Software Requirements Specification

for

Image Stenography with

AES Encryption

Version 9.0.0

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Legendary Lichens

September 22, 2017

Table of Contents

[Table of Contents i](#_Toc501104923)

[Revision History ii](#_Toc501104924)

[1. Introduction 1](#_Toc501104925)

[1.1 Purpose 1](#_Toc501104926)

[1.2 References 1](#_Toc501104927)

[2. Overall Description 1](#_Toc501104928)

[2.1 User Classes and Characteristics 1](#_Toc501104929)

[2.2 Operating Environment 1](#_Toc501104930)

[2.3 Design and Implementation Constraints 1](#_Toc501104931)

[2.4 Assumptions and Dependencies 2](#_Toc501104932)

[3. External Interface Requirements 2](#_Toc501104933)

[3.1 User Interfaces 2](#_Toc501104934)

[3.2 Hardware Interfaces 2](#_Toc501104935)

[3.3 Software Interfaces 2](#_Toc501104936)

[3.4 Communications Interfaces 3](#_Toc501104937)

[4. System Use Cases 3](#_Toc501104938)

[4.1D UC-01 Data Flow Diagram 3](#_Toc501104939)

[4.2D UC-02 Data Flow Diagram 4](#_Toc501104940)

[4.1 UC-01 - Encode with or without Encryption 4](#_Toc501104941)

[4.2 UC-02 - Decode with or without Encryption 6](#_Toc501104942)

[4.3 UC-03 – Advanced Options 6](#_Toc501104943)

[4.4 UC-04 - Help Page 7](#_Toc501104944)

[4.5 UC-05 – Generate Fractal 8](#_Toc501104945)

[4.6 UC-06 – About Page 9](#_Toc501104946)

[4.7 UC-07 – Navigation Bar/Menu System 9](#_Toc501104947)

[4.8 UC-08 – Generate Stock Image from Stock Image Page 11](#_Toc501104948)

[4.9 UC-09 – Generate Gradient Image 12](#_Toc501104949)

[5. Other Nonfunctional Requirements 12](#_Toc501104950)

[5.1 Performance Requirements 12](#_Toc501104951)

[5.2 Safety Requirements 13](#_Toc501104952)

[5.3 Security Requirements 13](#_Toc501104953)

[5.4 Software Quality Attributes 13](#_Toc501104954)

[6. Other Requirements 13](#_Toc501104955)

[7. System Requirements Chart 13](#_Toc501104956)

Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Date** | **Reason For Changes** | **Version** |
| Chris Hoegger  Leilani Ray  Nathan Beyer  Chris Menning | September 22, 2017 | Create initial document | 1.0.0 |
| Nathan Beyer | October 17, 2017 | Updated project descriptions in Cover Page and Headers to “AES Encryption”, instead of “3 Way Encryption”  Update the Performance Requirements section to reflect that the software only supports Latin ASCII characters, and that our software can encode JPEG images, but cannot decode them, and the encoded image must be saved in another format | 2.0.0 |
| Nathan Beyer | October 22, 2017 | Expanded Purpose Section  Updated User Interfaces Section  Updated Software Interfaces Section | 2.0.1 |
| Nathan Beyer | October 23, 2017 | Added 3 Use Cases (U1 – U3) to Section 4 | 2.0.2 |
| Nathan Beyer | October 25, 2017 | Added 7 Use Cases (U4 – U10) to Section 4 | 2.0.3 |
| Chris Hoegger | October 30, 2017 | Created Pull Request for Version | 3.0.0 |
| Chris Hoegger | November 2, 2017 | Completed and provided updates to the following sections   1. Introduction 2. Overall Description 3. External Interface Requirements 4. Use Cases 5. Other Non-Functional Requirements 6. System Requirements – prepared example/template for use in completing section   Highlighted sections are those that need to be completed.  Highlighted verbiage indicates questions. | 4.0.0 |
| Leilani Ray | November 6, 2017 | Updated some of Chris M’s comments, added some comments from Chris H updates.  Added the letter “D” to the two diagrams to identify them uniquely from the use cases.  Worked on continuity of use cases. | 4.0.2 |
| Leilani Ray | November 8, 2017 | Incorporated all comments from this week’s review, from all team members. | 5.0 |
| Chris Menning | November 13, 2017 | Updated phrasing in Purpose section to remove erroneous sequence of events.  Added to References section.  Updated Data Flow Diagrams.  Updated UC2, UC-05. | 6.0 |
| Leilani Ray | November 27, 2017 | Created Systems Requirement Chart for Section 7.0. |  |
| Chris Hoegger | November 30, 2017 | Provided the following updates to the following sections:   1. Update reference to include Lichen artwork 2. Use Cases – Updated existing 3. Inserted UC-08 4. Created UC-09 5. Included updated table   Reverted cover page date back to original date of document creation | 7.0 |
| Chris Hoegger | December 7, 2017 | Provided updates to the following sections:  3.3 Software interfaces to include “save file” dialog to text format option for message.   1. Use Cases – Updated existing | 8.0 |
| Chris Hoegger | December 14, 2017 | Provided updates to the following sections:   1. Flow Diagrams – Encoding and Decoding 2. Use Cases – Updated existing   5.3 Security Requirements update   * 1. Software Quality Attributes  1. System Requirements updates | 9.0 |

# Introduction

## Purpose

This developed software package enables users to hide messages written in plain text within bitmap images, and retrieve hidden messages from already-encoded images. The user’s message may be encoded with or without AES encryption.

