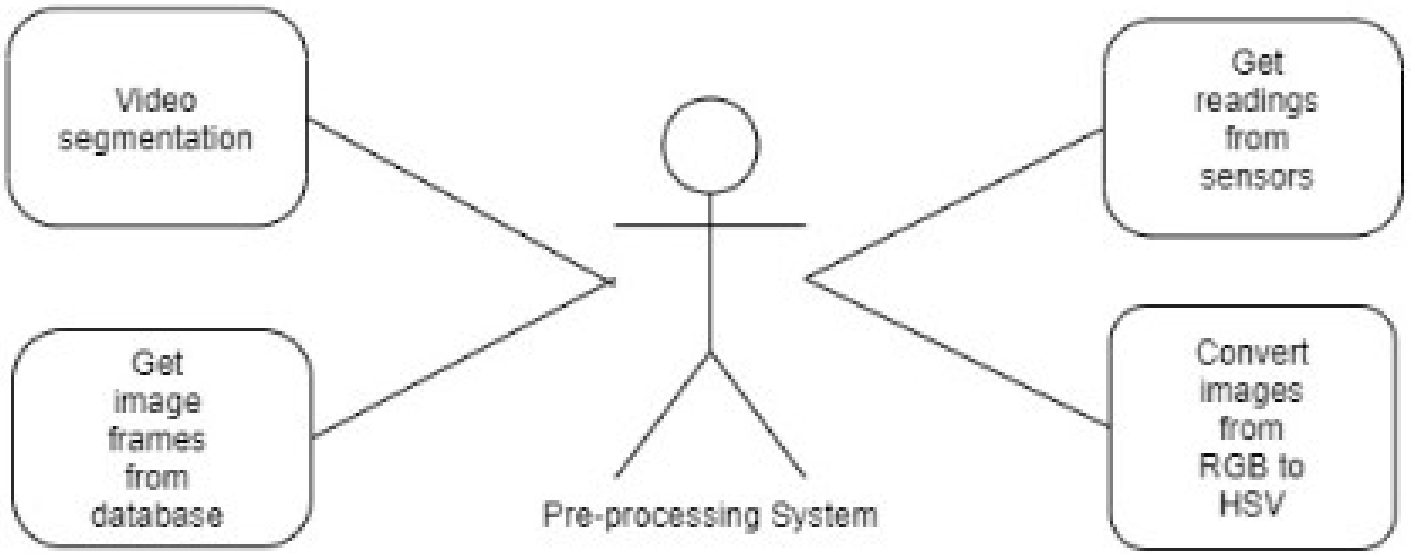
Use case(1/4)


CRD new plant type
CRUD Usertype
CRUD Land
CRUD Timer
CRUD notifications content
Admin
Login
Accept landowners' requests
CRUD Landowner
Reject landowners' requests
CRUD LED light colors
CRUD sensor
Logout
Recieve Notifications
Signup
Update his own info.
View Statistics
Send request to add new land
Landowner

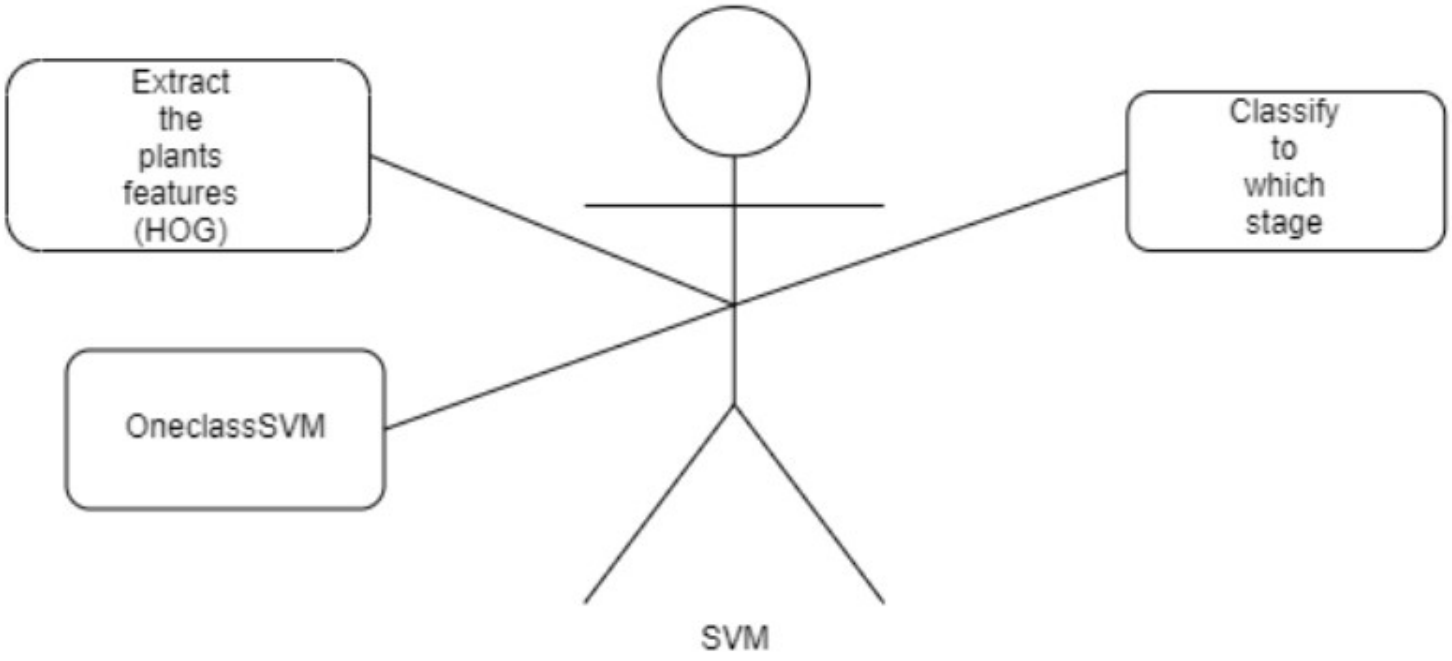
Use case(2/4)


