INDIRA GANDHI NATIONAL OPEN UNIVERSITY

MCS - 044

PROJECT REPORT TITLED

"Digital Image Watermarking for PDF Files"

Submitted by

Mr. Srijan Mallick

Enrolment no: 176716214

Under the guidance of

Mr. Suhas Lawand

Submitted to the School of Computer and Information Sciences, IGNOU

in partial fulfilment of the requirements

for the award of the degree

Year of Submission 2021

Master of Computer Application

Indira Gandhi National Open University

Mumbai – 410206

RESUME OF THE PROJECT GUIDE

I. PERSONAL INFORMATION

Name : Suhas J.Lawand

Address : Prince Paradise ,A/26,
Near Ghodke hospital
Old Panvel-410206
Mobile No.
9821127648

E-Mail : suhas_lawand@yahoo.com, suhas@mes.ac.in

CAREER OBJECTIVE

To associate with an organization that gives me a chance to prove my knowledge and efficiency andenhance my skills in the field of technology and be a part of the team that excels in work towards the growth of the organization

II. EDUCATIONAL CREDENTIALS

- Master in Computer Engineering from Pillai's Institute Of Information Technology, with first class distinction (75%)
- B.E in Computer Engineering from Bharati Vidyapeeth College of Engineering, with first class distinction (72%)
- H.S.C. from Maharashtra State Board with first class distinction (75.67%)
- S.S.C from Maharashtra State Board with first class distinction (77.33%)

III. KNOWLEDGE AND SKILLS

Programming Languages Known:

- C, C++
- Core Java
- Advance Java

- TASM
- Web based programming HTML/XML,Javascript, AJAX
- VC++

IV. EMPLOYMENT HISTORY

10 years in teaching.

Assistant Professor: (1st April 2017 till date**)**
Pillai College of Engineering New Panvel, Navi Mumbai

Lecturer: (3rd Jan 2008 to 31St March 2017)
Pillai Polytechnic New Panvel, Navi Mumbai.

Major Responsibilities:

- Working as Assistant Professor in Pillai College of Engineering
- Worked as Lecture in Pillai Polytechnic
- Worked as an Academic Coordinator in Pillai's Polytechnic
- Worked as Training and Placement Officer in Pillai's Polytechnic
- Worked as subject expert for Lab Manual Development
- Worked as CAP In-charge for summer and winter exam
- Worked as Zonal officer for MSCIT exam
- Worked as Exam Controller
- Member of External vigilance squad for exam
- Member of Progressive Test Committee

The subjects taught by me during the tenure of Lecturer are C, C++, Core Java, Advance Java Microprocessor Programming, Computer Graphics, Data Structure, and System Programming,Advance Algorithm

V. PUBLICATIONS AND PROJECTS

Technical Papers and Publications:

1. Enhance Biometric Authentication System using Graphical Password presented at **National Conference** held at BVIT College Navi Mumbai Mar 7th, 2014

2. Selective Encryption for Secure Real Time Remote Video Monitoring at the Second World Congress on Information and Communication Technologies (**IEEE**) held at IIITM-Trivandrum, Kerala, India (WICT-2012) 978-1-4673-4804-1_c 2012 IEEE

3. Secure Cryptosystem with Blind Authentication at Fourth International Conference on Networks and Communications **(Springer)** held at December 22-24 Chennai, India

4. Video Streaming over multi-channel multi-radio, multi-hop wireless network presented at
   International Conference held at CCAC College Pune August 8-9,2011

5. Real Time Video Data Security Using Compression and Encryption presented at National
   Conference held at SIES College Nerul August 26-27,2011

6. Biotokens Based Biometric presented at **National Conference** held at Vidyalankar College Wadala March 25-26, 2011

Project:

Blind Authentication: A Secure Crypto-Biometric Verification Protocol

This was my main M.E. Project. Here I modeled a biometric authentication protocol that does not reveal any information about the biometric samples to the authenticating server. It also does not reveal any information regarding the server, to the user or client. User creates a graphical password by clicking on the sequence of images. After creating a graphical password user proceed for biometric registration. When user login with correct graphical password authentication of biometric is done

VI. MEMBERSHIPS / INVOLVEMENT:

Life Member of ISTE

Conferences/Workshops Attended:

- Participated in One day Workshop(23 August 2019) on Linux organised by the Teaching Learning Centre, ICT at IIT Bombay, funded by the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT), MHRD, Govt. of India

- Participated in Short Term Training Program On Management Information System (July 1st,2018 to July 5th, 2019) organised by Pillai College of Engineering New Panvel

- Participated in One day Workshop(22 June 2019) on Linux organised by the Teaching Learning Centre, ICT at IIT Bombay, funded by the Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching (PMMMNMTT), MHRD, Govt. of India

- Participated in Faculty Development Program(March 8th, 2018 to April 12th,2018) on ICT for Education , IIT Bombay

- Participated in Two-week ISTE workshop on Computer Programming (May 20th, 2014 to June 21st 2014)

- Participated in Two-week ISTE workshop on Computer Networking (May 28th, 2014 to July 5th ,2014)
- Participated in One-week ISTE workshop on Multimedia and Animation (Feb 13th, 2012 to Feb 18th, 2012)
- Participated in One-week ISTE workshop on Business Intelligence and Business Analytics (Aug 4th, 2011 to Aug 9th, 2012

VII. LANGUAGE KNOWN:

English, Hindi and Marathi

VIII. PERSONAL PROFILE:

Date of Birth : 31st Aug 1984

Gender : Male

Marital Status : Married

Nationality **:** Indian

I hereby declare that the above information provided is correct and true to the best of my knowledge.

(Suhas J.Lawand)

PROFORMA OF PROJECT PROPOSAL

Enrolment No.: 176716214

Study Centre: Pillai College of Arts, Commerce and Science, New Panvel

Regional Centre: Panvel, Navi Mumbai

Study Centre Code: 1632

E-mail: smallick974@gmail.com

Mobile No.: +91 9870603499

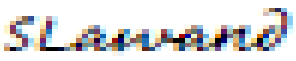
Name of the Student: Mr. Srijan Mallick

Address of the Student: E4/5, Shantiniketan CHS., Ugantak Complex,
Sukapur, New Panvel,
Dist: Raigad, Navi Mumbai.
Maharashtra – 410206

Title of the Project: Digital Image Watermarking for PDF Files

Name of the Counsellor: Mr. Suhas Lawand

Programming Language used in the Project: JAVA



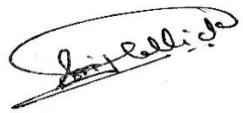
Signature of the Student **Signature of the Counsellor**

Date: 30-05-2021 **Date: 30-05-2021**

CERTIFICATE OF ORIGINALITY

This is to certify that the project report entitled **"Digital Image Watermarking for PDF Files"** submitted to **Indira Gandhi National Open University** in partial fulfilment of the requirement for the award of the degree of **MASTER OF COMPUTER APPLICATIONS (MCA),** is an authentic and original work carried out by **Mr. Srijan Mallick** with Enrolment no. **176716214** under my guidance.

The matter embodied in this project is genuine work done by the student and has not been submitted whether to this University or to any other University / Institute for the fulfilment of the requirements of any course of study.



…….

Signature of the Student:

Date: 30-05-2021

Name and Address
the student:

Srijan Mallick
E-4/5, Shantiniketan CHS.,
Ugantak Complex, Sukapur,
New Panvel, Dist – Raigad
Navi Mumbai, Maharashtra -410206

……

Signature of the Guide

Date: 30-05-2021

Name, Designation of
and Address of the
Guide:

Suhas Lawand
Prince Paradise ,A/26,
Near Ghodke hospital
Old Panvel-410206

Enrolment No: 176716214

Table of Contents

CHAPTER 1: INTRODUCTION

1.1 Purpose

Millions of PDF files are created each day and securing and classifying those files with the watermark has become the need of the day in order to discourage unauthorized distribution and track your documents.

The purpose of "**Digital Image Watermarking for PDF Files**" is to digitally watermark the PDF files with the image of the choice to identify the rightful owner of the work and discourage other people from using it as their own. A watermark is a visible overlay of copyright information (usually in the form of text or an image logo) added to photos or other digital documents.

Perhaps most important of all, a watermark on your PDF document is hard to miss once you've stamped it onto your pages. Whether recipients print the document or simply view it onscreen, a watermark shows the classification of your entire file at a glance, making it an ideal PDF security feature.

1.2 Scope

The scope of this project is to create a digitally watermarked PDF file by selecting the file and the logo image. Once both the files are correctly selected and uploaded, the program will create a new document with the image as the watermark on the provided PDF document.

The project currently supports digitally watermarking only one file at a time. It also gives user the option to preview the file before downloading so that user knows how the final document will look before downloading it.

Various validations such as filetype check, image file format checks, etc. have been added in the system to ensure that no incorrect files are uploaded on the server.
The system also currently supports only the PDF file of size 5 MB max. and image file of 100 KB to be uploaded on the server for digitally watermarking the documents.

1.3 Overview

Digital watermarking is the process by which an image is embedded with an owner's watermark. The file could be an image, audio, video or text.

Nowadays, digital watermarking has many applications such as broadcast monitoring, owner identification, proof of ownership, transaction tracking, content authentication, copy control, device control, and file reconstruction.

The main specifications of a watermarking system are:

- Robustness (Against intentional attacks or unintentional ones such as compression), Imperceptibility, and Capacity. Importance of each depends on the application.
- Copyright protection
- Source tracking
- Broadcast tracking, such as watermarked videos from global news organizations
- Hidden communication

Watermark can be implemented on the images with the below three techniques as follows:

- **Watermarking in Spatial domain**

  Spatial Domain Digital Watermarking is a technique for the insertion of watermarked information (side information defined by the owner) into the source (cover) image/video in the spatial domain.

- **Watermarking in Frequency domain**

  The watermark is embedded in the DWT (discrete wavelength transform) and DCT (discrete cosine transform) domain of an image in a multi-resolution way. In the decoding phase, once the watermark is extracted from the watermarked image, certain performance measures such as peak signal to mean noise ratio (PSNR) and correlation are calculated

- **Watermarking in Hybrid domain**

  A hybrid watermarking scheme for multimedia data such as digital image, digital video utilizes various image processing transforms and Compressive Sensing (CS) to achieved fragility and security for multimedia data. The scheme offers fragility and security to multimedia data against various standard watermarking attacks such as signal processing attacks, geometric attacks, and compression attacks.