## References

* [Nevon Projects: Image Steganography With 3 Way Encryption - Project idea and synopsis](http://nevonprojects.com/3-way-encryption-image-staganography/)
* [Code Project: Steganography: Simple Implementation in C#](https://www.codeproject.com/Tips/635715/Steganography-Simple-Implementation-in-Csharp)
* [Quick Crypto: Encryption information for emails and files; password handling and file shredding](http://quickcrypto.com/)
* [MSDN: Documentation of the built-in AES class for Visual Studio](https://msdn.microsoft.com/en-us/library/system.security.cryptography.aes(v=vs.110).aspx)
* [Stack Overflow: Generating AES 256 Bit Key Value](https://stackoverflow.com/questions/17195969/generating-aes-256-bit-key-value)
* [C# Helper: Draw a Mandelbrot set fractal in C#](http://csharphelper.com/blog/2014/07/draw-a-mandelbrot-set-fractal-in-c/)
* [Lichen Tree Credit: Mona May Mayer](http://www.monamay.ca/?paged=3)

# Overall Description

## User Classes and Characteristics

User(s) – Individual(s) utilizing the software to safeguard textual data through one or more available processes including encoding with optional encryption and decryption/decoding through authentication opportunities.

## Operating Environment

This software application will operate under the following systems and components:

* Windows Environment: Versions 7.0 - 10
* Thumb/USB, CD, DVD and SD drive device components

## Design and Implementation Constraints

The project team has identified the following constrains for design and implementation of this software:

* GitHub (chosen project repository and file/version management tool) learning curve
* Encryption/Decryption process understanding
* Image property and manipulation technique knowledge base

## Assumptions and Dependencies

In order to achieve the defined, team-designed, final product, it is the assumption that all team members either have a working Visual Studio application or have access as through a workstation at the College or via other means.

# External Interface Requirements

## User Interfaces

The main form includes a navigation bar at the top to assist the user in choosing functions. The availability of “About” and “Help pages along with Advanced Options (for power users) and alternative fractal, gradient and stock images will round out the application features, creating a robust, user friendly application.

Through the design of command buttons is where the majority of user interface resides. Depending upon the situation, auto-generated prompts and/or error messages informing the user of needed next steps will appear.

Users cannot open and encode an image when its size prevents it from storing a single character or when the image size itself exceeds the size allowed by the application. This halted process would prevent the user’s ability to encode any message within the image and they should choose an alternate course.

The form’s message box dynamically limits the size of the message the user can create based on the size of the user’s chosen image. This feature, accomplished by setting the maximum character limit of the textbox to the maximum number of characters that are available to be encoded, returns a count of remaining characters. This information will be available on the screen for user reference.

Once an image is selected and message submitted, a save file dialog box is presented and the user can save their encoded image to any directory, device or location of their choosing.

The user also has available to them an optional feature. In order to secure the document image further, they have the ability to use the AES Encryption process and file’s password protection element.

Once the image is secure, the user has the option to decode the file. The file is now ready for decryption, if necessary, and decoded so that the hidden message is displayed.

## Hardware Interfaces

There are no hardware interfaces at this time.

## Software Interfaces

The software utilizes the user’s operational system “open file” dialog box for both locating original images to be encoded, as well as the final decoded image. The window’s “save file” dialog box is triggered upon command once the image has been encoded so that the user can choose a location to place the file. Generation of both dialog windows are designed such that users can only open and save images of supported file types.

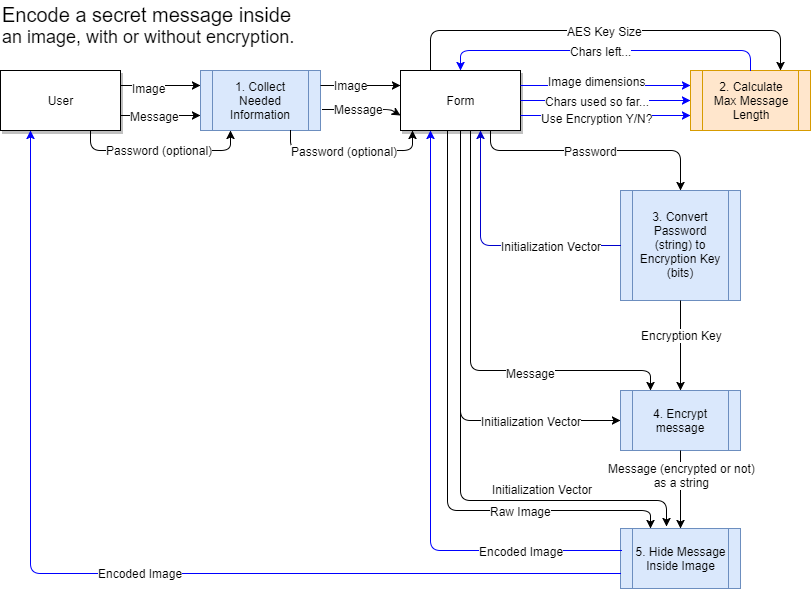
The user also has the ability to save the decoded text message to a text file, through the user’s system’s “save file” dialog box, again saving to their choice of supported media channels.