View Statistics
Landowner
Send request to add new land
Send Notifications to landowners
Turn on needed led light
Turn on/off fans if needed
Set the timer
Automated System
Generate threshold value

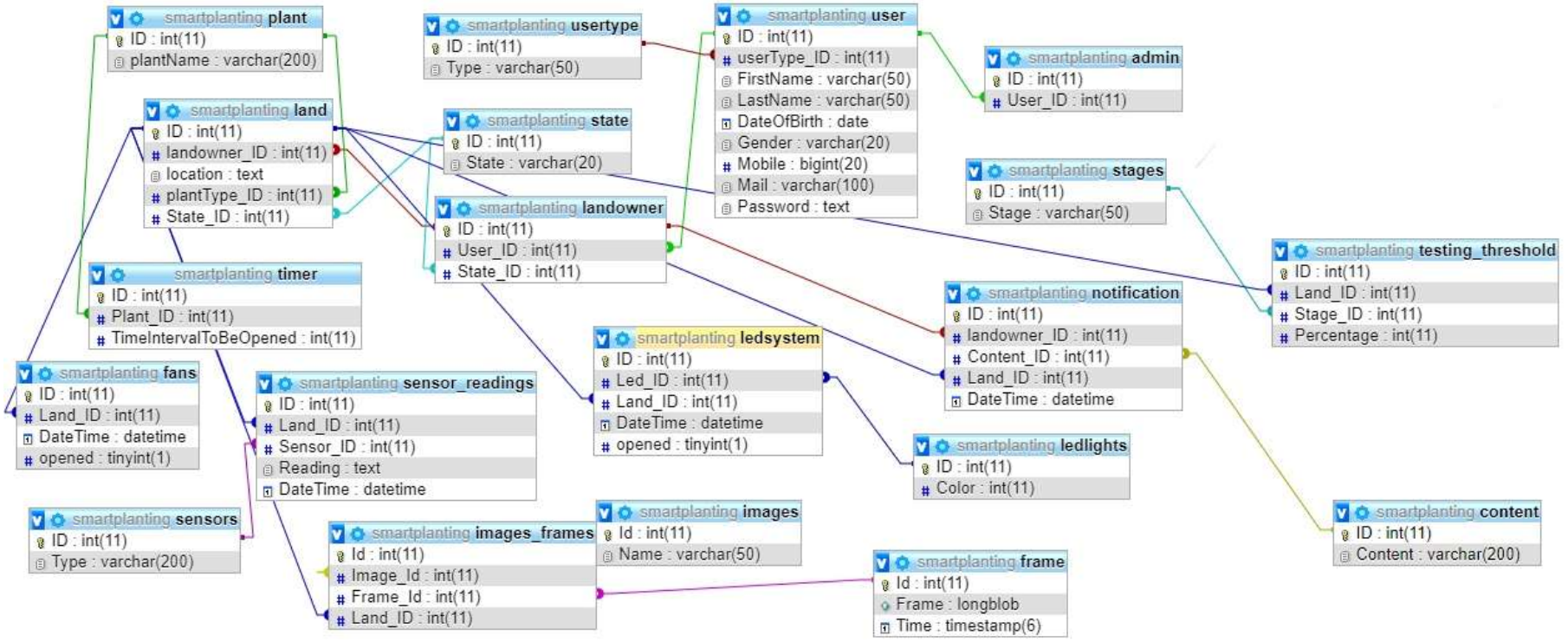
Use case(3/4)


Video segmentation
Get image frames from database
Pre-processing System
Get readings from sensors
Convert images from RGB to HSV

