*Leaf Disk Analyzer*

project charter

Version *1.0*

*01/28/2019*

VERSION HISTORY

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Version #** | **Implemented**  **By** | **Revision**  **Date** | **Approved**  **By** | **Approval**  **Date** |
| 1.0 | *Kyle Sargent* | *1/28/2019* | *Dr. Razib Iqbal* | *TBD* |
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# Introduction

## Purpose of Project Charter

The Leaf Disk Pathogen Analyzer project charter documents and tracks the necessary information required by decision maker(s) to approve the project for funding. The project charter will include the needs, scope, justification, and resource commitment as well as the project’s sponsor(s) decision to proceed or not to proceed with the project.  It is created during the initiating phase of the project.

The intended audience of the Leaf Disk Pathogen Analyzer project charter is the project sponsor and senior leadership.

# project And Product Overview

The team of Emily Box, Colton Eddy, Erica Gitlin, Connor Jansen, Kyle Sargent, and Alex Wilson, hereafter referred to as Group 2, will be assisted and instructed by Dr. Razib Iqbal and working with Dr. Laszlo Kovacs from Missouri State University to work on and develop a specialized software. This software will be able to analyze pictures of grade leaf disks and return a ratio of how much of the leaf disk is infected with a specific pathogen. The project will be worked on from January 16th, 2019 to May 6th, 2019 and has no allocated budget or funds.

# Justification

## Business Need

A program, using image analysis, to quantify the amount of downy mildew (Plasmopara viticola) growing on grapevine plants will assist in the ability to determine which genes in the plant will lead to higher resistance against the pathogen. If the gene leading to this resistance can be determined, this can lessen the loss in the wine production business that is caused by this mildew. This will also lessen the amount of harmful chemicals businesses need to use to get rid of this mildew, which cuts out the cost of these chemical while also causing less damage to the environment.

## Public Health and Business Impact

This system will collect numerical information based on the photos provided to quantify the amount of downy mild present of various types of grapevine plants. This will facilitate in the research for the cause of higher resistance in some plants over others

# Scope

## Objectives

To help with reducing the loss of grape production by creating software that will analyze images of grapevine leaves and quantify the amount of mildew growing on them. This will help in determining how resistant the plant is to this pathogen.

The objectives of the Leaf Disk Pathogen Analyzer are as follows:

* Determining the amount of mildew that is present.
* Detecting patterns in the growth of the mildew
* Tracking data of all given samples.

## High-Level Requirements

The following table presents the requirements that the project’s product, service or result must meet for the project objectives to be satisfied.

|  |  |
| --- | --- |
| **Req. #** | **I Requirement Description** |
| 1.Uploading files | The system must allow users to upload at least 8 files. |
| 2.Processing files | The software must be able to process all uploaded files simultaneously. |
| 3.Bacteria patterns | The system must detect if the bacteria is growing in clusters, spontaneously, along the veins, or along the edges of the leaf. |
| 4.Bacteria amount | The software must determine the total surface area of the leaf in which bacteria is present. |
| 5.Tracking data | The system must allow the user to transfer results of analysis to a spreadsheet. |

## Major Deliverables

The following table presents the major deliverables that the project’s product, service or result must meet for the project objectives to be satisfied.

|  |  |
| --- | --- |
| **Major Deliverable** | **I Deliverable Description** |
| Functional Application | An easy-to-use, GUI-Based software system that allows the user to upload files, process them, and receive accurate results. |
| Data storage | A spreadsheet where all data is to be recorded and can easily be transferred from the application. |
| User’s manual | Documentation on how to use and maintain the software. |

## Boundaries

Items that are out of scope would include image analysis in real-time, identifying other types of bacteria that may be growing on the leaves, Identifying bacteria on plants other than grapevine leaves.

