Design Document Revision 0
Liquid Rescaling

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1 Revision History

Table 1: Revision History

Date	Revision
November 10, 2017	Revision 0

2 Introduction and Overview

The goal of this project is to implement a seam carving algorithm to perform content aware scaling on images. The program will intelligently scale an image in order to prevent the deformation of important features. The following documentation will be a MIS representation of the existing code for this project. The MIS will be following the design principles of information hiding and encapsulation.

2.1 Document Structure

- Section 3 - Anticipated and Unlikely Changes
- Section 4 - Requirements and Design Relationship
- Section 5 - Module Hierarchy and Secrets
- Section 6 - Traceability Matrix between Modules and Requirements
- Section 7 - Module Interface Specification
- Section 8 - Uses Hierarchy
- Section 9 - Gantt Chart

3 Anticipated and Unlikely Changes

3.1 Anticipated changes

1. Changing technologies from Windows C++ CLI/.NET to Linux GTK+/GTKmm.
2. Changing integrated development environments from Visual Studio Community 2017 to Visual Studio Code.
3. Using Glade to build user interfaces instead of Visual Studio.

3.2 Unlikely changes

1. General UI design/layout.
2. LiquidRescaling module functionality.
3. Usage of the liblqr library.
4. Usage of the C++ programming language.

4 Requirements and Design Relationship

4.1 Software Decision Module

The MainForm module contains generic image loading and saving handlers that can be used in other applications to provide image handling capabilities. The LiquidRescale module contains generic functions that provide a simple interface to the liblqr library. These functions can be implemented seamlessly into another project, assuming the library is available to use.

4.2 Connection Between Requirements and Design

The following design decisions were made in order to satisfy the requirements of the project:

- When loading a file using the MainForm module, the image loading handler needed to take extra steps to assert that the file chosen by the user was a file accepted by the requirements (a PNG or JPEG file).
- When saving a file using the MainForm module, the image saving handler needed to take extra steps to assert that the file name defined by the user matches the accepted types defined by the requirements (a PNG or JPEG file). If the file name did not satisfy this requirement, a default extension (.PNG) would be added to the file name.

5 Module Hierarchy

Table 2: The Hierarchy of Modules

Level 1	Level 2
LiquidResale.cpp	
MainForm.cpp	MainForm.h

Table 3: One module one secret

Module	Secret
MainForm	User Interface functions and Event Handlers
LiquidRescale	Algorithm used for image processing

6 Traceable Matrices

6.1 Requirements Matrices

M1 $\rightarrow MainForm$
$M2 \rightarrow LiquidRescale$

Table 4: Traceability matrix between modules and requirements

Function Requirements	Module
FR1	M1
FR2	M1
FR3	M1, M2

Non-Function Requirements	Module
NF1	M1
NF2	M1
NF3	M1
NF4	M1
NF5	M1, M2
NF6	M1, M2
NF7	M1, M2
NF8	M1

Please see Requirements document for corresponding requirement.

6.2 Anticipated Changes Matrices

Table 5: Traceability matrix between modules and anticipated changes

Anticipated Change	Module
AC1	M1, M2
AC2	M1, M2
AC3	M1

7 Module Interface Specification

7.1 MIS for MainForm.cpp

Module

MainForm

Uses

MainForm.h
System
System Drawing
System Windows Forms

Syntax

Exported Types

N/A

Exported Access Programs

N/A

Semantics

State Variables

N/A

Environment Variables

Screen: Display Output Device
Mouse: Input Device
Keyboard: Input Device

7.2 MIS for LiquidRescale.cpp

Module

LiquidRescale

Uses

LiquidRescale.h
lqr.h
System
System Drawing
System Windows Forms

Syntax

Exported Types

N/A

Exported Access Programs

Table 6: Exported Access Programs in LiquidRescale.cpp

Routine name	In	Out	Exceptions
LiquidRescaleImag	Bitmapˆ, int, int	Bitmapˆ	
bitmapFromCarver	LqrCarver*	Bitmapˆ	
bufferFromBitmap	Bitmapˆ	guchar*	

Semantics

State Variables

N/A

Environment Variables

Screen: Display Output Device
Mouse: Input Device
Keyboard: Input Device

Access Routine Semantics

Bitmap ˆ liquidRescaleImage(Bitmap ˆ bitmap, int newWidth, int newHeight)

- output: out:= newBitmap

- exception: out:= N/A

Bitmap ^ bitmapFromCarver(LqrCarver * carver)

- output: out:= newBitmap
- exception: out:= N/A

guchar * bufferFromBitmap(Bitmap ^ bitmap)

- output: out:= buffer
- exception: out:= N/A

7.3 MIS for MainForm.h

Uses

LiquidRescale.h
System
System ComponentModel
System Collections
System Data
System Diagnostics
System Drawing
System IO
System Windows Forms

Syntax

Exported Types

N/A

Exported Access Programs

Table 7: Exported Access Programs in MainForm.h

Routine name	In	Out	Exceptions
btnLoadFile_Click	System Object^, System EventArgs^		
btnSaveFile_Click	System Object^, System EventArgs^		
MainForm_Resize	System Object^, System EventArgs^		
pbMainImage_Paint	System Object^, System EventArgs^		

Semantics

State Variables

N/A

Environment Variables

Screen: Display Output Device
Mouse: Input Device
Keyboard: Input Device

Access Routine Semantics

N/A

8 Uses Hierarchy

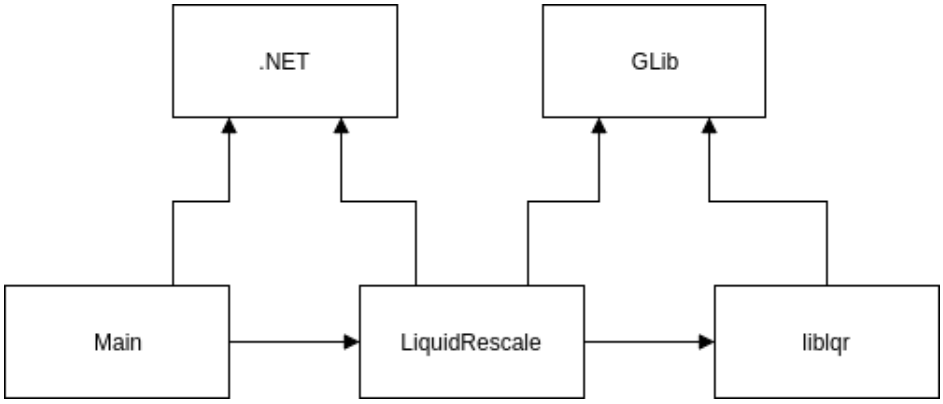

Figure 1: Uses Hierarchy

9 Gantt Chart

The updated Gantt Chart can be found in the git repository. See File **Liquid Rescaling Development Schedule - Version 3.pdf**