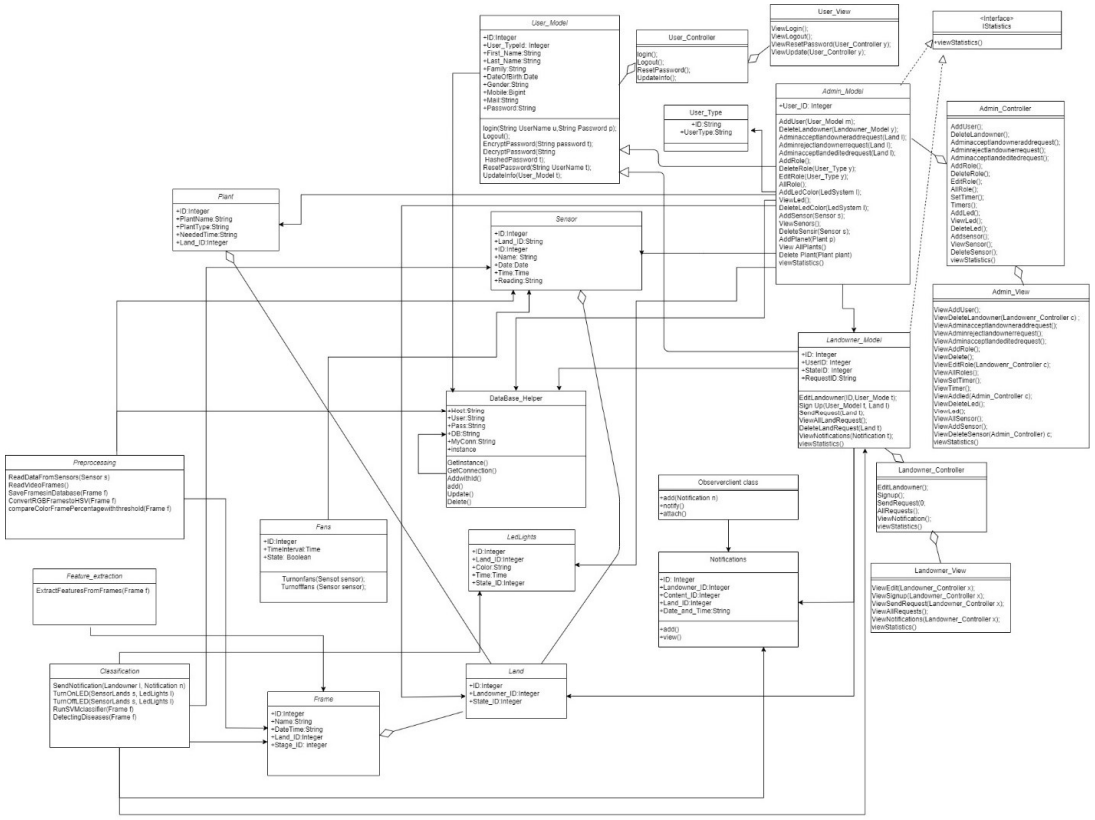
Use case(4/4)