CHAPTER 2: SURVEY OF TECHNOLOGIES

Java Maven:

Java is a programming language and computing platform first released by Sun Microsystems in 1995. There are lots of applications and websites that will not work unless you have Java installed, and more are created every day. Java is fast, secure, and reliable.

Maven is a project management tool that is used to build and manage any Java-related project. Maven helps in easing the job of a Java developer. It is capable of handling a project's build, reporting, and documentation.

Below are the terms used when developing projects using MAVEN in Java.

POM files: In order to configure the Maven, we need to use Project Object Model (POM) which is stored in a pom.xml-file. POM includes the configuration setting related to Maven. It also has goals and plugins. Maven reads the goal, searches for the POM in the directory and gets the required information.

Build Life Cycles, Phases, and Goals: A Build Lifecycle is a well-defined sequence of phases. It defines the order in which the goals are to be executed. Each build phase consists of a sequence of goals. If one life cycle is executed, all build phases in that life cycle are executed. If a build phase is executed, all build phases before it in the pre-defined sequence of build phases are executed.

Build plugins: Maven is basically a plugin execution framework and every task is done through plugins. If there is a need to perform a certain set of actions for your project which are not covered by the standard Maven build phases and goals, you can add a plugin to the POM file. Maven has some standard plugins that can be used in the java project. A plugin actually gives a set of goals. Plugins are mentioned in pom.xml using plugin elements.

Build profiles: Build profiles are used if you need to build your project in several ways. You can also customize build for multiple environments such as Production v/s Development environments. There are three types of build profiles: Per profile, Per user, Global.

Repository: A repository is simply a directory on your machine. The project jars, plugins or any other project-related materials are stored here. There are three different types of repositories: Local, Central, Remote.

CHAPTER 3: REQUIREMENTS AND ANALYSIS

3.1 Problem Definition

Create a web application that watermarks a PDF documents with the provided image file.
The application must accept a PDF file and an image file that will be watermarked on it using the web GUI.
The application must have facility to accept the files of the desired size and must be able to recognize the type of the file uploaded.
It should not allow any other type of file to be uploaded on the server expect the specified types and must perform all other required validations before generating the final document.
The development must be done using any object-oriented programming language only.

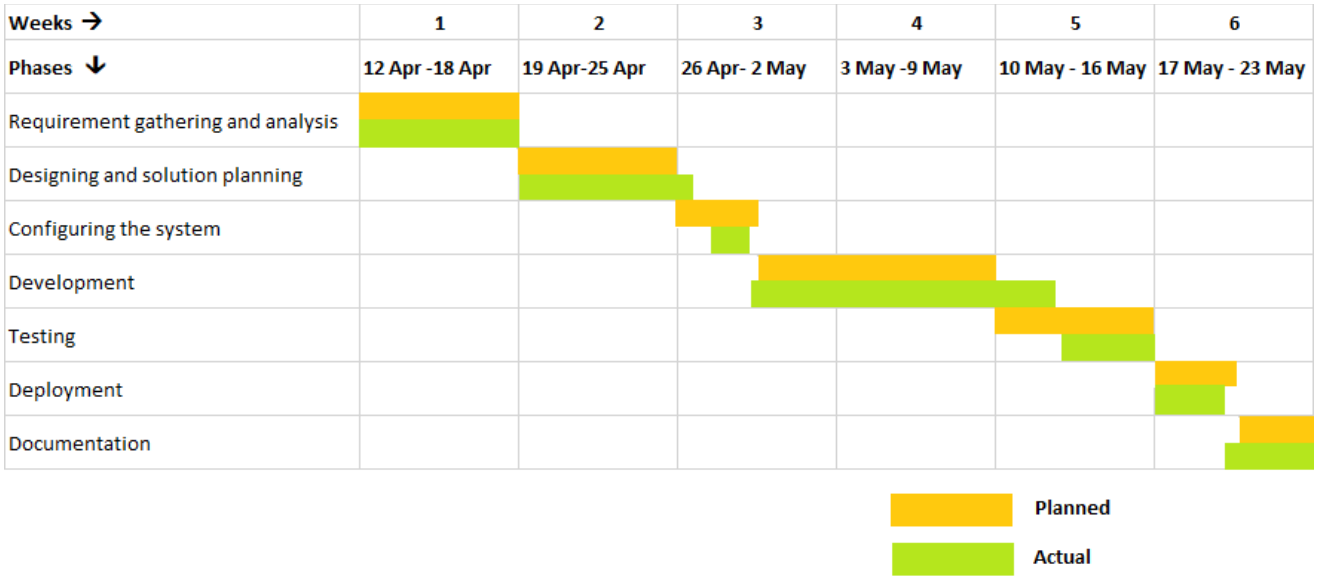
3.2 Requirements Specification

- **Hardware Specifications:**
  - **Computer:** 4GHz minimum, dual/multi core processors.
  - **Memory (RAM):** At least 4 GB RAM, preferably higher.
  - **Hard Disk space:** At least 10 GB of free spaces.
- **Software Specifications:**
  - **Operating System:** Any operating system such as Windows, Linux, etc. can be used.
  - **Programming Language used for Backend:** Java Maven with Servlet
  - **Front End:** HTML 5, jQuery, JavaScript, CSS.
- **Browser Compatibility:**
  - Google Chrome (recommended)
  - Microsoft Edge
  - Mozilla Firefox
  - Safari

3.3 Planning and Scheduling

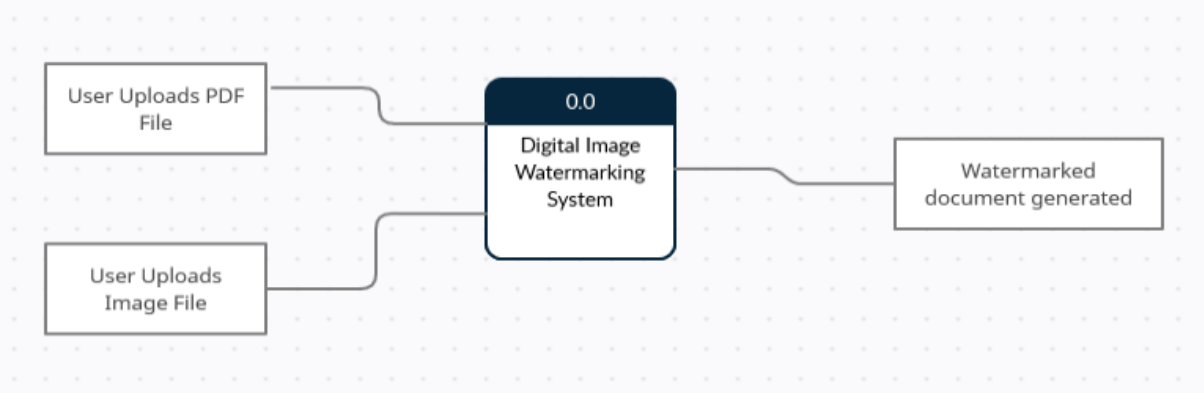
Gantt Chart:

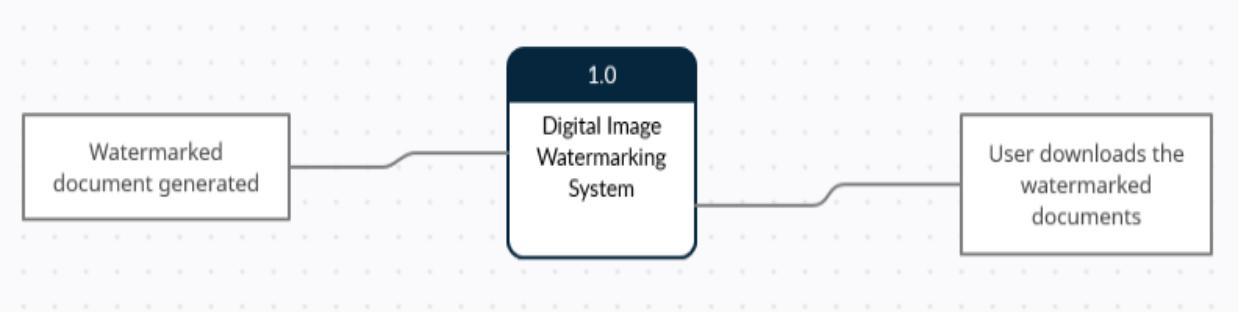
The detailed planning and scheduling of the project was outlined in Gannt Chart which is a project management tool that illustrates a project plan.
It typically includes two sections: the left side outlines a list of tasks, while the right side has a timeline with schedule bars that visualize work. The Gantt chart can also include the start and end dates of tasks, milestones, dependencies between tasks, and assignees.