# Duration

## Timeline

1/17

1/18

2/11

04/15

System Development

Completed

Working prototype

Requirements meeting

with Dr. Kovacs

Meeting with Dr. Iqbal

demo

## Executive Milestones

The table below lists the high-level Executive Milestones of the project and their estimated completion timeframe.

| **Executive Milestones** | **Estimated Completion Timeframe** |
| --- | --- |
| Meeting with Dr. Iqbal to discuss how to proceed with the assigned project. | Completed January 17, 2019. |
| Meeting with Dr. Kovacs, the client, to determine requirements and expectations for the Leaf Disk Pathogen Analyzer. | Completed January 18, 2019. |
| Develop prototype demo | We can expect to have a working prototype by mid-February, though it will likely have some bugs to be worked out and may or may not be feature complete. |
| System Development Completion | The Leaf Disk Pathogen Analyzer should be finished and ready to ship by mid-April. |

# Assumptions, Constraints And Risks

## Assumptions

This section identifies the statements believed to be true and from which a conclusion was drawn to define the goals of the project and the charter itself.

1. The first assumption that was made was that the project is at all possible. Given an input file, containing an image, we **assume** that known computer vision algorithms implemented through various libraries will be able to identify the pathogen from the plant. If the ratio of plant to pathogen is quantifiable then we can easily compare it to the total area of the leaf disk and produce a coverage statistic, thus meeting the goal of the project.
2. Another key assumption about this project is related to the performance of the software. The product owner demands great accuracy from this software. We **assume** that the images analyzed, will be relatively high quality. This assumption also leads to the face that our solution should be able to work on most image-file types and that the clarity/resolution of the image will be great enough to allow adequate analysis. If the quality of the image is too low then analysis may be incorrect. If the quality of the image is too high, which is much less likely, then it may take additional time to analyze.

## Constraints

This section identifies any limitation that must be taken into consideration prior to the initiation of the project.

1. There main two constraints on any project will be time and capital. This project will have almost no fiscal budget but it has a great amount of time allocated to completing it. Despite the large amount of time to put into the project it is not unlimited. This project **must** be completed by the 15th week of the second semester of the 2018-2019 school year, regardless of the progress made. There are many milestones, demos, and deliverables ahead but there is a final date.
2. Another constraint is that the software **must** be accurate enough to distinguish between plant and pathogen. In order to meet the goal of the project and get an accurate reading of what percentage of the leaf is covered by a pathogen, then both the area of pathogen and plant must be measured. To do this will require a great deal of fine tuning to reduce the number of false-positives/negatives. It is clear that quality performance will impact the design of the software from the very beginning.

## Risks

1. If the first assumption, that the project is possible given existing libraries, is not true then the team will need to make time in order to research/develop new algorithms or an alternative approach. This would impact the schedule and the performance of the software. This risk is unique based on the fact that once chosen, a particular architecture is unlikely to change but changing it has a huge cost. One way to mitigate this risk is to plan for intense research and design of the software before is implemented. The increased workload up front is offset by mitigating the risk of switching architectures. This is a huge risk, but it can be mitigated successfully.
2. If the second assumption, that the image to be analyzed has an appropriate resolution to allow analysis, fails then this will impact the project negatively in regards to staying on schedule. To mitigate this risk there is a need to account for both extremes of resolution quality in the software and the user should be notified when analysis may have been corrupted. If the file is too large performance is affected but if the image is too small, then the quality will be affected.

| **Risk** | **Mitigation** |
| --- | --- |
| Risk #1 | Plan the software design |
| Risk #2 | Disclose appropriate image size; tell the user when analysis may be inaccurate. |

# Project Organization

## Roles and Responsibilities

This section describes the key roles supporting the project.