Extract the plants features (HOG)
OneclassSVM
Classify to which stage
SVM

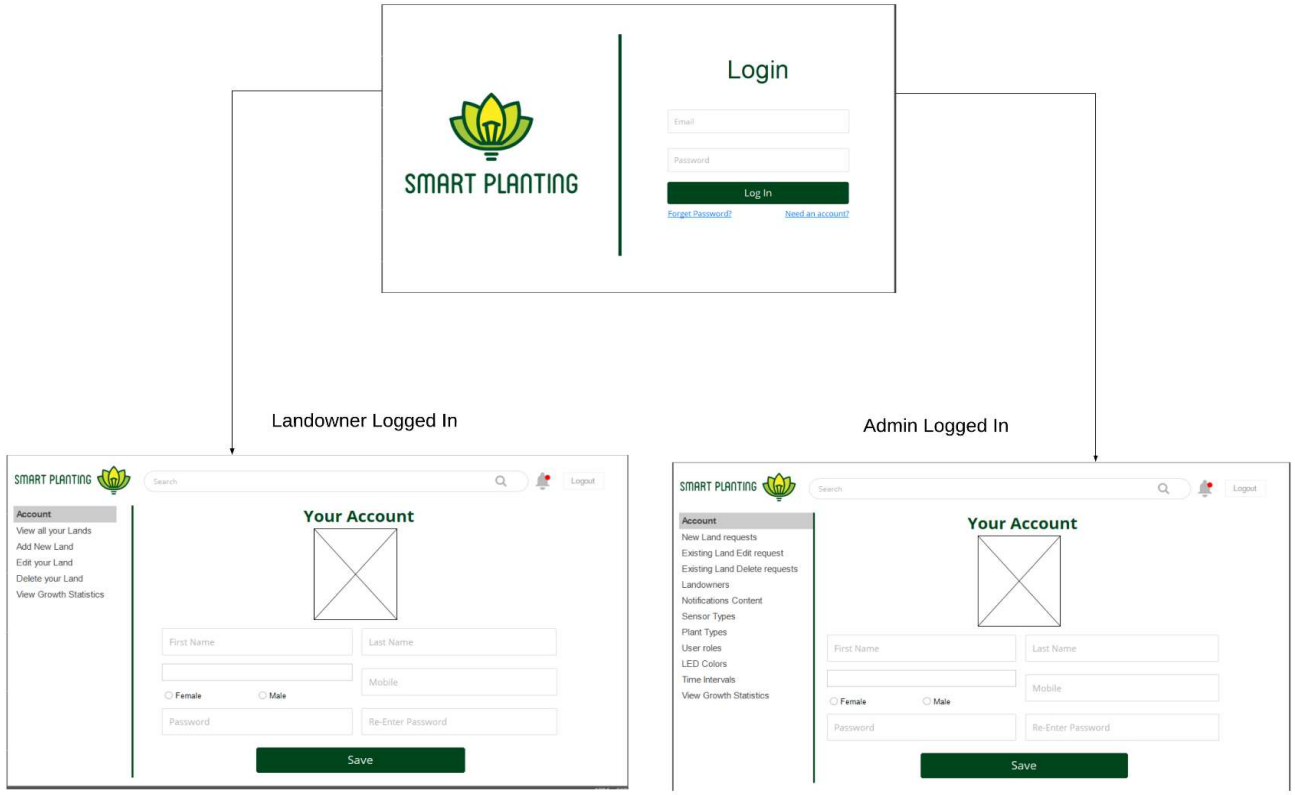
Database schema