## Communications Interfaces

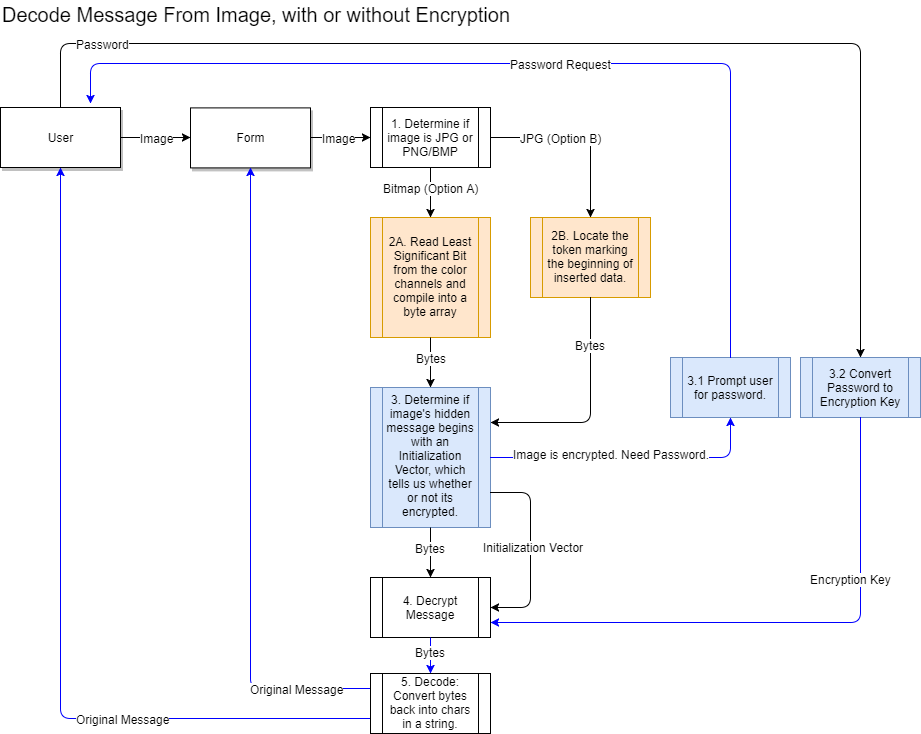
This application is a stand-alone product and therefore, no identified communication interface components.

# System Use Cases

## 4.1D UC-01 Data Flow Diagram



## 4.2D UC-02 Data Flow Diagram



## UC-01 - Encode with or without Encryption

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-01 | | | Priority | High | |  | |
| Use Case Name: | **Encode with or without Encryption** | | | | | | | |
| Type: | External | | X | Temporal |  |  | | |
| Created By: | Chris Hoegger | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | November 2, 2017 | | | | Date Last Updated: | | | December 12, 2017 |
| Actors: | | User | | | | | | |
| Description: | | The user encodes and saves a message into an image (with optional encryption and security features). | | | | | | |
| Trigger: | | User clicks Encode button from main form | | | | | | |
| Preconditions: | | 1. User has need for application and opens the exe file. | | | | | | |
| Post Conditions: | | 1. User has option to decrypt and decode | | | | | | |
| Normal Flow: | | 1. User chooses an image file they wish to encode 2. System opens user’s selected image file 3. User enters message into the appropriate textbox 4. System encodes message in selected image file 5. User selects where and how to save encoded image file 6. System saves encoded image file | | | | | | |
| Alternative Flows: | | 1. With Optional Fractal, Gradient or Stock Image   (in place of Step 1 in Normal Flow)   * 1. User chooses to create fractal, gradient or stock image by clicking associated command.   2. System generates fractal, gradient or stock image through system sub-process.   3. User continues at Step 3 in Normal Flow.  1. With Optional Encryption and Password Protection.   (before Step 3 in Normal Flow)   * 1. User chooses to encrypt file checking the “Use Encryption” checkbox at any point before clicking the “Hide Text in Image” button.   2. User enters a four character password to protect image file.   3. User continues at Step 3 in Normal Flow.  1. With Advanced Options selected    1. User chooses to utilize one of the Advanced User settings | | | | | | |
| Exceptions: | | 1. Image is corrupt/format error.    1. Exception handling generates message to user.    2. User chooses new image or quits application. 2. Image size is too small to contain message.    1. Exception handling generates message to user.    2. User chooses new image or quits application. 3. Message is too large for application.    1. Exception handling generates message to user.    2. User revises message or quits application. 4. Encryption fails    1. Exception handling generates message to user    2. User quits application 5. Password entered is not compliant with established rules or missing    1. Exception handling generates message to user    2. User enters new password 6. Selected directory or location for encoded image is not available per security measures.    1. User’s system generates exception handling message.    2. User options       1. changes location       2. permission levels are updated       3. File is saved | | | | | | |
| Includes: | | Encoding, Encryption, Password Protection, UC-03 | | | | | | |
| Frequency of Use: | | Frequent. As often as user wishes, but process is activated once per image when encode button is clicked. | | | | | | |
| Business Rules: | |  | | | | | | |
| Special Requirements: | |  | | | | | | |
| Assumptions: | |  | | | | | | |
| Notes and Issues: | |  | | | | | | |

