# Requirements Document Revision 0
# Liquid Rescaling

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Table 1: Terminology

| Terminology | Meaning |
|---|---|
| Content-Aware Image Resizing | A method of resizing images that avoids the distortion of the main features in the image. |
| Seam Carving/Liquid Rescaling | Interchangeable names used to refer to the algorithm that performs content-aware image resizing. |
| GIMP | GNU Image Manipulation Program. An open source photoshop-like image editing application. |
| Visual Studio | An integrated development environment (IDE) developed by Microsoft. Used extensively for building computer programs for Windows operating systems, web applications, mobile applications, etc. |
| Git | A version control software that provides an easy way to manage versions of the project. |
| Library | An external software module that contains code that can be accessed via an API to accomplish a desired task. |
| API | Application Programming Interface. Documentation that describes the set of instructions that can be used to communicate with a library. |

# 1   Project Drivers

The purpose of Liquid Rescaling is to allow the user to perform content aware image resizing on an image of choice. Many people make use of photo editing everyday. However the main stakeholders of this project will be teenages and young adults since they are more invested in all of the social media platforms of today. This program shall be usable by people of all ages. Another stakeholder in the project are existing photo editing companies like GIMP. This program will only function on Windows operating systems since it will be developed using Visual Studios which only runs on machines running microsoft's operating system. Throughout the documentation of this project the name liquid rescale and rescaling algorithm will be used. These two names are synonyms for the algorithm used in this project.

# 2    Scope

The advancements in imaging and video technology, brought about an era where people strived to find more effective and efficient solutions to rescale images. Today people consume an enormous amount of information, the consumption of videos and images are the most rapidly growing. Image editing algorithms such as a Liquid Rescaling algorithm are now more important than ever before due to the consumption of images and videos via social media platforms (like Facebook, Twitter, Instagram and Snapchat). Because social media platforms are such an intricate part of all our daily lives it is very important for people to be able to manipulate images to their liking. This is why tools such as the GIMP Liquid Rescaling plug-in play a major role in all our lives. The users range from children to older adults and as such creating a liquid rescaling application with an effective user interface is very important.

The scope of the project is to use the open sourced library to make an application that removes or preserves aspects of an image. The program should also be able to use content aware scaling to enlarge or shrink an image. The program will have an attractive and efficient user interface that is more intuitive than the GIMP implementation of this software.

# 3    Project Issues

## 3.1    Potential Problems

**Compilation Error**

- The program may have unexpected errors in the code caused by incorrect syntax.

**C++ Libraries**

- The library is a free wiki library therefore there might error within the source code.

- The C++ library being used has an API that group members are unfamiliar with.

**Potential Problems With The Project Environment**

- Visual studio is a complicated IDE which could cause issues if it is used incorrectly.

- Group members lack experience using Git through Visual Studio, which may cause problems when pushing and pulling from the project repository.

**Time Constraints**

- The project uses a library to function, it has yet to be implemented in the project's source code. This code has the potential to be much longer than anticipated.

## 3.2 Off-the-shelf solutions

This project is based on existing open source projects so there are many other solutions that exist, like the Liquid Rescale GIMP plugin.

## 3.3 User documentation

This project does not require extensive user documentation. A document with a simple tutorial of how to use the user interface (i.e. an explanation of what the buttons do) is sufficient.

## 3.4 Waiting Room

For this project performance requirements are in the waiting room. The priority of this project is not performance. The priority of this project is to create an effective user interface for the program. The team does not have the knowledge or experience with C++ to significantly improve the performance of the program. Such as launch time, response time and image processing time.

# 4 Proof Of Concept

It is reasonable to create an application that performs a liquid rescaling algorithm in the next two months. Although the liquid rescaling is a complicated algorithm that requires difficult math and complicated logic, a C++ library exists on Wikidot [1][1] which will be used in the application. This library is available for free download online for all operating systems. The only potential issue that this library brings is that it is a C++ library - a language that the team is not familiar with. Fortunately, C++ is similar to other languages that the team members have used. This application will only be usable on Windows operating systems, since the team has decided to use Visual Studio (2017) IDE to develop a Windows Desktop Application. As for testing, multiple tests can be run to ensure image quality and its general ability to rescale images properly. The current plan is to attempt to successfully rescale images as well as to accomplish the removal and preservation of objects within images. The team will be more conservative with the scope of the project if time becomes a significant constraining factor during the development process. In other words, if needed we will make the scope of the project to encompass only the scaling of images. Overall, the seam carving algorithm is complicated and novel idea but with the use of the Wikidot library it is feasible to create an application using it with the next two months.

# 5 Functional Requirements

## 5.1 Input

- The program must be capable of loading JPEG and PNG images.

- The program must be capable of loading an image from any location within the operating system.

- The program must be capable of loading an image of any size and quality.

- The editing of an image will not overwrite the input file unless the user requests to overwrite said file when saving.

- The program will prompt the saving of an image if an image is being edited when the user tries to load an image.

- The program will automatically scale an image proportionally to fit the window.

- Size when the image is loaded (will not perform content-aware resizing for this).

## 5.2 Output

- The program must be able to save images in JPEG and PNG format.

- The program must be able to save images with a file name given by the user.

- The program must be able to save images to a location given by the user (within operating system constraints).

- The program must be able to overwrite an image when requested by the user.

- The program must save an exact copy of the image shown within the editor when the user requests the image to be saved.

## 5.3 Functionality

- The program must only enable editing tools if an image is loaded.

- The program must display the image in the editing pane when an image is loaded.

- The program must be capable of performing content-aware image resizing on the image being edited.

- The program must be able to automatically resize an image to the dimensions given by a user.

- * The program must allow the user to remove elements of the image being edited.

- * The program must allow the user to preserve elements of the image being edited.

- * The program will contain a feature that selects objects by edge detection.

* - if time permits.

# 6  Non Functional Requirements

## 6.1  Appearance requirements

- The main program window will consist of a static editing and controls panel.

- The program will have a quit button in the top right of the main window.

## 6.2  Usability requirements

- The program is designed to be used by English speakers only.

- The program will be designed to be used by people aged thirteen years or older.

- All functionality of the program will be located in one area of the window to simplify use.

## 6.3  Safety requirements

- The program must not misbehave in a way that may trigger an epileptic episode.

- The program will not delete any files on the system unless explicitly instructed to by the user.

## 6.4  Privacy requirements

- The program must not store user data in any way possible, other than when loading and saving images to the users hard drive.

## 6.5  Performance requirements

- The program shall be operational within ten seconds of launch.

- The program user interface shall respond quickly.

- The program should be able to scale photos reasonably fast.

### 6.6   Installability requirements

- The program shall be operational without any installation.

### 6.7   Portability requirements

- The program shall be able to function as a standalone executable application.

- The program must be operational on all Windows desktop operating systems of version 7 or higher.

### 6.8   Learning Requirements

- The program must be intuitive so that a user can interpret all uses of the controls from the user interface.

# 7   Health and Safety

The application may cause eyestrain of the user if used for a prolonged period of time. Users with epilepsy must be aware if the screen begins to flicker that it may trigger an epileptic episode. Finally users must be aware that if they give a file name the same name as an existing file it will be over ridden.

# 8   Assumptions

It is assumed that the user is experienced with the basic uses of a desktop computer (mouse movement, mouse selection, keyboard use, etc)

# 9   References

## References

[1] Carlo Baldassi. Liquid rescale library.