| **Name & Organization** | **Project Role** | **Project Responsibilities** |
| --- | --- | --- |
| Dr. Razib Iqbal  Missouri State University | Group Instructor | This person(s) will be responsible for providing initial constraints to the project, for providing feedback on the project at different stages, and for providing needed assistance to the Developers. |
| Dr. Laszlo Kovacs  Missouri State University | Customer/Subject Contact | Person(s) who will be responsible for outlining all other requirements and constraints for the project, for coordination with the Developers, and for providing needed expertise on the subject matter when it falls outside the Developers knowledge. |
| Kyle Sargent | Repository Officer | Person who is and has been responsible for consolidating and setting up files related to the project, including but not limited to a file repository, the charter outline, list of requirements and restraints, etc. |
| Alex Wilson | External Communication Manager | A Developer responsible for maintaining and initiating contact with the Customer and any other individuals outside of the project team, and for relaying any communication from them back. |
| Connor Jansen | Project Manager | Developer responsible for assigning roles to other developers, delegating tasks, and ensuring internal communication within the project team. |
| Emily Box, Colton Eddy, Erica Gitlin, Connor Jansen, Kyle Sargent, and Alex Wilson | Developer | Person(s) responsible for developing, innovating, and designing the many different aspects of the software. |

## Stakeholders (Internal and External)

The stakeholder(s) for this project include Dr. Laszlo Kovac, Group 2, and Dr. Razib Iqbal.

## Stakeholder communication

## Each group will have different means of communication. All stakeholders, as a group, will communicate through face-to-face meetings and Missouri State email; this will include Dr. Kovacs and Dr. Iqbal. We plan to communicate with all stakeholders once a week to update everyone on progress, important upcoming dates, and deliverables/demos. For internal team communication, which will happen daily, the developers will primarily use Discord, a third-party messaging app. Discord will serve as a record of group communication, and as a backup for files/documentation. This will provide relevant information through email to all stakeholders, additionally all documentation can be found at the first URL found in the reference section.

# project Charter approval

The undersigned acknowledge they have reviewed the project charter and authorize and fund the Leaf Disk Analyzer project. Changes to this project charter will be coordinated with and approved by the undersigned or their designated representatives.

|  |  |  |  |
| --- | --- | --- | --- |
| Signature: |  | Date: |  |
| Print Name: |  |  |  |
| Title: |  |  |  |
| Role: |  |  |  |

|  |  |  |  |
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| Signature: |  | Date: |  |
| Print Name: |  |  |  |
| Title: |  |  |  |
| Role: |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Signature: |  | Date: |  |
| Print Name: |  |  |  |
| Title: |  |  |  |
| Role: |  |  |  |

APPENDIX A: REFERENCES

The following table summarizes the documents referenced in this document.

|  |  |  |
| --- | --- | --- |
| **Document Name and Version** | **Description** | **Location** |
| *diskAnalyzer.py*  *v1.0* | This is the main python program that will do analyzation of the disk photos, produce the output and report found data into an Excel Spreadsheet. | This can be found:  [Here](https://github.com/KySarge23/LeafDiskAnalyzer/blob/master/code/diskAnalyzer.py)  https://github.com/KySarge23/LeafDiskAnalyzer/blob/master/code/diskAnalyzer.py |
| *Project\_Charter\_LeafDiskAnalyzer.docx* | This is the group’s project charter which explains the purpose, roles, concerns, risks, constraints, milestones, and more. | This can be found at:  [Here](https://github.com/KySarge23/LeafDiskAnalyzer/blob/master/documents/Project_Charter_LeafDiskAnalyzer.docx)  https://github.com/KySarge23/LeafDiskAnalyzer/blob/master/documents/Project\_Charter\_LeafDiskAnalyzer.docx |

APPENDIX B: KEY TERMS

The following table provides definitions for terms relevant to this document.

|  |  |
| --- | --- |
| **Term** | **Definition** |
| *OCV/OpenCV* | OpenCV or OCV which is the Python Library we are using regarding all Image Processing processes that we will be using. |
| *Python* | Python is the programming language in which the software will be written in. |
| *GUI* | GUI stands for Graphical User Interface and will be the main way the user interacts with the program. This will be how the user what/when to analyze. |
| *Image Analysis* | Image Analysis is the technique in which an image is analyzed, or looked at, in order to produce a specific result. |
| *Downy Mildew (Plasmopara viticola)* | Downy Mildew (Plasmopara viticola) is the mildew that grows and destroys the leaf disks rendering them useless for grade production. This is what will be analyzed and quantified by the software. |