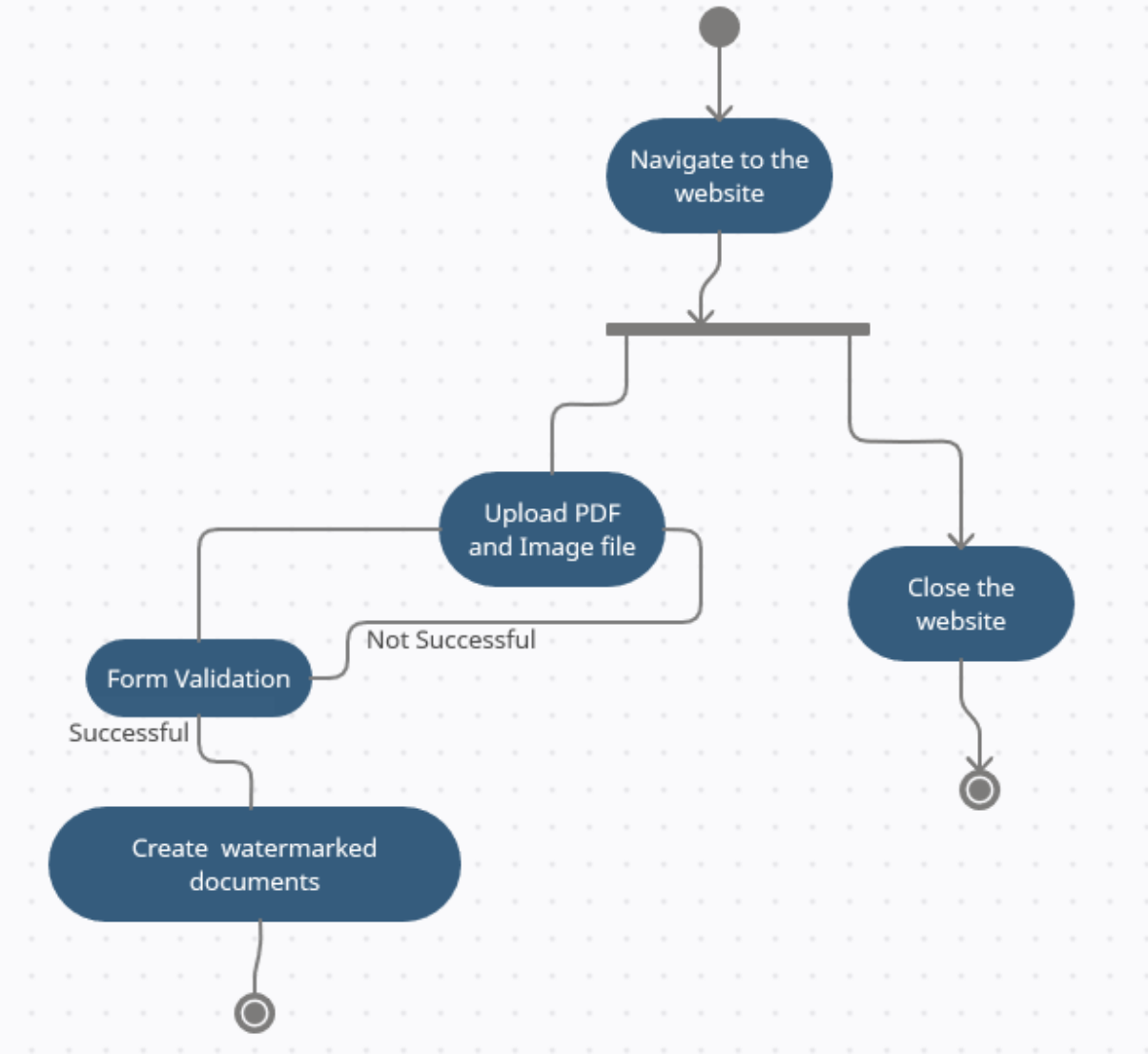
CHAPTER 4: SYSTEM DESIGN

4.1 Data Flow Diagram (DFD)

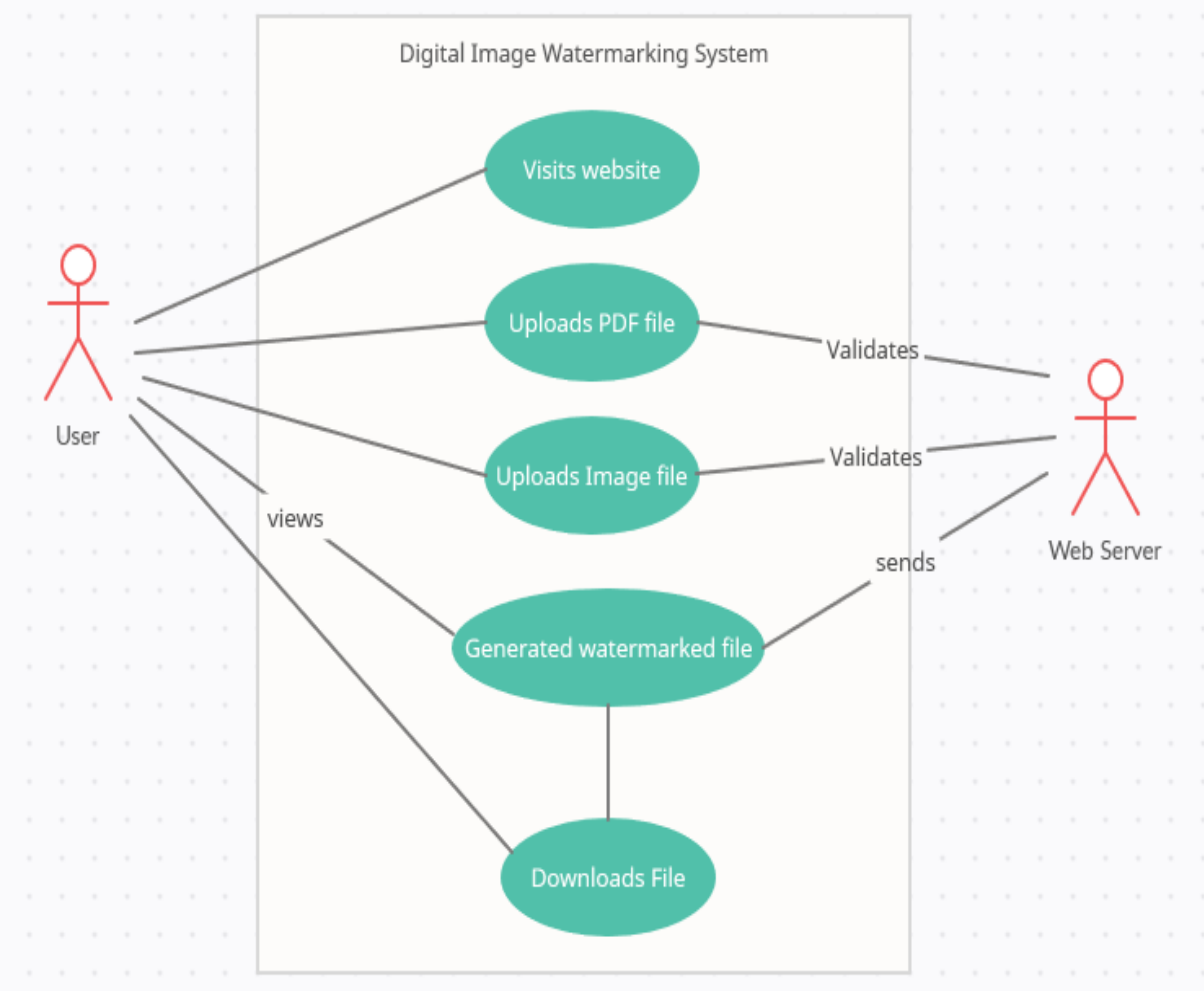




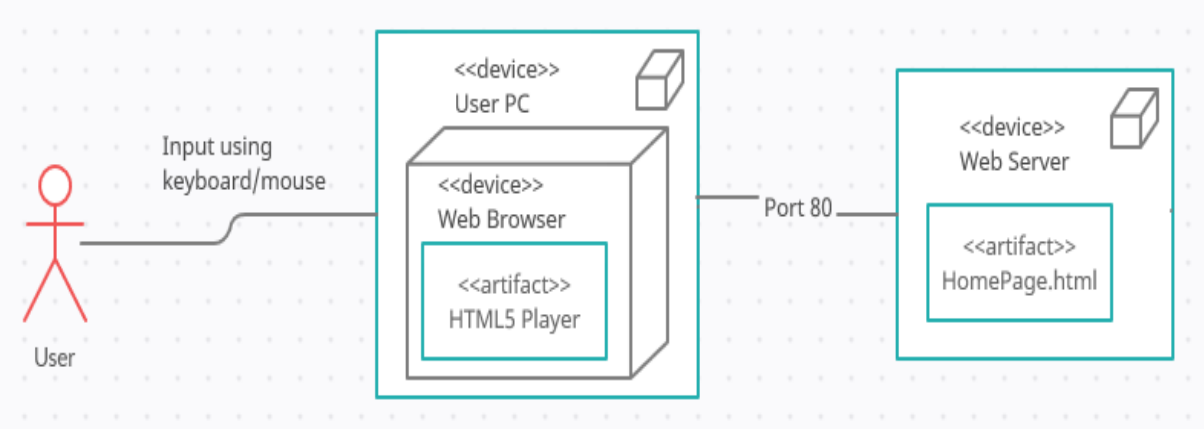
4.2 Activity Diagram



4.3 Use Case Diagram



4.4 Deployment Diagram

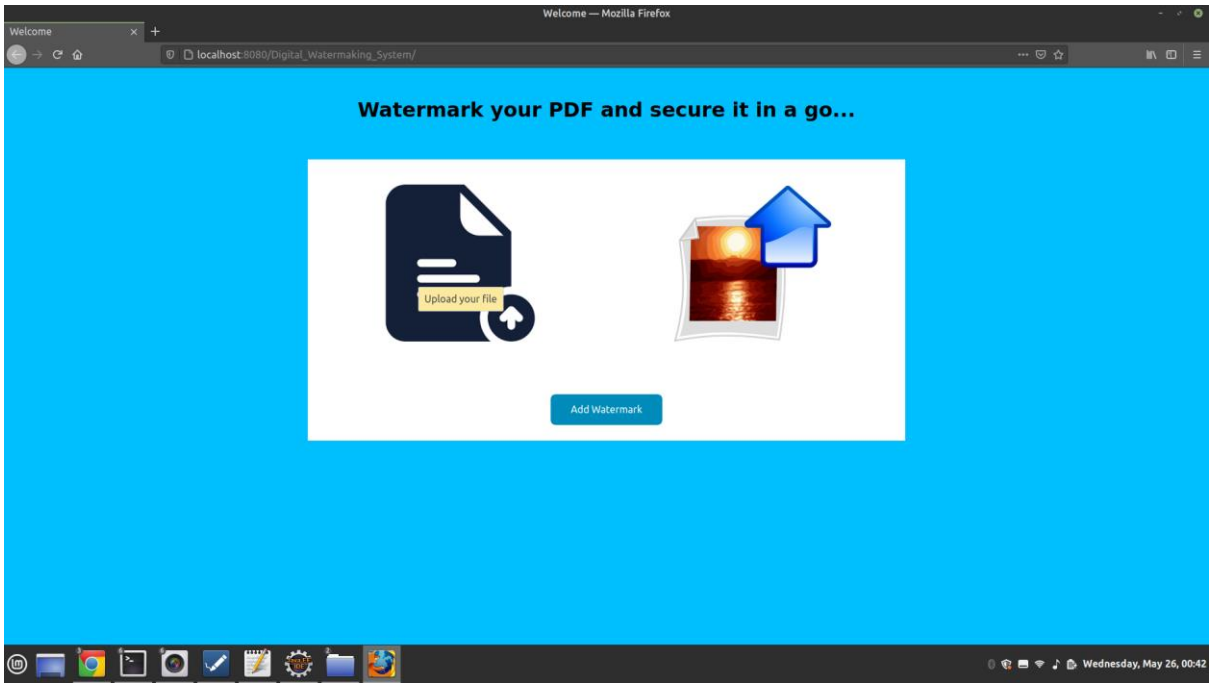


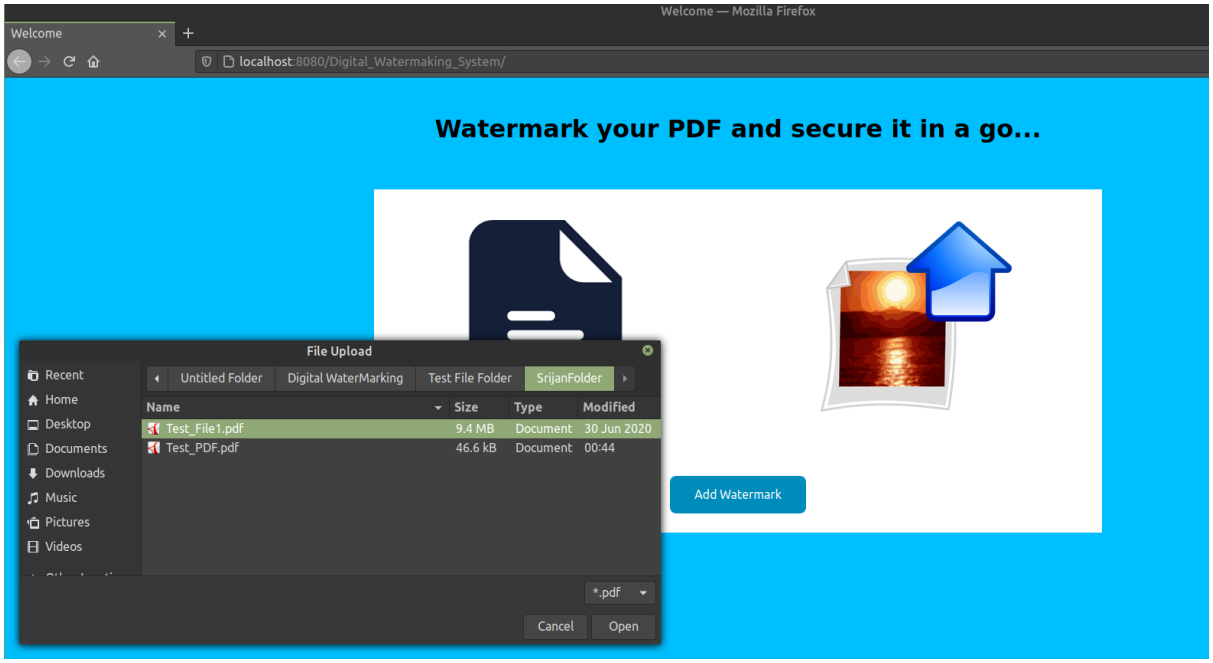
4.5 Data Integrity and Constraints

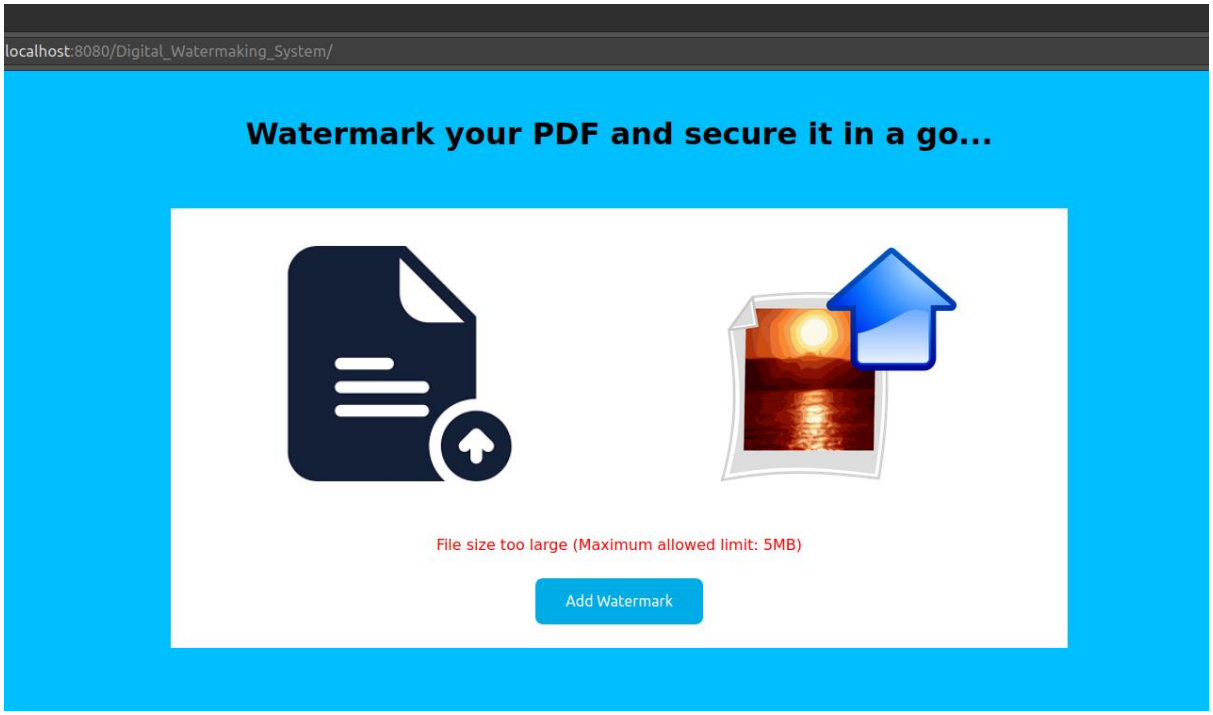
This website does not retain any user data and hence no data integrity or constraints are required as there are no databases used in this website.

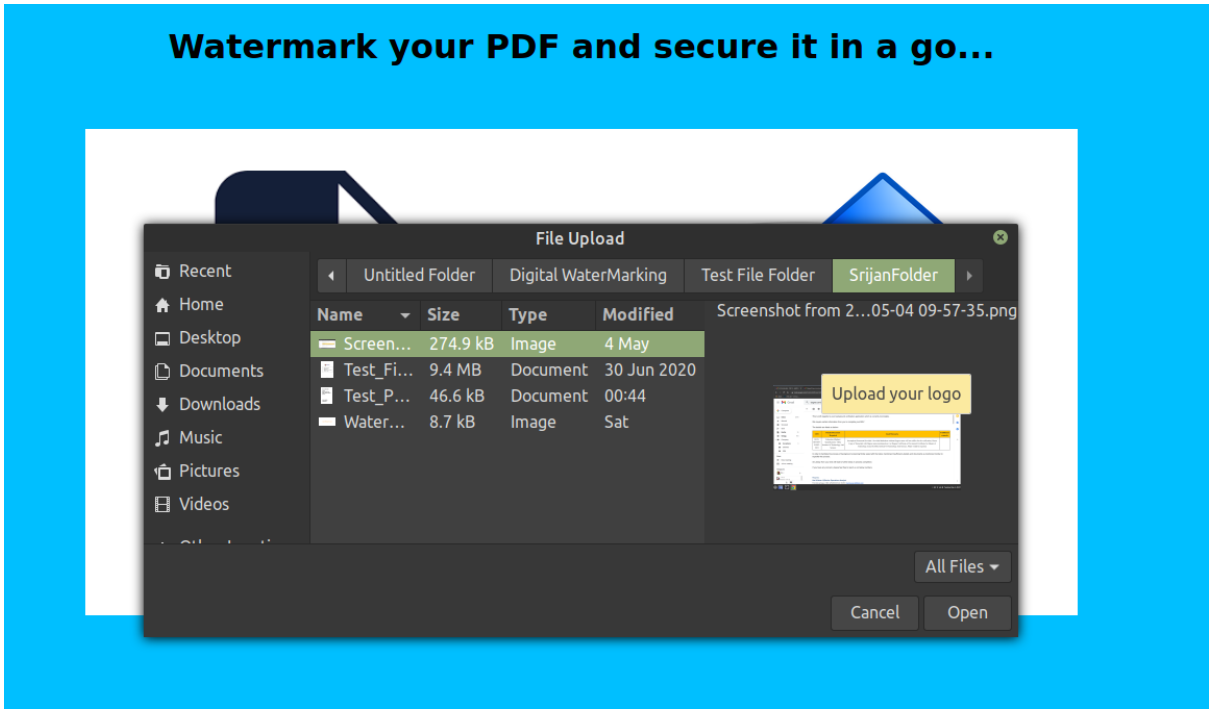
4.6 User interface design

HomePage






localhost:8080/Digital_Watermaking_System/
Watermark your PDF and secure it in a go...
