

**The A Team**

**Image Processing Tool for**

**Leidenfrost-Ratchet Systems**

**Design Document for Version 2.0 (First Draft)**

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Table of Contents

1. Introduction 2
   1. Purpose of Design Document 2
   2. Project Scope and Objectives 2
   3. Document Organization 2
   4. Audience 2
2. Design Overview 3
   1. Approach 3
   2. Optimization Goals 3
   3. Design Patterns 3
      1. Image Processing Form 3
      2. Image Droplet Class 3
      3. Output Class 3
3. User Interface Diagram 3,Appendix A
4. Topology Diagram 4
5. UML Diagram 4
   1. Sequence Diagram 4, Appendix B
   2. UML Class Diagram 4, Appendix C
   3. Use Case Diagram 5
6. Glossary 6
7. References 6

**1. Introduction/Overview**

The design document details the project design for the design phase of the development process.

1.1 Purpose of Design Document

The design document will brain storm the user interface, UML diagrams, and Topology.

1.2 Project Scope and Objectives

The scope comprises what we intend to implement and nothing more. The software's current capacity is to efficiently track a drop of liquid and record measurements through images gathered from a high speed camera as it falls from an injection needle and travels along a ratchet surface. We intend to add to this according to the following sections.

1.3 Document Organization

This document is organized into the following sections:

|  |  |
| --- | --- |
| Introduction | Provides information related to this document |
| Design Overview | Describe the approach, optimization goals, and design patterns |
| Topology | Describe the various components and the integration between them. |
| UML Diagram | Describe the overall design of sequence, class, and use case diagram |
| Glossary | Explain the definition and terminology |
| Reference | List all of the material used in this document |

1.4 Audience

The intended audience of this document is the development team, and testers.

**2. Design Overview**

The design overview describes the process of the design phase.

2.1 Approach

This document is created after the initial design of the User Interface. The document diagram is used in multiple documents.

2.2 Optimization Goals

The requirement of this Leiden-frost software tool is to be user friendly. The A-Team brainstorms a creative but friendly user interface. The tool is supposed to be fast. So we will be implementing multi-threading to optimize the speed of the tool. Also the user interface will have a tool tip to guide the user to use the tool.

2.3 Design Patterns

2.4.1 Image Processing Form

This class controls the user interface.

2.4.2 Droplet Image

This class holds the object of the image. This class will work on all the algorithms and fine-tune the image to send to the output class.

2.4.3 Output

This class will export the data into excel files.

**3. User Interface Diagram**

The user interface is friendly and simple that has a tool tip to guide the user. The purpose of the user interface is to aid the user. See Appendix A.

**4. Topology Diagram**

The purpose of this diagram is to show the integration between various components required to use this Image Processing tool.

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Figure 1. Topology Diagram between various component.

**5. UML Diagram**

The overall of UML diagram is to help the development team brainstorm what is need before implement in code.

5.1 Sequence Diagram

The purpose of this diagram is to describe the sequence and action from the user and the purpose of the Image Processing Tool. Sequence diagram is the interaction between the user and the user interface. See Appendix B.

5.2 Class Diagram

The class diagram is the initial outline of what will be inside the implementation of the software and the relation between the classes. See Appendix C.

5.3 Use Case Diagram

The use case diagram is to tell a story between the user and the software interface. The user will load the data, input the frame rate, input the width of the Image, Run the data, and fine-tune the location of the needle if needed. Then the output will show the real time measurements in an excel sheet.