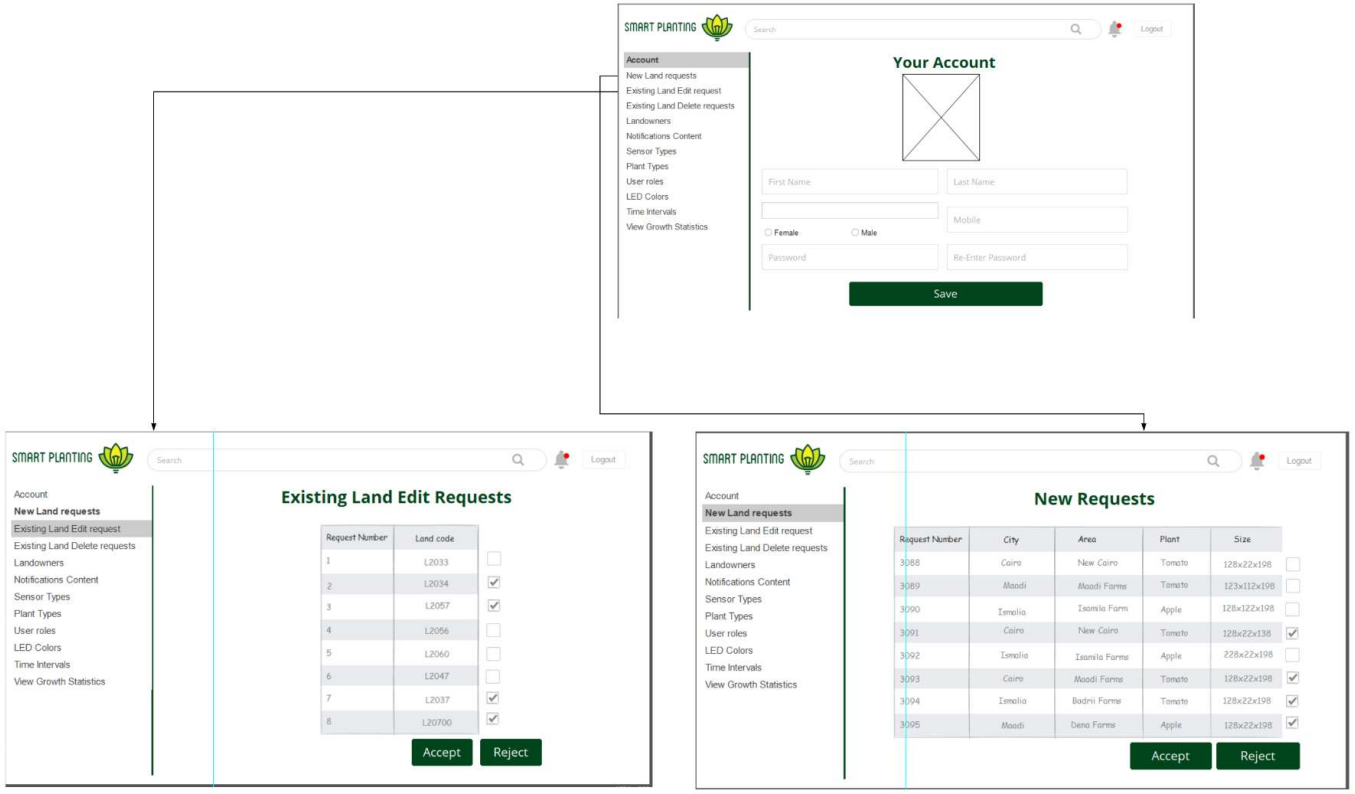
Class diagram



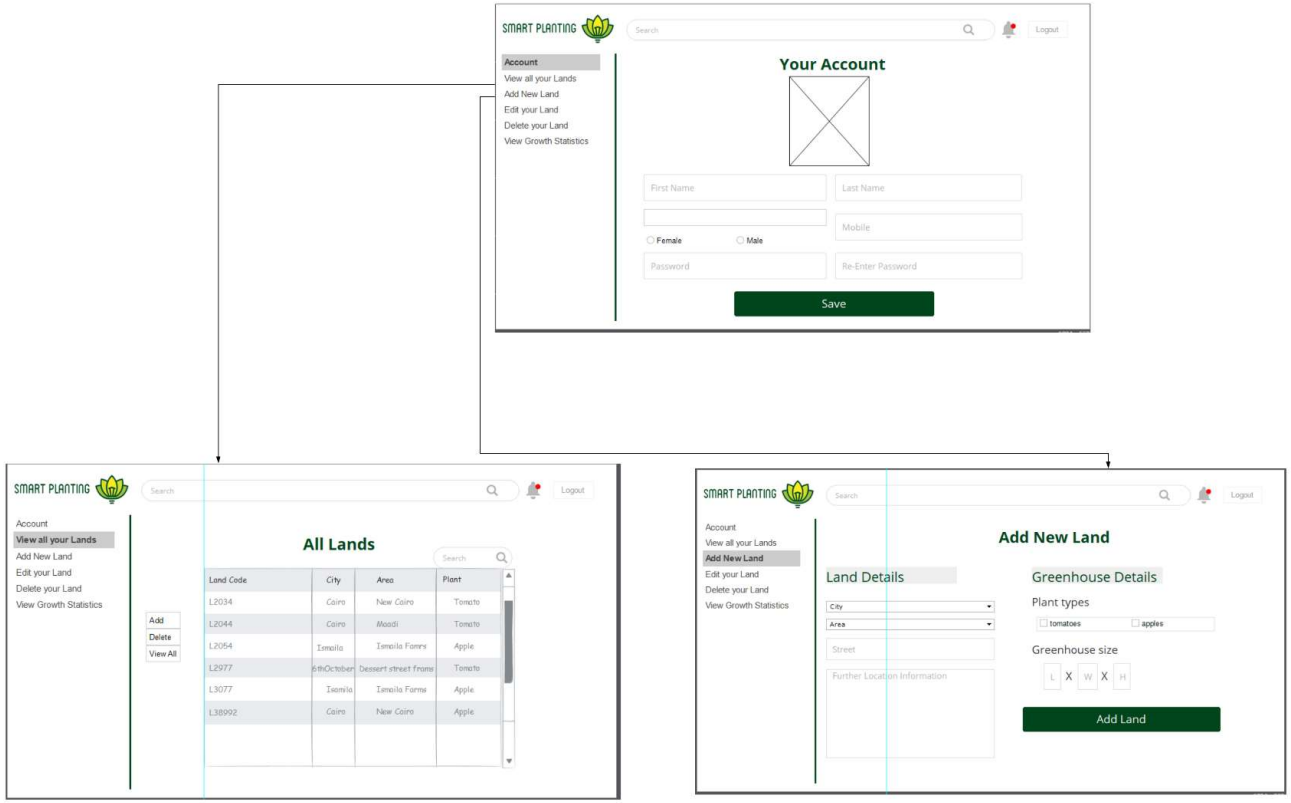
Wireframe(1/4)



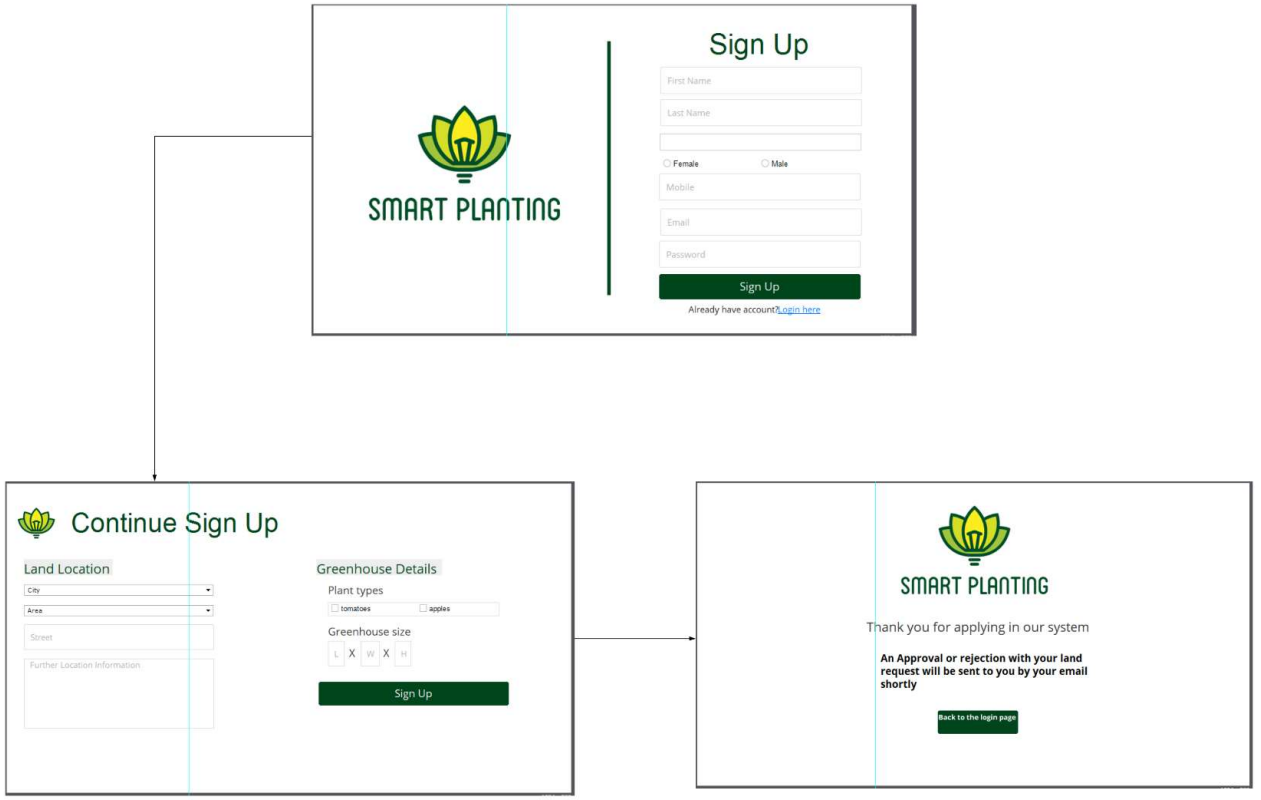
Wireframe(2/4)