File size too large (Maximum allowed limit: 5MB)
Add Watermark


Watermark your PDF and secure it in a go...
File Upload
Recent
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Untitled Folder
Digital WaterMarking
Test File Folder
SrijanFolder
Name
Size
Type
Modified
Screen...
274.9 kB
Image
4 May
Test_Fi...
9.4 MB
Document
30 Jun 2020
Test_P...
46.6 kB
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8.7 kB
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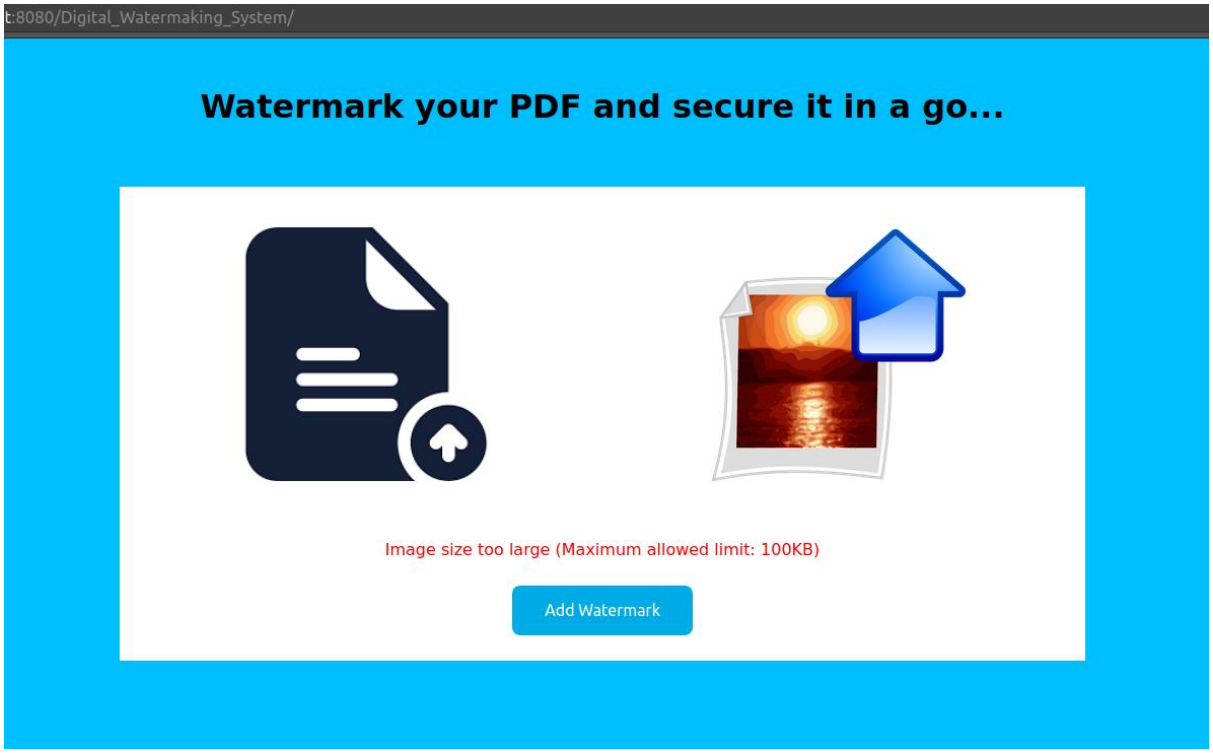
Upload your logo
All Files
Cancel
Open


t:8080/Digital_Watermaking_System/
Watermark your PDF and secure it in a go...
Image size too large (Maximum allowed limit: 100KB)
Add Watermark