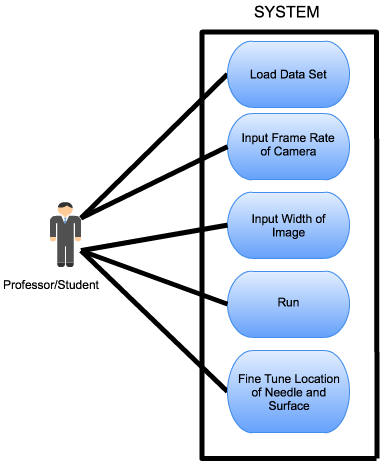


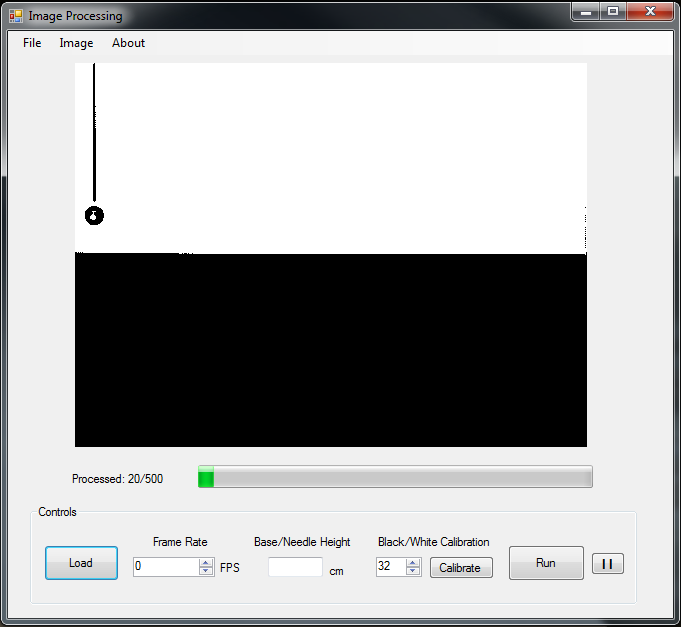
Figure 2. Use Case Diagram of the Image Processing Project

**6. Glossary**

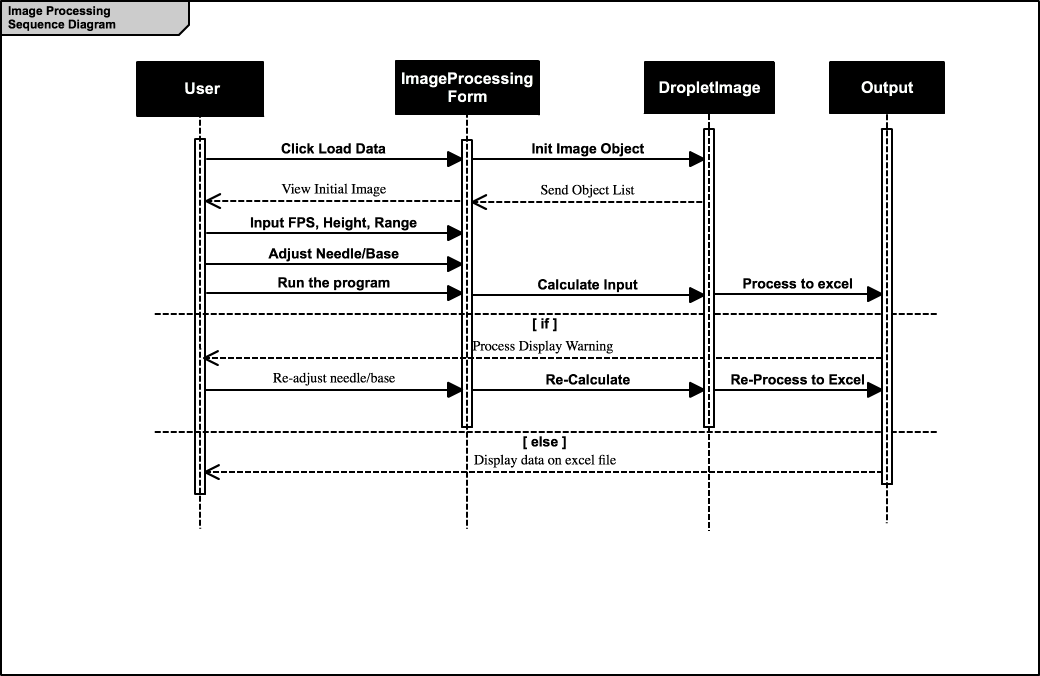
|  |  |
| --- | --- |
| **Term** | **Definition** |
| **Leidenfrost-Ratchet System** | A system involving a ratchet surface heated to a fluid's Leidenfrost point will allow a droplet of that fluid to spontaneous accelerate along that surface, even if it means traveling up slope. |
| **UML** | Unified Model Language |
| **Droplet** | A very small drop of a liquid. |

**7. References**

This document was completed with the guidance from the Online Screening Tool Tech Design Document, Design Powerpoints written by Catherine Stringfellow a professor at Midwestern State University, and the presentation of Julia John and James Miller of UML Diagrams for the Software Engineering class at Midwestern State University.

Appendix A

Appendix B



Appendix C