## UC-02 - Decode with or without Encryption

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-02 | | | Priority | High | |  | |
| Use Case Name: | **Decode with or without Decryption** | | | | | | | |
| Type: | External | | X | Temporal |  |  | | |
| Created By: | Leilani Ray | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | November 1, 2017 | | | | Date Last Updated: | | | December 12, 2017 |
| Actors: | | User | | | | | | |
| Description: | | A user wishes to decode a file. | | | | | | |
| Trigger: | | User clicks a button to decode the file. | | | | | | |
| Preconditions: | | 1. The application is open. 2. User has access to an encoded file. | | | | | | |
| Post Conditions: | | 1. The file is now decoded and shows text. | | | | | | |
| Normal Flow: | | 1. User selects the “Retrieve Message from Image” button. 2. User opens an already-encoded image file. 3. User selects “Decode Text from Image” button. 4. The program retrieves a hidden message from the image. 5. The retrieved text is displayed in a textbox. | | | | | | |
| Alternative Flows: | | 1. The “Use Encryption” checkbox is checked.    1. User is prompted to enter a password.    2. User continues at Step 3 in Normal Flow. 2. The user chooses to save extracted text    1. User select “Save Text to File” command    2. System uses “Save file” dialog box for user to select location for save of new text file. 3. With Advanced Options selected    1. User chooses to utilize one of the Advanced User settings | | | | | | |
| Exceptions: | | If the password is incorrect or the wrong decryption algorithm is used, the message is simply not displayed correctly. | | | | | | |
| Includes: | | Decoding, Encryption, Password Protection, UC-03 | | | | | | |
| Frequency of Use: | | Frequent | | | | | | |
| Business Rules: | |  | | | | | | |
| Special Requirements: | |  | | | | | | |
| Assumptions: | | The user possesses an image bearing a hidden message. | | | | | | |
| Notes and Issues: | |  | | | | | | |

## UC-03 – Advanced Options

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-03 | | | Priority | Medium | |  | |
| Use Case Name: | **Advanced Options** | | | | | | | |
| Type: | External | | X | Temporal |  |  | | |
| Created By: | Chris Menning | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | October 29, 2017 | | | | Date Last Updated: | | | December 13, 2017 |
| Actors: | | User | | | | | | |
| Description: | | A power user wants to use Advanced Options for more control of the encryption process. | | | | | | |
| Trigger: | | The user selects “Advanced Options” from the menu system. | | | | | | |
| Preconditions: | | 1. The application is open. 2. “Use Encryption” is selected. | | | | | | |
| Post Conditions: | | 1. User supplies a password or passphrase of their choosing. The system then derives an AES key from the password/passphrase. 2. The system remembers the user’s selected preference the next time the program is run. | | | | | | |
| Normal Flow: | | 1. User selects “Advanced Options” from the menu. 2. Form presents the user with an option to select one of the following, for generating AES keys from a password:    1. Mode 1: 128 bits    2. Mode 2: 192 bits    3. Mode 3: 256 bits 3. Encryption and decryption will now utilize the selected key size. 4. By default “Remember Settings” is checked, and the user’s preference is saved to a file and automatically reloaded next time. 5. User may continue with UC-01 or UC-02. | | | | | | |
| Alternative Flows: | | 1. User chooses not to utilize Advanced Options menu.    1. AES key set to 128 bits by default. 2. If the user unchecks the “Remember Settings” checkbox, the encryption will default back to 128-bit encryption the next time the program is launched. | | | | | | |
| Exceptions: | | 1. User changes AES block size, then tries to decrypt something encrypted with a different AES key Size    1. System detects scrambled output.    2. Display message: “*Something not right? Try changing AES Block Size in Advanced Options.* | | | | | | |
| Includes: | | UC-01, UC-02, UC-07 | | | | | | |
| Frequency of Use: | | Occasional. Since this an optional choice for the user, its use is dependent upon on user preference. | | | | | | |
| Business Rules: | | AES Keys themselves must not be saved in any files. Only AES Key size preferences can be saved. | | | | | | |
| Special Requirements: | | The Mode set in the Advanced Options form will be dependent upon by the AESEncrypt and AESDecrypt classes. | | | | | | |
| Assumptions: | | The term “Advanced Options” conveys that these options are not features the average user needs to concern themselves with, but they’re present for power users who would like more control. | | | | | | |
| Notes and Issues: | |  | | | | | | |