Watermark your PDF and secure it in a go...
File Upload
Recent
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Untitled Folder
Digital WaterMarking
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Confidential
All Files
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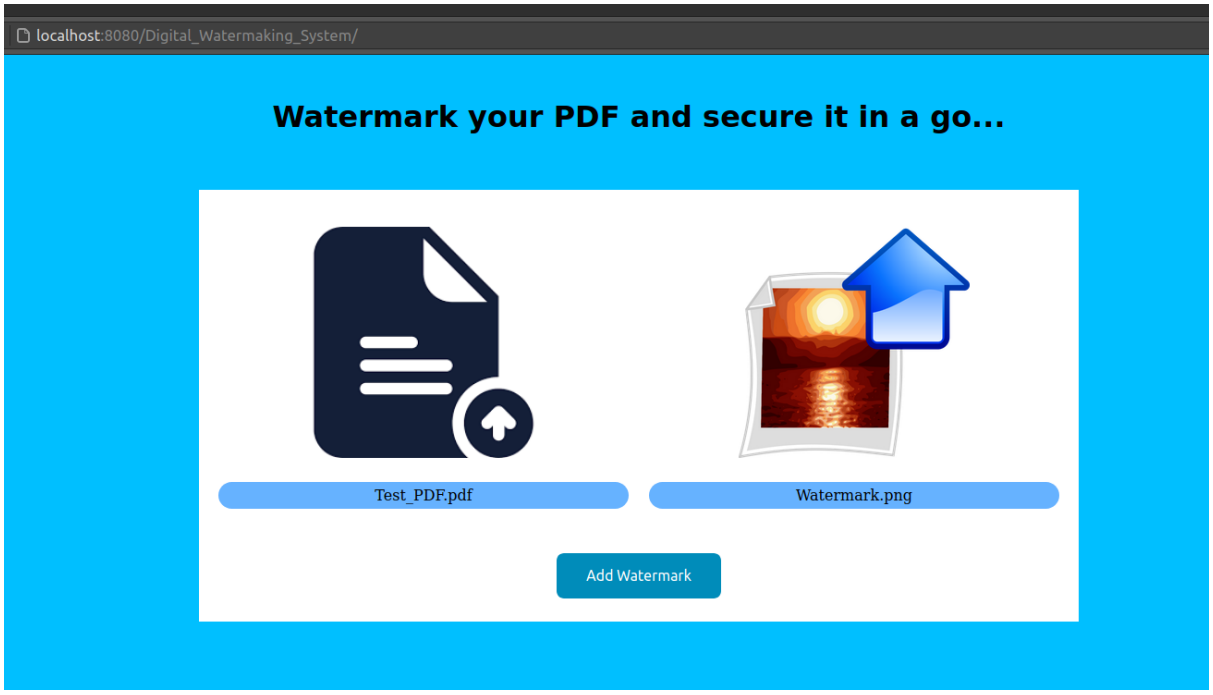
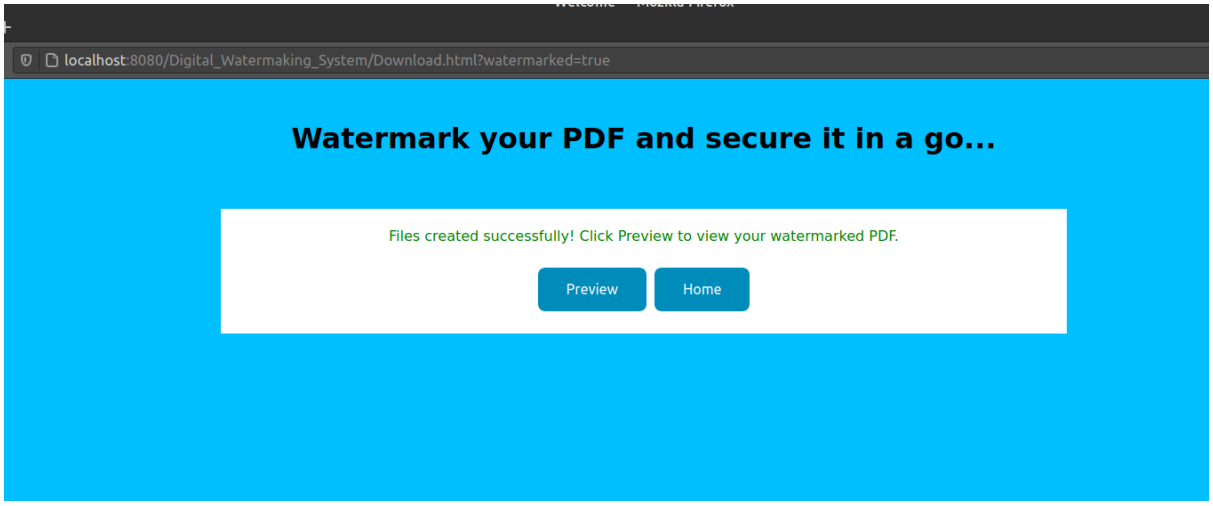
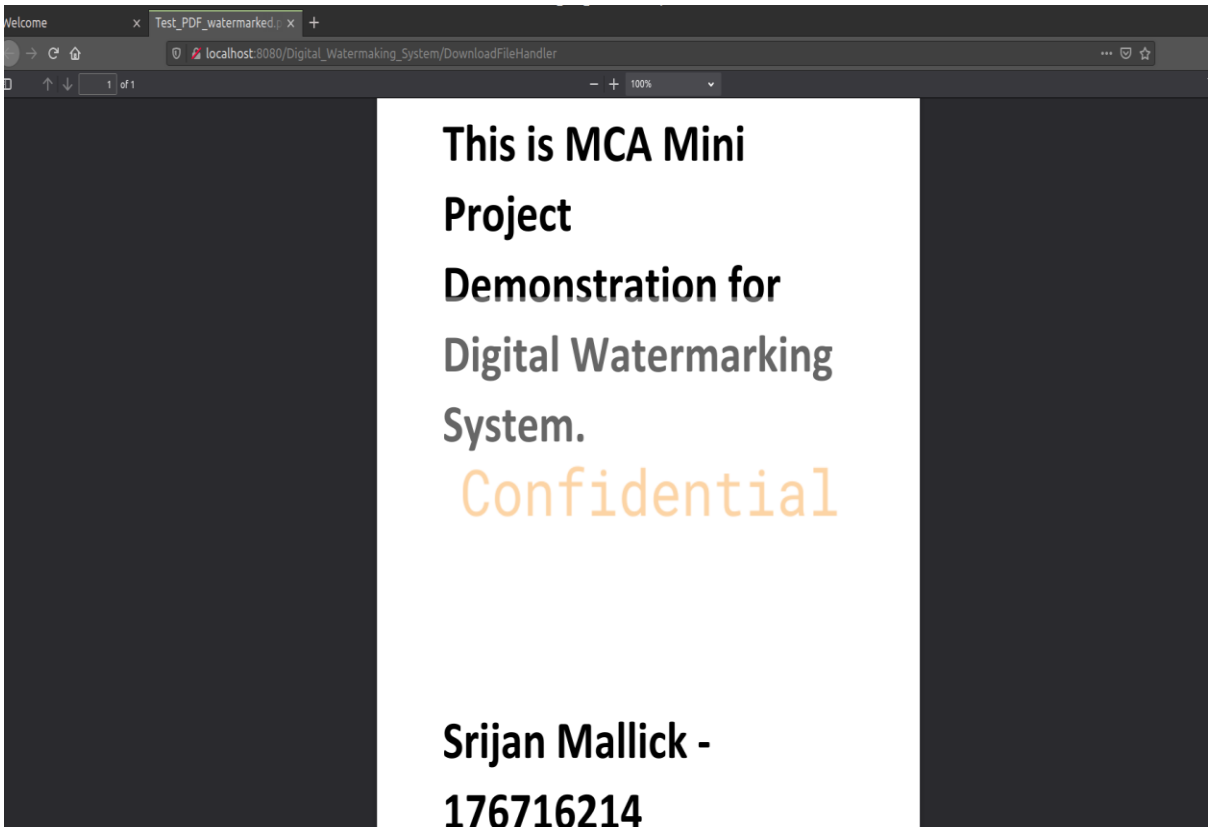


DownloadPage:



Final Watermarked Document:



4.7 Security Issues

Frequent uses of network pose a high threat on the security. There are various paths through which hackers can potentially risk the sites.

The threats related to Web Application are not known until they reach to the Web Server. Appropriate measures need to be taken to prevent these security attack. Some of them are discussed below along with its security measures,

- **Cross-Site Scripting (XSS)** – XSS is a type of injection in which malicious codes are send to the browser without validations from non-trusted source. This will allow to run malicious scripts in the host browser to hijack the user's session, invalid forwards or accessing sensitive information.
    - As a security measure to prevent XSS strong validations are added in JavaScript and to the Server in this application. Frequent checks are done to verify if the file size and type of file that is being uploaded meets the requirements.