Wireframe(3/4)

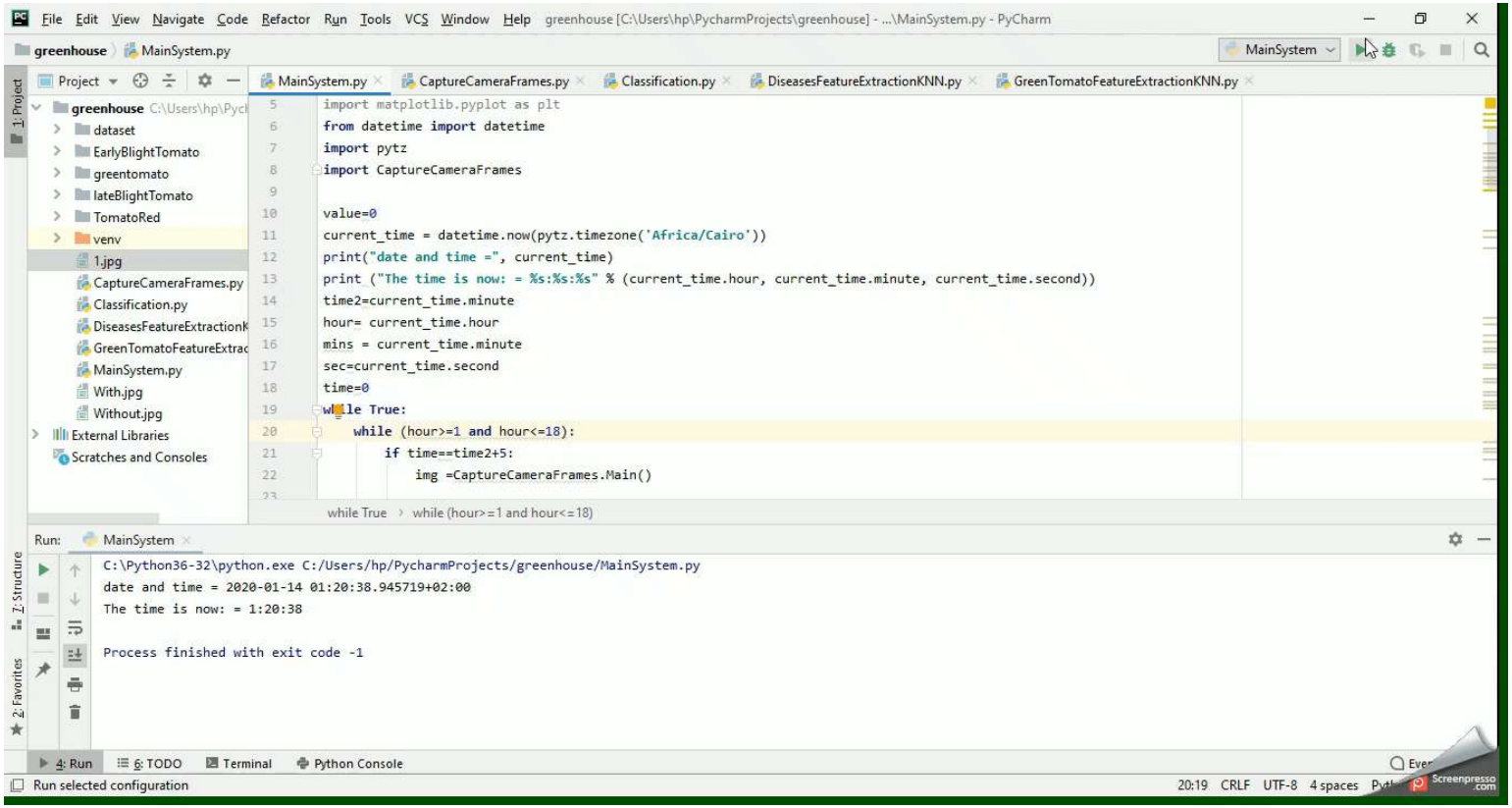


Wireframe(4/4)