## UC-04 - Help Page

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-04 | | | Priority | Medium | |  | |
| Use Case Name: | **Help Page** | | | | | | | |
| Type: | External | | X | Temporal |  |  | | |
| Created By: | Nathan Beyer | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | October 31, 2017 | | | | Date Last Updated: | | | December 12, 2017 |
| Actors: | | User | | | | | | |
| Description: | | User wishes to open and view the Help page | | | | | | |
| Trigger: | | User clicks a button on the main form to open the Help page | | | | | | |
| Preconditions: | | 1. The application is open | | | | | | |
| Post Conditions: | | 1. User has opened and viewed the Help page | | | | | | |
| Normal Flow: | | 1. User clicks the menu option on the main form to open the Help page 2. System displays the Help page 3. User closes Help page when finished viewing it by clicking the Close button | | | | | | |
| Alternative Flows: | |  | | | | | | |
| Exceptions: | |  | | | | | | |
| Includes: | | UC-07 | | | | | | |
| Frequency of Use: | | Occasional | | | | | | |
| Business Rules: | |  | | | | | | |
| Special Requirements: | | Can only be utilized by the familiar menu system interface | | | | | | |
| Assumptions: | |  | | | | | | |
| Notes and Issues: | |  | | | | | | |

## UC-05 – Generate Fractal

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-05 | | | Priority | High | |  | |
| Use Case Name: | **Generate Fractal** | | | | | | | |
| Type | External | | X | Temporal |  |  | | |
| Created By: | Nathan Beyer | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | November 2, 2017 | | | | Date Last Updated: | | | December 12, 2017 |
| Actors: | | User | | | | | | |
| Description: | | A user has a message that they want hidden in an image, but they don’t have an image they wish to use. This option allows them to generate a fractal for use in this application. | | | | | | |
| Trigger: | | User clicks the Generate Fractal option on the main form to generate the image. | | | | | | |
| Preconditions: | | 1. The application is open | | | | | | |
| Post Conditions: | | 1. A fractal image is saved with the message hidden inside. | | | | | | |
| Normal Flow: | | 1. User selects the Generate Fractal option from the main form to generate a fractal image. 2. The picture box displays the system created fractal. 3. User may continue with UC-01. | | | | | | |
| Alternative Flows: | | 1. The “Use Encryption” option is checked. 2. See Alternative Flow for UC-01. 3. With Advanced Options selected 4. User chooses to utilize one of the Advanced User settings | | | | | | |
| Exceptions: | |  | | | | | | |
| Includes: | | UC-01, UC-03 | | | | | | |
| Frequency of Use: | | Occasional. Since this an optional choice for the user, its use is dependent upon on user preference. | | | | | | |
| Business Rules: | |  | | | | | | |
| Special Requirements: | |  | | | | | | |
| Assumptions: | |  | | | | | | |
| Notes and Issues: | |  | | | | | | |

## UC-06 – About Page

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-06 | | | Priority | Medium | |  | |
| Use Case Name: | **About Page** | | | | | | | |
| Type: | External | | X | Temporal |  |  | | |
| Created By: | Nathan Beyer | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | October 29, 2017 | | | | Date Last Updated: | | | December 12, 2017 |
| Actors: | | User | | | | | | |
| Description: | | The user wishes to open and view the About page | | | | | | |
| Trigger: | | User clicks a button on the main form to open the About page | | | | | | |
| Preconditions: | | 1. The application is open | | | | | | |
| Post Conditions: | | 1. User has opened and viewed the About page | | | | | | |
| Normal Flow: | | 1. User clicks a button on the main form to open the About page 2. System opens the About page 3. System fills the textbox on the About page with the information stored inside the project’s readme file 4. User closes About page when finished viewing it | | | | | | |
| Alternative Flows: | |  | | | | | | |
| Exceptions: | | 1. System cannot find the readme file or read text from it    1. System displays an appropriate error message in a message box    2. System places the error message inside the textbox on the About page. | | | | | | |
| Includes: | | UC-07 | | | | | | |
| Frequency of Use: | | Occasional | | | | | | |
| Business Rules: | |  | | | | | | |
| Special Requirements: | | Can only be utilized by the familiar menu system interface | | | | | | |
| Assumptions: | |  | | | | | | |
| Notes and Issues: | |  | | | | | | |