- **Sensitive data exposure** – Web applications most of the time do not properly saves sensitive information like passwords authentication details, account information or tokens. This allows to easily access the details by taking control over their sessions.
    - As a security measure, PDF Watermarking application is designed in such a way that it does not store the generated PDF file and the watermarked files once the file is previewed/ downloaded by the user.
    - There may be some other security threats which will be taken care in future scope.

- **Invalidated Redirects & Forwards** – Eve-dropper can redirect the user to malicious pages if proper validations are not enforced in the page.
    - The website is tested for invalid redirects and validations are enforced for redirecting to Download.html page from Home.html. It is still a beta version that is being tested for any illegal redirects and is under development to improve before hosting to the server.

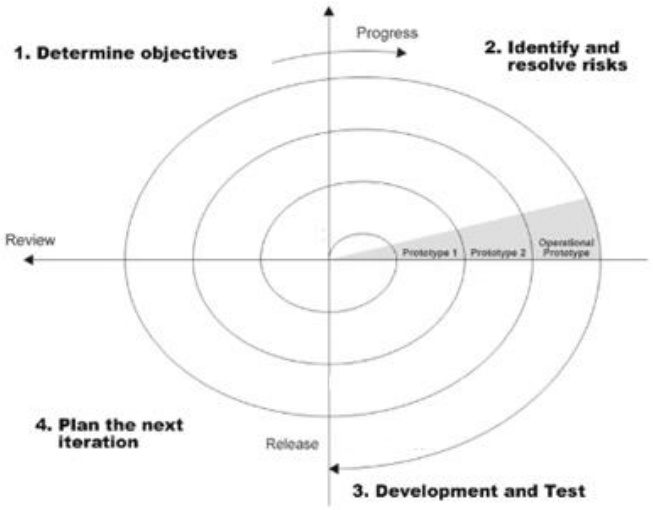
Security provided by Java:

Certain security aspects are provided by Java when the application is installed, or deployed, to the web container. Annotations and/or deployment descriptors are used to relay information to the deployer about security and other aspects of the application. Specifying this information in annotations or in the deployment descriptor helps the deployer set up the appropriate security policy for the web application.

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Implementation Approaches

To implement this project Spiral Model is used. It is a combination of Waterfall model and Incremental model with in each increment there is a phase of planning till testing and deployment as shown in below image,



Spiral Model

Spiral Modal Steps:

- Determine objective
- Identify and resolve the risk factor:
- Development and Test:
- Next iteration planning:

Iteration 1: The HomePage.html along with File upload and Image Upload was designed and implemented along with Form validations.

Iteration 2: The Servlet class was implemented to handle the Watermarking back-end logic.

Iteration 3: The Download.html along with the form validation and option to Preview the generated watermarked PDF was designed, developed and tested.

5.2 Coding Details

HomePage.html

```
<!DOCTYPE html>
<html>

<head>
<meta charset="UTF-8">
<link rel="stylesheet" type="text/css" href="main.css"  />
<title>Welcome</title>
<script src="jquery-3.5.1.min.js"></script>
<script type="text/javascript">
$(document).ready(function(){
	$('input[type="file"]').change(function(e){
		var btn_watermark=document.getElementById("btn_add_watermark");
	if(e.target.id=='btn_file_selector'){
		var filename=e.target.files[0].name;
	var uploaded_file = document.getElementById('btn_file_selector');
	var filesize=0;
	if(uploaded_file.files.length>0){
		var fsize=uploaded_file.files.item(0).size;
			filesize=(fsize/(1000*1000)).toFixed(1); //in MB
	}
		if(filename.substring(filename.lastIndexOf("."), filename.length)!=".pdf"){
			btn_watermark.classList.remove("submit_style");
			btn_watermark.classList.add("disabled_button_style");
			btn_watermark.disabled=true;
			$("#error_msg_div").text("Invalid file type");
			document.getElementById("btn_file_selector").value = "";
		}
		else if(uploaded_file.files.length > 0 && filesize>5){
			btn_watermark.classList.remove("submit_style");
			btn_watermark.classList.add("disabled_button_style");
			btn_watermark.disabled=true;
			$("#error_msg_div").text("File size too large (Maximum allowed limit:
5MB)");
			document.getElementById("btn_file_selector").value = "";
		}
		else{
			$("#lbl_file").text(e.target.files[0].name);
			$("#div_file").css("background-color","#66B2FF");
			$("#error_msg_div").text("");
			btn_watermark.classList.remove("disabled_button_style");
				btn_watermark.classList.add("submit_style");
				btn_watermark.disabled=false;
		}
	}
	else if(e.target.id=='btn_logo_selector'){
```

```
                var filename=e.target.files[0].name;
                var uploaded_img = document.getElementById('btn_logo_selector');
                var img_size=0;
                if(uploaded_img.files.length>0){
                        var fsize=uploaded_img.files.item(0).size;
                        img_size=(fsize/1000).toFixed(1);  //in KB
                }
                var ext=filename.substring(filename.lastIndexOf("."), filename.length);
                if(!(ext==".png" || ext==".jpg" || ext==".jpeg")){
                        btn_watermark.classList.remove("submit_style");
                        btn_watermark.classList.add("disabled_button_style");
                        btn_watermark.disabled=true;
                        $("#error_msg_div").text("Invalid file type (allowed types: .jpg, .png,
.jpeg)");
                        document.getElementById("btn_logo_selector").value = "";
                }
                else if(uploaded_img.files.length>0 && img_size>100){
                        btn_watermark.classList.remove("submit_style");
                        btn_watermark.classList.add("disabled_button_style");
                        btn_watermark.disabled=true;
                        $("#error_msg_div").text("Image size too large (Maximum allowed
limit: 100KB)");
                        document.getElementById("btn_logo_selector").value = "";
                }
                else{
                        $("#lbl_logo").text(e.target.files[0].name);
                        $("#div_logo").css("background-color","#66B2FF");
                        $("#error_msg_div").text("");
                        btn_watermark.classList.remove("disabled_button_style");
                                btn_watermark.classList.add("submit_style");
                                btn_watermark.disabled=false;
                }
        }
   });
});

function validateForm(){
        var file=document.getElementById("btn_file_selector");
        var logo=document.getElementById("btn_logo_selector");
        if(file.files.length==0 && logo.files.length==0){
                $("#error_msg_div").text("Select the file and watermark image");
                return false;
        }
        else if(file.files.length==0){
                $("#error_msg_div").text("Select the PDF file");
                return false;
        }
        else if(logo.files.length==0){
                $("#error_msg_div").text("Select the image to add as watermark");
                return false;
```

```
        }
        else{
                var form=document.getElementById("watermark_form");
                form.action='UploadFileHandler';
                form.submit();
        }
}

</script>
</head>
<body style="background-color:#00bfff">
<div align="center"  ><br/>
        <h1 style="font-family: sans-serif">Watermark your PDF and secure it in a
go...</h1><br/><br/>
        <form method="post" enctype="multipart/form-data"  id="watermark_form">
        <table style="background-color: white;">
                <tr align="center">
                        <td >
                                        <input type="file"  id="btn_file_selector"
name="file_upload" hidden="true" accept = ".pdf"  /><br/>
                                        <label for="btn_file_selector" >
                                                <img alt="Select a file to upload"
src="images/upload_file.png" width="250px"  height="250px"   title="Upload your file"/>
                                        </label>
                        </td>
                        <td>
                                        <input type="file"  id="btn_logo_selector"
name="logo_upload" hidden="true"/><br/>
                                        <label for="btn_logo_selector" >
                                                <img alt="Select a logo to upload"
src="images/upload_watermark.png" width="250px"  height="250px"   title="Upload your
logo"/>
                                        </label>
                        </td>
                </tr>
                <tr align="center">
                        <td>
                                <div class="file-name-display" id="div_file">
                                        <label id="lbl_file"  class="wrap-text" ></label>
                                </div>
                        </td>
                        <td>
                                <div class="file-name-display" id="div_logo">
                                        <label id="lbl_logo" class="wrap-text"></label>
                                </div>
                        </td>
                </tr>
                <tr >
                        <td colspan="2" align="center">
```

```
                                <div id="error_msg_div"  style="color:red;font-family: sans-
serif"> </div>
                        </td>
                </tr>
                <tr align="center">
                        <td colspan="2">
                                <input type="submit"  id="btn_add_watermark" value="Add
Watermark" class="submit_style"  onclick="return validateForm();"/>
                                <input type="hidden" value="HomePage" id="input_hidden"
name="input_hidden"/>
                        </td>
                </tr>
                </table>
        </form>
</div>
</body>
</html>
```

Download.html

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<link rel="stylesheet" type="text/css" href="main.css"  />
<title>Welcome</title>
<script src="jquery-3.5.1.min.js"></script>
<script type="text/javascript">
	$(document).ready(function(){
		const urlParams = new URLSearchParams(location.search);
		if(urlParams.has('watermarked') && urlParams.get('watermarked')=='true'){
		$("#msg_div").text("Files created successfully! Click Preview to view your
watermarked PDF.");
	}
	});

	function goToHome(){
		window.location.href("HomePage.html");
	}
</script>
</head>
<body style="background-color:#00bfff">
	<div align="center"  ><br/>
		<h1 style="font-family: sans-serif">Watermark your PDF and secure it in a
go...</h1><br/><br/>
		<form method="post" enctype="multipart/form-data"
id="watermark_download">
		<table style="background-color: white;">
			<tr>
				<td colspan="2" align="center">
					<div id="msg_div"  style="color:green;font-family:
sans-serif"> </div>
				</td>
			</tr>
			<tr align="center">
				<td colspan="2">
					<input type="hidden" value="Watermarked"
id="input_hidden"  name="input_hidden"/>
					<input type="submit" id="btn_preview"
value="Preview" class="submit_style"  onclick="form.action='DownloadFileHandler'"
formtarget="_blank" />
					<input type="submit" id="btn_home" value="Home"
class="submit_style"  onclick="form.action='UploadFileHandler'" />
				</td>
			</tr>
		</table>
		</form>
	</div>
```

```
</body>
</html>
```

Watermarkhandler.java

```
package com.digital_watermarking;
import java.io.FileOutputStream;
import javax.servlet.http.HttpServletRequest;
import javax.servlet.http.HttpSession;
import com.itextpdf.text.*;
import com.itextpdf.text.pdf.*;

public class WatermarkHandler {

	public WatermarkHandler() {
		// TODO Auto-generated constructor stub
	}

	public void applyWatermark(String filePath, String logoPath,HttpServletRequest
request) {
		try {

