Software Requirements Specification

for

Medical Image Compression

Version 1.0 approved

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Table of Contents

Revision History

Name	Date	Reason For Changes	Version

1. Introduction

1.1 Purpose:

Image compression reduces the size of the original image. The reduced size is helpful when transferring image files, storing image files. The compressed image can also be decompressed to its original form using the decompression algorithm. The website serves each user to either compress/decompress images using the website or users can also download the library to integrate into their own systems.

1.2 Document Conventions:

Font: Times New Roman, 12

1.3 Intended Audience and Reading Suggestions:

Any user who wants to decode or encode 2D medical images locally or from a server can easily do it on our website.

1.4 Product Scope:

Image compression for medical images is very much needed as it reduces the size of the image significantly which occupies less space to store. Hospitals or medical imaging manufacturers can easily integrate the algorithm for image compression. Users requiring compression temporarily can use the website for encoding/decoding.

2. OVERALL DESCRIPTION:

2.1. PRODUCT PERSPECTIVE:

The system uses 2D X-ray images of the chest region. Medical image compression dealing with two-dimensional modalities is still in the premature stage.Referring to the previous work reviewed, most of the compression methods used lossless rather than lossy. In medical imaging, reversible compression of an image's region of interest (ROI) which is diagnostically relevant is considered essential. Then, improving the global compression rate of the image can be obtained by separately coding the ROI part and the remaining image.
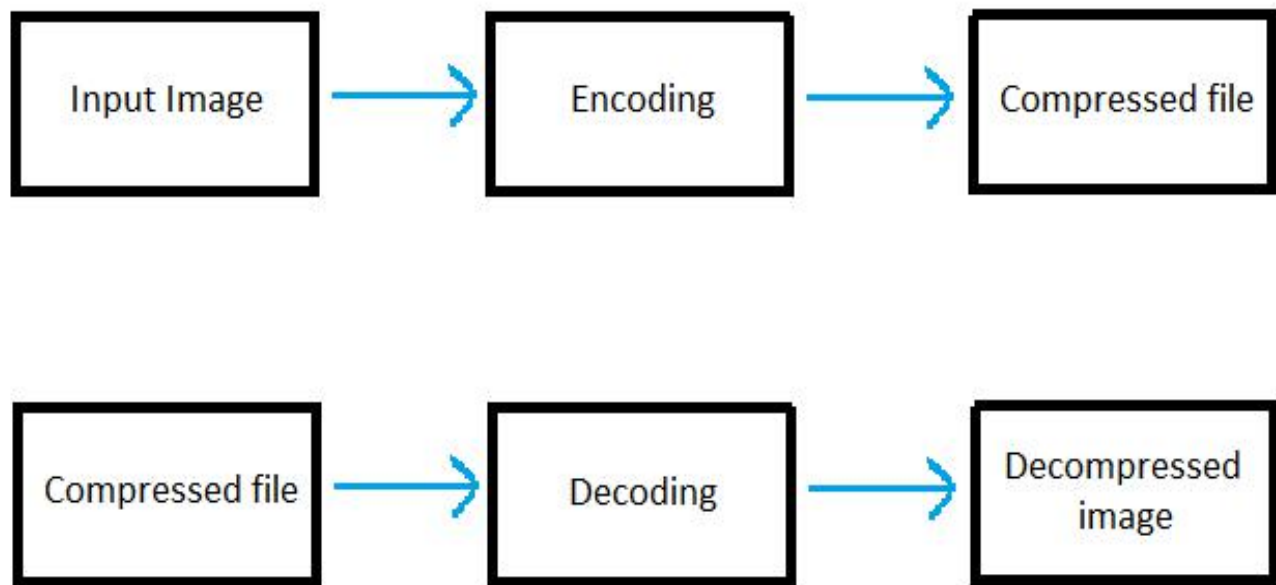
Fig: Product Perspective (Top image: Encoding; Bottom image: Decoding)

2.2. Product Functions:

2.2.1. Upload:

- The user will upload the zip file containing 2D medical images.

2.2.2. Encoding:

- The Image files are compressed.

2.2.3. Decoding:

- The compressed image files are decompressed.

2.2.4. Download:

- The encoded/decoded image file is downloaded.
- Users who are willing to encode/decode the images locally will get to download the library.