## UC-07 – Navigation Bar/Menu System

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-07 | | | Priority | Medium | |  | |
| Use Case Name: | **Menu System** | | | | | | | |
| Type: | External | | X | Temporal |  |  | | |
| Created By: | Chris Menning /  Chris Hoegger | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | October 31, 2017 | | | | Date Last Updated: | | | December 12, 2017 |
| Actors: | | User | | | | | | |
| Description: | | A user wishes to access application options through the menu/navigation bar. | | | | | | |
| Trigger: | | The user clicks one of the following options from the menu:   * File * Edit * Settings * Help | | | | | | |
| Preconditions: | | 1. The application is open. | | | | | | |
| Post Conditions: | | 1. The user can locate and execute their desired command. | | | | | | |
| Normal Flow: | | 1. The user selects the File menu.    1. The following items appear in a dropdown menu.       1. Open Image (see UC-01, UC-02, UC-05)          1. Open Plain Image          2. Open Encoded Image          3. Choose Stock Photo       2. Generate Image (see UC-08, UC-09)          1. Fractal Image          2. Gradient Image       3. Save Encoded Image (see UC-01)       4. Save Decoded Message (see UC-02)          1. Open a Save dialog and output a text file       5. Quit    2. User selects one of the listed items and the command executes. 2. The user selects the Edit menu.    1. The following items appear in a dropdown menu.       1. Cut       2. Copy       3. Paste       4. Delete       5. Select-All    2. User clicks on of the listed items, and the edit is executed on the text in the textbox. 3. The user selects the Settings menu.    1. The following items appear in a dropdown menu.       1. Advanced Options (see UC-03)       2. Use Encryption (see UC-01)    2. User selects one of the listed items and the command executes. 4. The user selects the Help menu.    1. The following items appear in a dropdown menu.       1. View Help (see UC-04)       2. View About (see UC-06)       3. What is a Fractal?          1. Redirects user to Wikipedia    2. User selects one of the listed items and the command executes. | | | | | | |
| Alternative Flows: | |  | | | | | | |
| Exceptions: | | 1. User selects an option from the Edit menu, but the cursor is not in the textbox or text in the textbox is not highlighted.    1. Error/Validation messages appear to user asking them to retry | | | | | | |
| Includes: | | UC-01, UC-02, UC-03, UC-05, UC-06, UC-08, UC-09 | | | | | | |
| Frequency of Use: | | Frequent. Even though most of the choices are optional and would depend on user preference, it is felt that this Use Case would be utilized often. | | | | | | |
| Business Rules: | |  | | | | | | |
| Special Requirements: | |  | | | | | | |
| Assumptions: | | Many users find the familiarity of a top-bar menu with File, Edit, Settings, and Help to be an intuitive means of using an application. | | | | | | |
| Notes and Issues: | | The most general use cases from the average user can be accomplished without the menu system. But items like Advanced Options, Preferences, Help, and About can only be utilized by the familiar menu system interface. | | | | | | |

## 4.8 UC-08 – Generate Stock Image from Stock Image Page

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-08 | | | Priority | Medium | |  | |
| Use Case Name: | **Generate Stock Image from Stock Image Page** | | | | | | | |
| Type | External | | X | Temporal |  |  | | |
| Created By: | Nathan Beyer | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | November 16, 2017 | | | | Date Last Updated: | | | December 12, 2017 |
| Actors: | | User | | | | | | |
| Description: | | A user has a message that they want hidden in an image, but they don’t have an image they wish to use. This option allows them to generate a stock image for use in this application. | | | | | | |
| Trigger: | | User clicks the Stock Images option on the main form to open the Stock Images Page | | | | | | |
| Preconditions: | | 1. The application is open | | | | | | |
| Post Conditions: | | 1. User has opened the Stock Images Page and has saved a copy of the chosen file in a chosen size (Large, Medium, Small) 2. The selected Stock Image is saved with the message hidden inside. | | | | | | |
| Normal Flow: | | 1. User selects the Stock Images option on the main form to open the Stock Images page 2. User selects the image they want to copy for use 3. User selects the size of the image (large, medium, small) 4. System updates picture box on the Stock Images page with a copy of user’s selected image 5. System displays information on the selected image in the selected size in a textbox on the Stock Images page 6. User clicks the Open Image button to save image file back to the main form. 7. User clicks the Close button to close the form when finished 8. The user may continue with UC-01 | | | | | | |
| Alternative Flows: | | 1. The “Use Encryption” option is checked. 2. See Alternative Flow for UC-01. 3. With Advanced Options selected 4. User chooses to utilize one of the Advanced User settings | | | | | | |
| Exceptions: | | 1. System cannot access copy of image 2. System captures information on thrown exception 3. Error message is created based on thrown exception 4. System displays error message 5. System cannot save copy of image 6. System captures information on thrown exception 7. Error message is created based on thrown exception 8. System displays error message | | | | | | |
| Includes: | | UC-01, UC-03 | | | | | | |
| Frequency of Use: | | Occasional. Since this an optional choice for the user, its use is dependent upon on user preference. | | | | | | |
| Business Rules: | |  | | | | | | |
| Special Requirements: | |  | | | | | | |
| Assumptions: | |  | | | | | | |
| Notes and Issues: | |  | | | | | | |