				String baseURL = filePath.substring(0, filePath.lastIndexOf("/") + 1);
				String tempFileName = filePath.substring(filePath.lastIndexOf("/"));
				 String fileName = baseURL + tempFileName.substring(1,
tempFileName.lastIndexOf(".")) + "_watermarked"+
tempFileName.substring(tempFileName.lastIndexOf("."));
				 System.out.print("Filename: "+fileName);
				 HttpSession session = request.getSession();
				 session.setAttribute("file-name",fileName);
				 System.out.print("Filename111: "+fileName);
				PdfReader reader = new PdfReader(filePath);
				PdfStamper stamper = new PdfStamper(reader, new
FileOutputStream(fileName));

				Image img = Image.getInstance(logoPath);
				float w = img.getScaledWidth();
				float h = img.getScaledHeight();

				PdfContentByte over;
				Rectangle pagesize;
				float x, y;
				int n =reader.getNumberOfPages();

				for (int i = 1; i<= n; i++) {
				  // get page size and position
					pagesize = reader.getPageSizeWithRotation(i);
					x = (pagesize.getLeft() + pagesize.getRight()) / 2;
					y = (pagesize.getTop() + pagesize.getBottom()) / 2; over =
```

```
stamper.getOverContent(i);
                        over.saveState();

                       // set transparency
                        PdfGState state = new PdfGState();
                       state.setFillOpacity(0.2f); over.setGState(state);

                       // add watermark text and image
                       over.addImage(img, w, 0, 0, h, x - (w / 2), y- (h / 2));
                       over.restoreState();
                       }
                      stamper.close();
                      reader.close();
          //  out.close();
                }
                catch (Exception e) {
                        //out.print("Error:::" + e);
                }
        }
}
```

Pom.xml

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
https://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>
  <groupId>Digital_Watermaking_System</groupId>
  <artifactId>Digital_Watermaking_System</artifactId>
  <version>0.0.1-SNAPSHOT</version>
  <packaging>war</packaging>
  <build>
    <plugins>
      <plugin>
        <artifactId>maven-compiler-plugin</artifactId>
        <version>3.8.1</version>
        <configuration>
          <release>11</release>
        </configuration>
      </plugin>
      <plugin>
        <artifactId>maven-war-plugin</artifactId>
        <version>3.2.3</version>
      </plugin>
    </plugins>
  </build>

  <dependencies>
     <!-- https://mvnrepository.com/artifact/com.itextpdf/itextpdf -->
<dependency>
    <groupId>com.itextpdf</groupId>
    <artifactId>itextpdf</artifactId>
    <version>5.5.13.2</version>
</dependency>
<dependency>
    <groupId>javax.servlet</groupId>
    <artifactId>javax.servlet-api</artifactId>
    <version>3.0.1</version>
    <scope>provided</scope>
</dependency>

   </dependencies>
</project>
```

5.3 Testing Approach

Test strategy is the outline which includes testing approaches that is to be followed in software development process.

Different types of testing are done to validate the functionality against different use cases such as:

- **Black Box Testing:**

This is also known as Functional Testing in which functionality of the software is tested. This testing is done to ensure that files are created successfully and user is able to preview/download as expected.

- **System/Integration Testing:**

System or Integration testing is done to ensure that system is working as expected without any errors when all the components are combined together. This testing is done to ensure that records in batches do not interfere with each other and are linked to Accounts properly.

- **Regression Testing:**

Regression Testing is done on this to find bugs in existing functionality because of new changes added to it. Existing functionality such as Upload files, new file creation, downloading the created files processes are tested to ensure that there is no impact on existing functionality.

CHAPTER 6: RESULTS AND DISCUSSION

Test Reports

Use Case 1: Generate Watermarked Document

As an end user, I should be able to upload the PDF file and image to be added as watermark

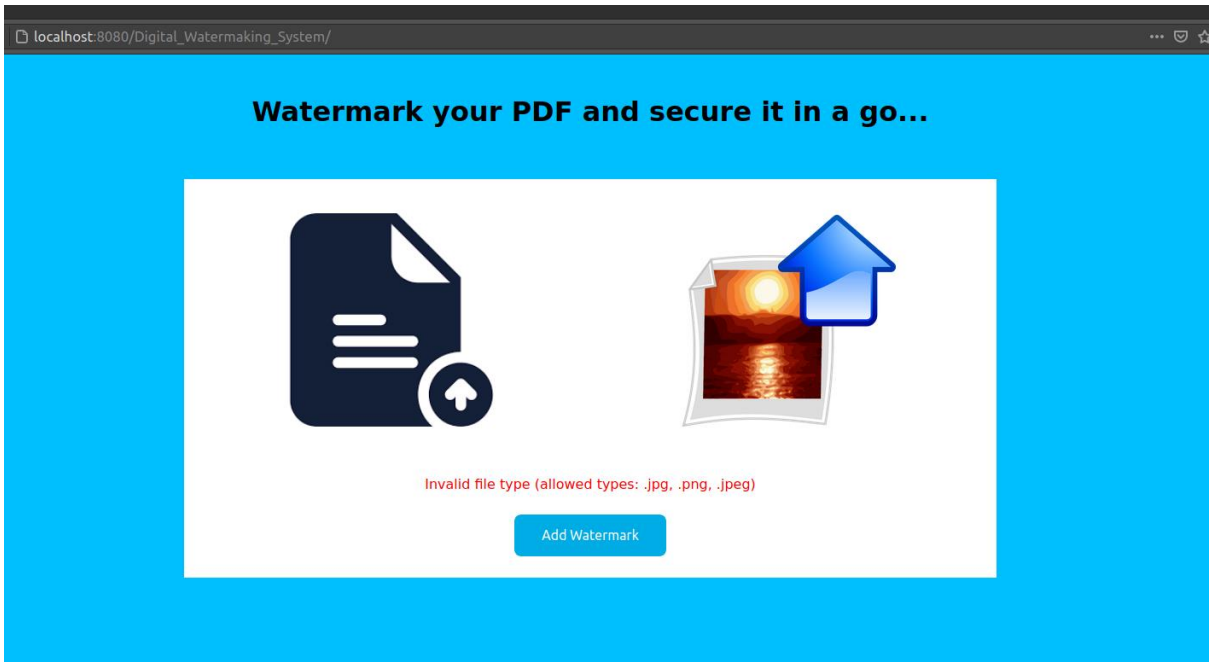
Test Case 1:

Test Case Id: TC001

Description: To verify if invalid file is uploaded user should get an error message

Step #	**Test Step**	**Expected Result**	**Actual Result**	**Result (Pass/Fail)**
1	Navigate to url http://localhost:8080/Digital_Watermaking_System/UploadFileHandler	HomePage should open	HomePage opened	Pass
2	Upload file other that .pdf in File Upload your file	Error message should be displayed and Watermark button should deactivate	Error displayed “Invalid file type” and Watermark button is Deactivated	Pass
3	Upload logo other than .png, .jpg and .jpeg format	Error message should be displayed and Watermark button should deactivate	Error displayed “Invalid file type (allowed types: .jpg, .png, .jpeg)” and Watermark button is Deactivated	Pass


localhost:8080/Digital_Watermaking_System/
Watermark your PDF and secure it in a go...
Invalid file type
Add Watermark

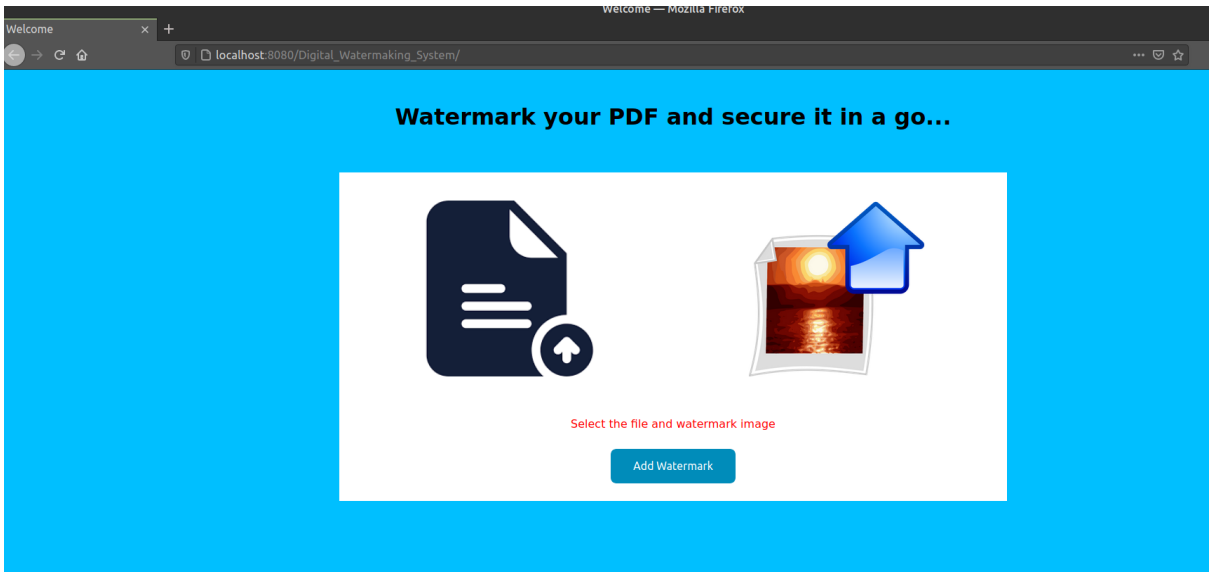

localhost:8080/Digital_Watermaking_System/
Watermark your PDF and secure it in a go...
Invalid file type (allowed types: .jpg, .png, .jpeg)
Add Watermark

Test Case 2:

Test Case Id: TC002

Description: To validate error message is displayed if none of the file is selected

Step#	Test Step	Expected Result	Actual Result	Result (Pass/Fail)
1	Navigate to url http://localhost:8080/Digital_Watermaking_System/UploadFileHandler	HomePage should open	HomePage opened	Pass
2	Click Watermark button	Error message should be displayed and Watermark button should deactivate	Error displayed “Select the file and watermark image” and Watermark button is Deactivated	Pass