2.3. User Classes and Characteristics:

Characteristics: The users get to encode/decode images using our website or they can locally use the same features with their own hardware.

Web Users: These users use the encode/decode features through the website.

Local Users: These users are willing to encode/decode the images with their own hardware.

Maintenance: It is to be kept in mind to assure quick loading of websites on any client machine be it desktop, mobile or any other device. This can be achieved by maintaining the server properly.

2.4 Operating Environment:

The hardware, software and technology used should have following specifications:

Software:

- Ability to manage huge traffic of request and response.
- Ability to keep the data safe and durable.
- Should have a strong secure protection against external hacks.
- Should be low on server resources to quickly respond to user's request.

Hardware:

- Should have a dedicated server to handle the huge request from all users.
- Server should be kept in a cold clean place.
- There should be a 24 Hour power backup facility.

- Ability to connect to connect to other networks when required.

Technology:

- Ability to adapt to new standards of the internet.
- Ability to add new components as required.

2.5 Design and Implementation Constraints:

2.5.1 Hardware

I. **Memory:**

- Primary memory should be enough to perform the operations.
- Web Server's secondary memory should be enough to save the zip files in the queue.
- The zip file size should be less than 50MB.

II. **Computation Power:**

- There should be enough computational power to perform the functions in suitable time.

2.5.2 Language Requirements:

I. **Python:**

- Used for server and compression related functions.

II. **Java Script:**

- Used for web clients.

2.5.3 Communication Protocols:

I. **HTTP:**

- The server uses the HTTP protocol to communicate with the web clients.

2.5.4 Security Considerations:

I. If any user causes any harm or interruption of any kind then they should be banned from accessing the service.

2.6. User Documentation:

- Manual for using the library on local hardware.

2.7. Assumption and dependencies:

- Server never crashes
- Software is bug free

3. External interface requirements

3.1 User Interfaces:

The interaction between the user end and the software system happens through the website designed specifically to meet the needs of the client side. The web-page user interface should be intuitive; with easy to use controls and graphics moreover the website must be responsive on any web enabled device.

3.2 Hardware Interfaces

The hardware requirement for the users who are operating the service locally should have better hardware requirements.

3.3 Software Interface

The Software should have following specifications:

3.3.1. Ability to respond to every web enabled device.

3.3.2. Ability to connect to external websites

3.3.3. Ability to optimize the time taken for any search result made on that web-page.

3.3.4. Ability to use cookies for better user friendly experience.

3.4 Communications Interface

The communication between client and server shall use the HTTP protocol.

4. System Features:

4.1. Encode Image:

4.1.1. Description and Priority:

This feature compresses the original images. Priority is High.

4.1.2. Stimulus/Response Sequences:

4.1.2.1 User selects the image

4.1.2.2 User selects encoding option

4.1.2.3 System uploads the image

4.1.2.4 Server encodes the image

4.1.2.5 Server sends the image to the web client

4.1.3. Functional Requirements:

REQ-1: User side should be capable of uploading the required images in zip file format.

REQ-2: The performance shall depend upon hardware components of the user who access the service locally.

4.2. Decode Image:

4.2.1. Description and Priority:

This feature decompresses the original images. Priority is High.

4.2.2. Stimulus/Response Sequences:

4.1.2.1 User selects the image

4.1.2.2 User selects decoding option

4.1.2.3 System uploads the image

4.1.2.4 Server decodes the image

4.1.2.5 Server sends the image to the web client

4.2.3. Functional Requirements:

REQ-1: User side should be capable of uploading the compressed images in zip file format.

REQ-2: Users should provide only those image files which are encoded with the encoding feature.

REQ-3: The performance shall depend upon hardware components of the user who access the service locally.

5. OTHER NON FUNCTIONAL REQUIREMENTS:

5.1. PERFORMANCE REQUIREMENTS:

The product shall be based on the web and run from a server. The server will manage web clients as well as encode and decode image files. The system must be interactive and the delays involved must be less.

5.2. SAFETY REQUIREMENTS:

Information transmission should be securely transmitted to the server without any changes in information.

5.3. SECURITY REQUIREMENTS:

The main security concern is for users, hence the system isn't storing user data on any type of database.