## UC-09 – Generate Gradient Image

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Use Case ID: | UC-09 | | | Priority | Medium | |  | |
| Use Case Name: | **Generate Gradient Image** | | | | | | | |
| Type | External | | X | Temporal |  |  | | |
| Created By: | Chris Hoegger | | | | Last Updated By: | | | Chris Hoegger |
| Date Created: | November 30, 2017 | | | | Date Last Updated: | | | December 12, 2017 |
| Actors: | | User | | | | | | |
| Description: | | A user has a message that they want hidden in an image, but they don’t have an image they wish to use. This option allows them to generate a gradient image for use in this application. | | | | | | |
| Trigger: | | User clicks the Gradient Image option on the main form to generate the image. | | | | | | |
| Preconditions: | | 1. The application is open | | | | | | |
| Post Conditions: | | 1. A gradient image is saved with the image hidden inside. | | | | | | |
| Normal Flow: | | 1. The user selects the Gradient Image option from the main form to generate a gradient image. 2. The picture box displays the system created gradient image. 3. The user may continue with UC-01. | | | | | | |
| Alternative Flows: | | 1. The “Use Encryption” option is checked. 2. See Alternative Flow for UC-01. 3. With Advanced Options selected 4. User chooses to utilize one of the Advanced User settings | | | | | | |
| Exceptions: | |  | | | | | | |
| Includes: | | UC-01, UC-03 | | | | | | |
| Frequency of Use: | | Occasional. Since this an optional choice for the user, its use is dependent upon on user preference. | | | | | | |
| Business Rules: | |  | | | | | | |
| Special Requirements: | |  | | | | | | |
| Assumptions: | |  | | | | | | |
| Notes and Issues: | |  | | | | | | |

# Other Nonfunctional Requirements

## Performance Requirements

This application only supports American Standard Code for Information Interchange (ASCII) characters for message encoding. As a result, English is the only supported language. Unicode is not supported.

Virtually any popular rasterized image format may be used for input, but the resulting image will always save as a PNG.

System performance is noticeably slower when choosing to use encryption while hiding messages as compared to hiding messages without encryption. This is normal.

## Safety Requirements

This software is available in an “as is” condition, meaning that utilization should be at operator’s own risk and caution exercised regarding safeguarding of confidential information as well as choice of image files used.

## Security Requirements

This application conforms to US Government Advanced Encryption Standard (AES). However, Legendary Lichens makes no guarantees that data will be 100% safeguarded from third party use.

## Software Quality Attributes

This software was developed keeping in mind the many levels of user interfaces that the application may reach and the multiple uses for which this software could be used. The design allows flexibility by offering multiple processes for each function; menu options versus main form buttons and optional system created images such as fractals and gradient type design, images available for use through the stock images page and also as basic as including the option for user’s owned images.

The form’s color scheme, font selection and size were chosen both by following industry accessibility standards and research regarding most common website and application design suggestions. One example, of our commitment to quality would be that both the field and text boxes are either enhanced with coordinating colors or softened to allow for viewing ease.