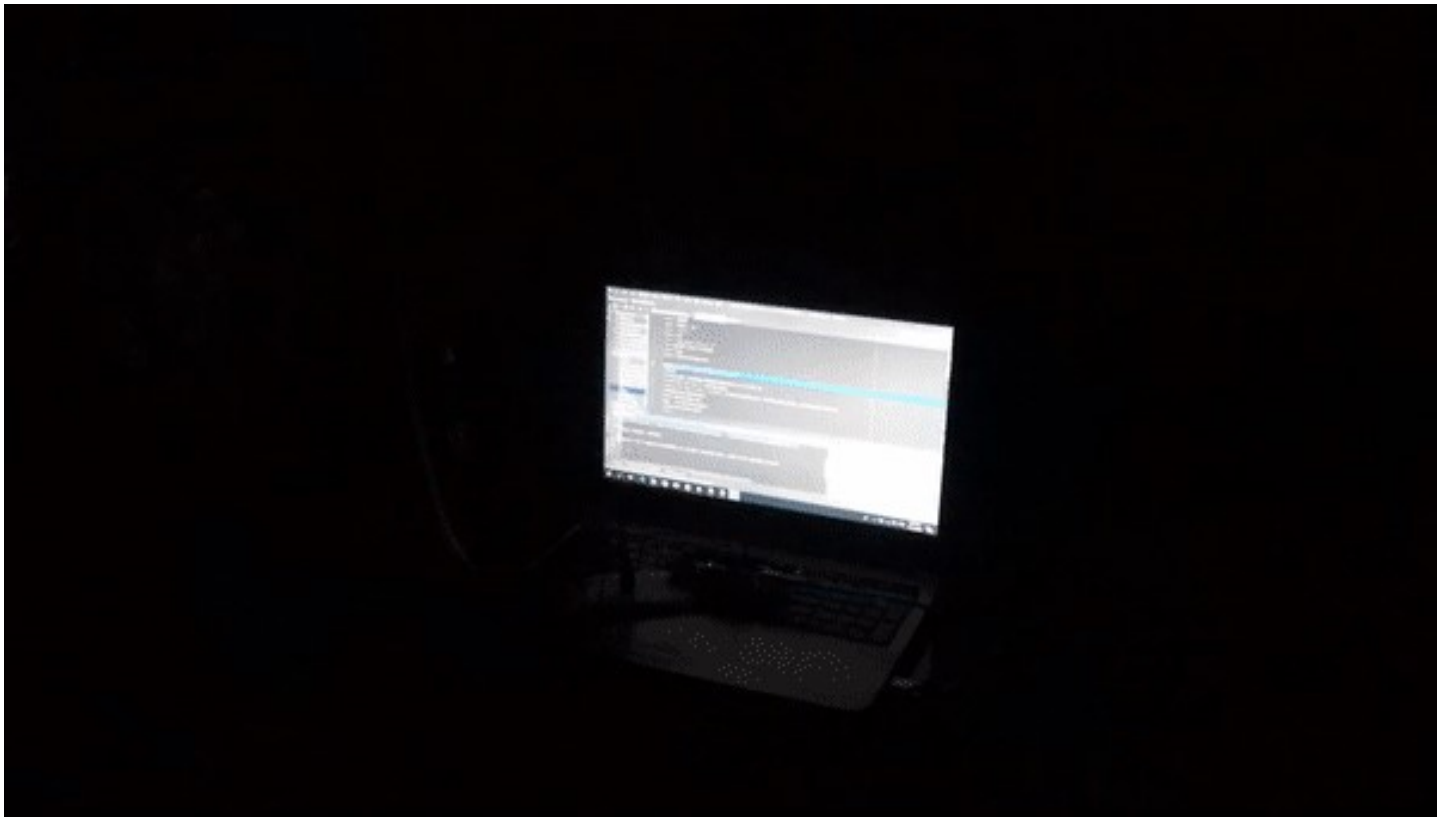


Demo

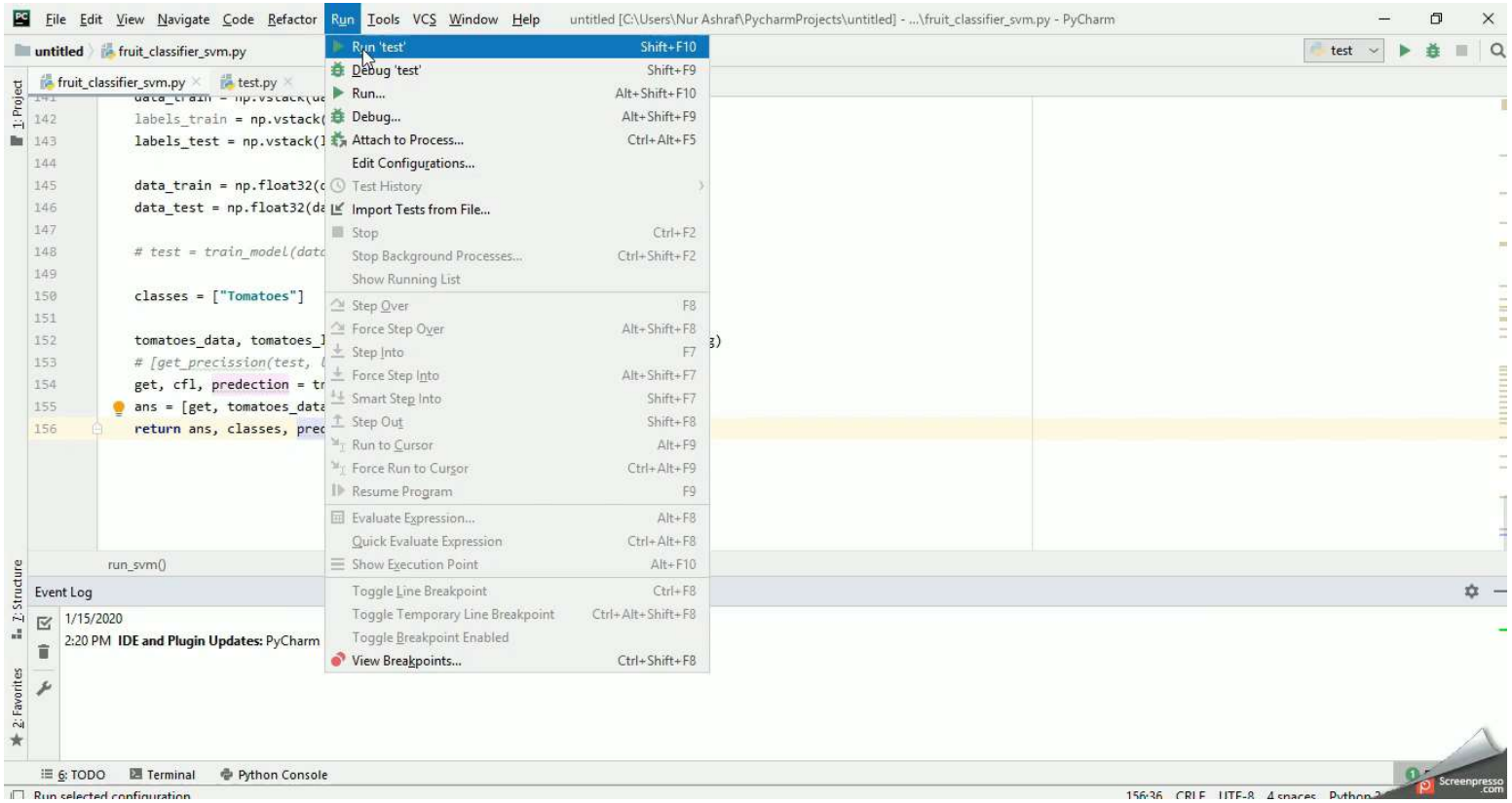
Demo(1/3) – Main system



Demo(2/3) – LED lights



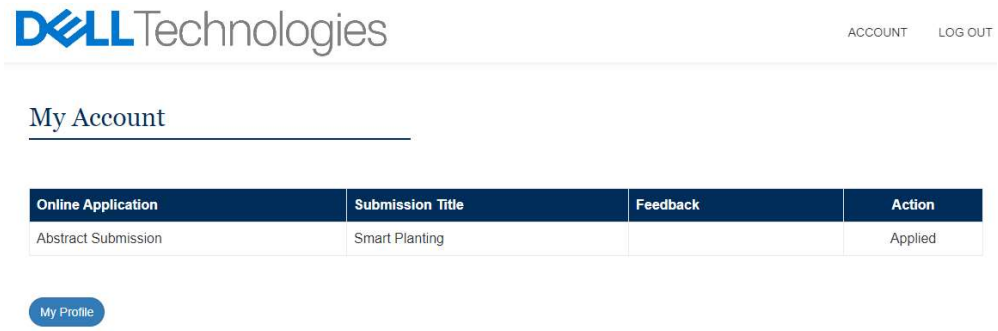
Demo(3/3) - Classification

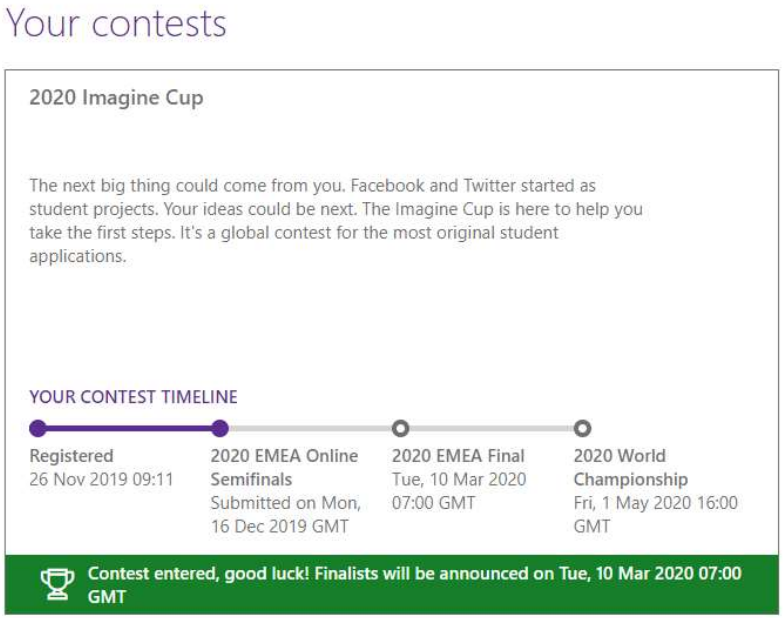


Our greenhouse

Competitions

1. Dell (Envision the future)
2. Imagine cup (Microsoft)
3. Youth science forum (WISWB)





Contribution paper status

Our conference paper is almost ready to be submitted it in "***The 11th International Conference on Information and Communication Systems (ICICS)"*** organized in Jordan.

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.