5.4. Software Quality Attributes:

- **Reliability:** System always checks the file type before encoding/decoding, in case of an incorrect file it will not interrupt other users.
- **Usability:** In case of incorrect file users will be prompted with an error message. The user interface is simple yet easy to use.
- **Portability:** The library can be used with many popular operating systems and can be easily set up by downloading it from the website.
- **Maintainability:** Easy to maintain since the system is pre-trained and can be updated easily.

6. OTHER REQUIREMENTS:

- Users should have an active internet connection.
- Clients using the library locally should have appropriate computing power (according to the minimum system requirements).
- Modern browsers should be used to access the website.
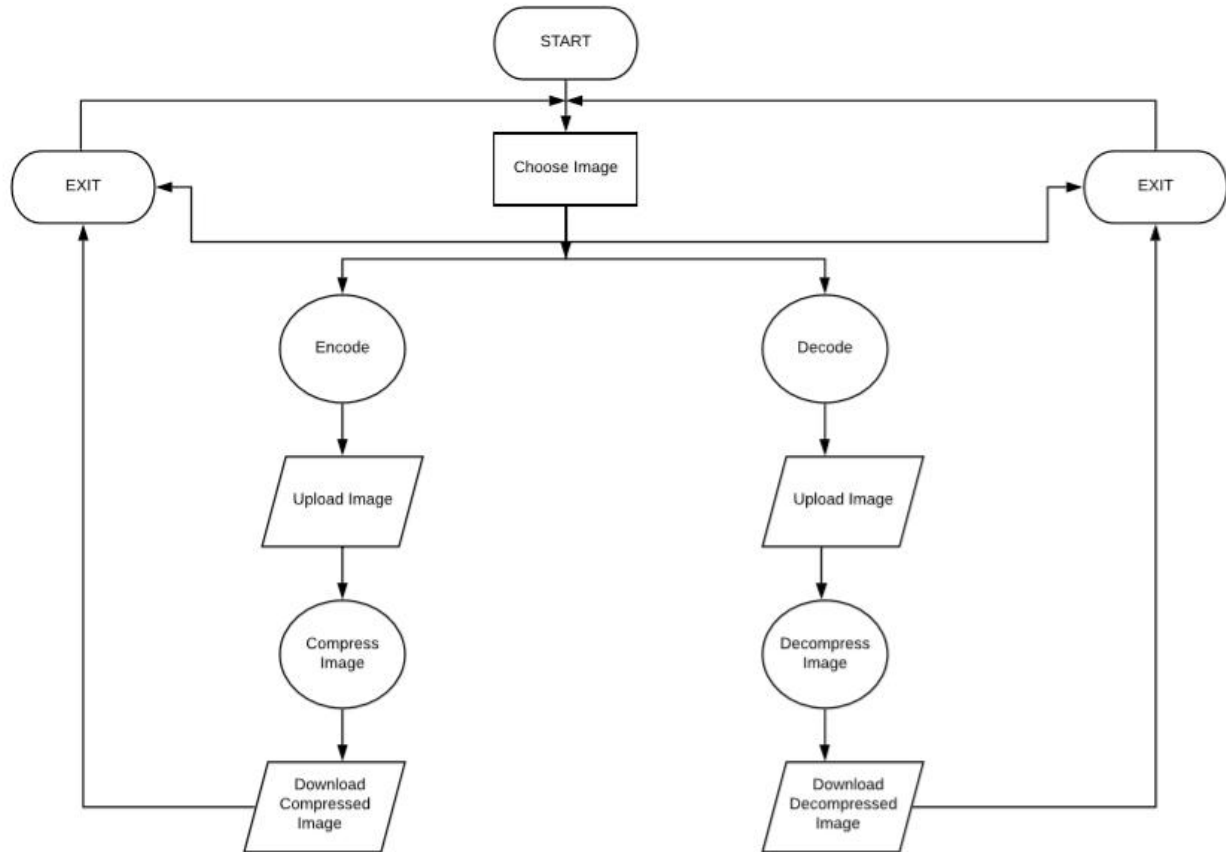
Appendix A: Analysis Models

DATA FLOW DIAGRAM:

Fig: DFD Model