# Other Requirements

N/A

# System Requirements Chart

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ID** | **Priority** | **Type \*** | **Source** | **Use Case(s)** | **Description** |
| 01.0.0 | High | F | Customer- John Doe | UC-01 | The user encodes and saves a message into an image |
| 01.1.0 | High | F | Customer- John Doe | UC-01 | User chooses an image file they wish to encode |
| 01.2.0 | High | F | Customer-John Doe | UC-01 | System opens user’s selected image file |
| 01.3.0 | High | F | Customer- John Doe | UC-01 | User enters message into the appropriate textbox |
| 01.4.0 | High | F | Customer-John Doe | UC-01 | System encodes message in selected image file |
| 01.5.0 | High | F | Customer-John Doe | UC-01 | User selects where and how to save encoded image file |
| 01.6.0 | High | F | Customer-John Doe | UC-01 | System saves encoded image file |
| 02.0.0 | High | F | Customer-John Doe | UC-02 | A user wishes to decode a file |
| 02.1.0 | High | F | Customer-John Doe | UC-02 | User selects the “Retrieve Message from Image” button |
| 02.2.0 | High | F | Customer-John Doe | UC-02 | User opens an already-encoded image file |
| 02.3.0 | High | F | Customer-John Doe | UC-02 | User selects “Decode Text from Image” button |
| 02.4.0 | High | F | Customer-John Doe | UC-02 | The program retrieves a hidden message from the image |
| 02.5.0 | High | F | Customer-John Doe | UC-02 | The retrieved text is displayed in a textbox |
| 03.0.0 | Medium | F | Customer-John Doe | UC-03 | A power user wants to use Advanced Options for more control of the encryption process. |
| 03.1.0 | Medium | F | Customer-John Doe | UC-03 | User selects “Advanced Options” from the menu. |
| 03.2.0 | Medium | F | Customer-John Doe | UC-03 | Form presents the user with an option to select one of the following, for generating AES keys from a password: Mode 1: 128 bits, Mode 2: 192 bits, Mode 3: 256 bits |
| 03.3.0 | Medium | F | Customer-John Doe | UC-03 | Encryption and decryption will now utilize the selected key size. |
| 03.4.0 | Medium | F | Customer-John Doe | UC-03 | By default, “Remember Settings” is checked, and the user’s preference is saved to a file and automatically reloaded next time. |
| 03.5.0 | Medium | F | Customer-John Doe | UC-03 | User may continue with UC-01 or UC-02 |
| 04.0.0 | Medium | F | Customer-John Doe | UC-04 | User wishes to open and view the Help page |
| 04.1.0 | Medium | F | Customer-John Doe | UC-04 | User clicks the menu option on the main form to open the Help page |
| 04.2.0 | Medium | F | Customer-John Doe | UC-04 | System displays the Help page |
| 04.3.0 | Medium | F | Customer-John Doe | UC-04 | User closes Help page when finished viewing it by clicking the Close button |
| 05.0.0 | High | F | Customer-John Doe | UC-05 | A user has a message that they want hidden in an image, but they don’t have a particular image in mind. This option allows them to generate a fractal for use in this application. |
| 05.1.0 | High | F | Customer-John Doe | UC-05 | User selects the Generate Fractal option from the main form to generate a fractal image |
| 05.2.0 | High | F | Customer-John Doe | UC-05 | The picture box displays the system created fractal |
| 05.3.0 | High | F | Customer-John Doe | UC-05 | User may continue with UC-01 |
| 06.0.0 | High | F | Customer-John Doe | UC-06 | User wishes to open and view the About page |
| 06.1.0 | High | F | Customer-John Doe | UC-06 | User clicks a button on the main form to open the About page |
| 06.2.0 | High | F | Customer-John Doe | UC-06 | System opens the About page |
| 06.3.0 | High | F | Customer-John Doe | UC-06 | System fills the textbox on the About page with the information stored inside the project’s readme file |
| 06.4.0 | High | F | Customer-John Doe | UC-06 | User closes About page when finished viewing it |
| 07.0.0 | Medium | F | Customer-John Doe | UC-07 | A user wishes to access application options through the menu/navigation bar. |
| 07.1.0 | Medium | F | Customer-John Doe | UC-07 | The user selects the File menu. |
| 07.1.1 | Medium | F | Customer-John Doe | UC-07 | The following items appear in a dropdown menu.  Open Image, , Generate Image, Save Encoded Image Save Decoded Message, Quit |
| 07.1.2 | Medium | F | Customer-John Doe | UC-07 | User selects one of the listed items and the command executes |
| 07.2.0 | Medium | F | Customer-John Doe | UC-07 | The user selects the Edit menu. |
| 07.2.1 | Medium | F | Customer-John Doe | UC-07 | The following items appear in a dropdown menu:  Cut, Copy, Paste, Delete, Select-All |
| 07.2.2 | Medium | F | Customer-John Doe | UC-07 | The user clicks on one of the listed items, and the edit is executed on the text in the textbox. |
| 07.3.0 | Medium | F | Customer-John Doe | UC-07 | The user selects the Settings menu. |
| 07.3.1 | Medium | F | Customer-John Doe | UC-07 | The following items appear in a dropdown menu.  Advanced Options and Use Encryption |
| 07.3.2 | Medium | F | Customer-John Doe | UC-07 | User selects one of the listed items and the command executes |
| 07.4.0 | Medium | F | Customer-John Doe | UC-07 | The user selects the Help menu. |
| 07.4.1 | Medium | F | Customer-John Doe | UC-07 | The following items appear in a dropdown menu.  View Help, About, What is a Fractal |
| 07.4.2 | Medium | F | Customer-John Doe | UC-07 | User selects one of the listed items and the command executes |
| 08.0.0 | Medium | F | Customer-John Doe | UC-08 | A user has a message that they want hidden in an image, but they don’t have an image they wish to use. This option allows them to generate a stock image for use in this application. |
| 08.1.0 | Medium | F | Customer-John Doe | UC-08 | User selects the Stock Images option on the main form to open the Stock Images page |
| 08.2.0 | Medium | F | Customer-John Doe | UC-08 | User selects the image they want to copy for use |
| 08.3.0 | Medium | F | Customer-John Doe | UC-08 | User selects the size of the image (large, medium or small) |
| 08.4.0 | Medium | F | Customer-John Doe | UC-08 | System updates picture box on the Stock Images page with a copy of user’s selected image |
| 08.5.0 | Medium | F | Customer-John Doe | UC-08 | System displays information on the selected image in the selected size in a textbox on the Stock Images page |
| 08.6.0 | Medium | F | Customer-John Doe | UC-08 | User clicks the Open Image button to save image file back to the main form. |
| 08.7.0 | Medium | F | Customer-John Doe | UC-08 | User clicks the Close button to close the form when finished |
| 08.8.0 | Medium | F | Customer-John Doe | UC-08 | The user may continue with UC-01 |
| 09.0.0 | Medium | F | Customer-John Doe | UC-09 | A user has a message that they want hidden in an image, but they don’t have an image they wish to use. This option allows them to generate a gradient image for use in this application. |
| 09.1.0 | Medium | F | Customer-John Doe | UC-09 | The user selects the Gradient Image option from the main form to generate a gradient image |
| 09.2.0 | Medium | F | Customer-John Doe | UC-09 | The picture box displays the system created gradient image |
| 09.3.0 | Medium | F | Customer-John Doe | UC-09 | The user may continue with UC-01 |

\*Type

NF=Nonfunctional

F=Functional