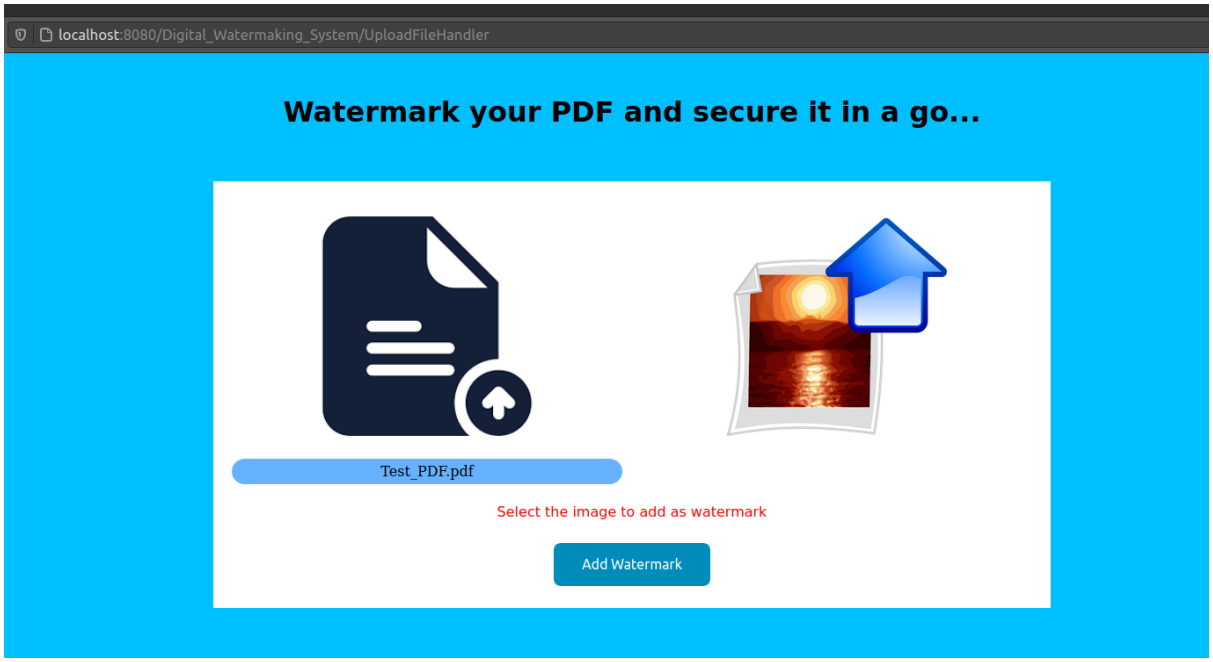


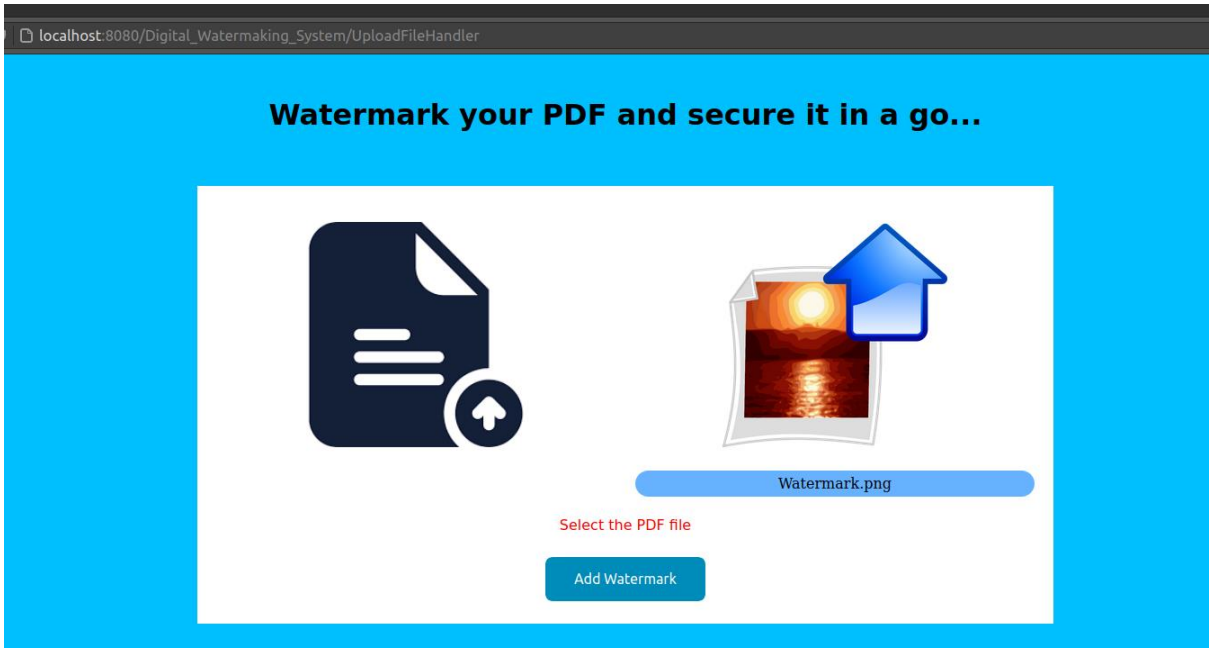
Test Case 3:

Test Case Id: TC003

Description: To verify form validation if either one of the files is selected

Step#	Test Step	Expected Result	Actual Result	Result (Pass/Fail)
1	Navigate to url http://localhost:8080/Digital_Watermaking_System/UploadFileHandler	HomePage should open	HomePage opened	Pass
2	Select PDF file by clicking on Upload your file button	File name should be displayed	Test.pdf is displayed	Pass
3	Click Watermark button	Error should be displayed and Watermark button should Deactivate	Error message “Select the image to add as watermark” and Watermark button is Deactivated	Pass
4	Again, navigate to http://localhost:8080/Digital_Watermaking_System/UploadFileHandler	HomePage should open	HomePage opened	Pass
5	Select image file by clicking on Upload your logo button	File name should be displayed	Watermark.jpg is displayed	Pass
6	Click Watermark button	Error should be displayed and Watermark button should Deactivate	Error displayed “Select the PDF file” and Watermark button is Deactivated	Pass


localhost:8080/Digital_Watermaking_System/UploadFileHandler
Watermark your PDF and secure it in a go...
Test_PDF.pdf
Select the image to add as watermark
Add Watermark

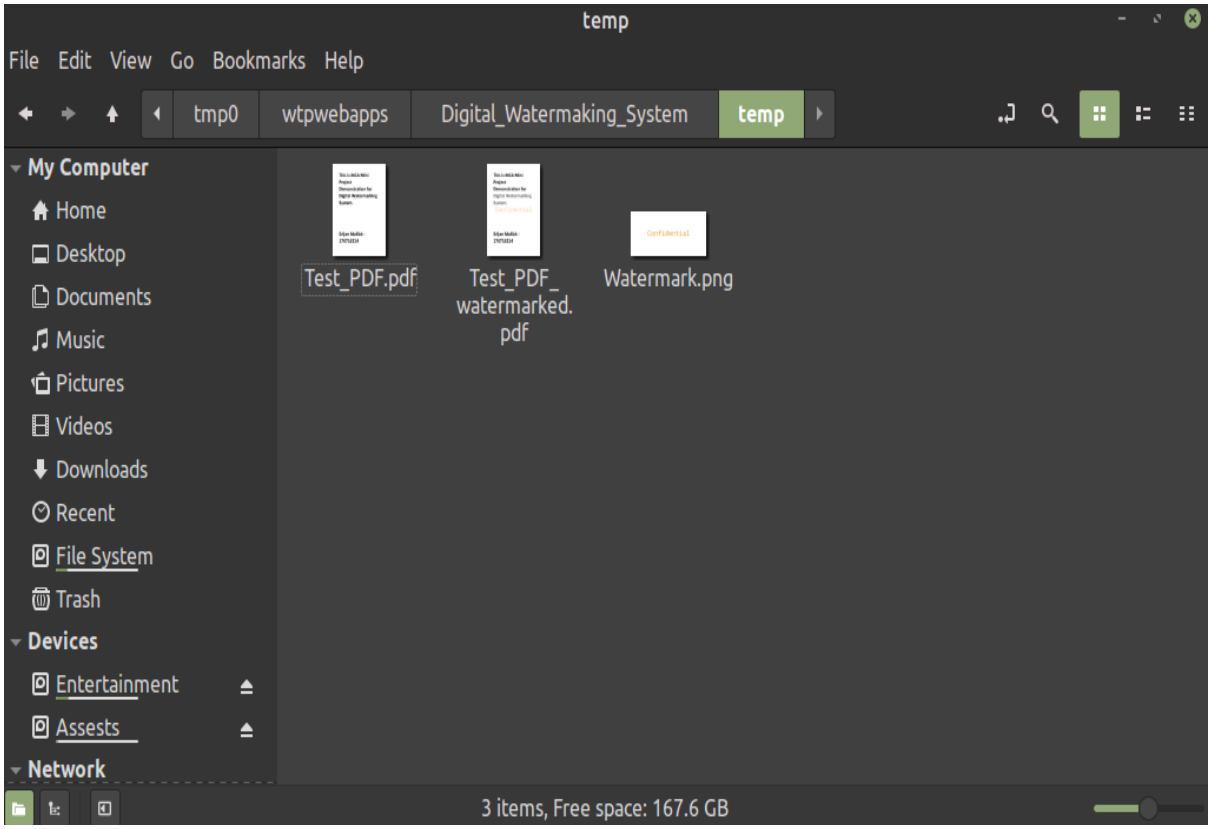

localhost:8080/Digital_Watermaking_System/UploadFileHandler
Watermark your PDF and secure it in a go...
Watermark.png
Select the PDF file
Add Watermark

Test Case 4:

Test Case Id: TC004

Description: To verify the watermarked pdf file is generated

Step#	Test Step	Expected Result	Actual Result	Result (Pass/Fail)
1	Navigate to URL http://localhost:8080/Digital_Watermaking_System/UploadFileHandler	HomePage should open	HomePage opened	Pass
2	Select PDF file by clicking on Upload your file button	File name should be displayed	Test.pdf is displayed	Pass
3	Select image file by clicking on Upload your logo button	File name should be displayed	Watermark.jpg is displayed	Pass
4	Click Watermark button	User should navigate to Download page	User is navigated to Download Page and have option to Preview the generated document	Pass
5	Go to Temp folder	Uploaded PDF, image and watermarked files should be created	Files are created	Pass


temp
File Edit View Go Bookmarks Help
tmp0
wtpwebapps
Digital_Watermaking_System
temp
My Computer
Home
Desktop
Documents
Music
Pictures
Videos
Downloads
Recent
File System
Trash
Devices
Entertainment
Assests
Network
Test_PDF.pdf
Test_PDF_watermarked.pdf
Watermark.png
3 items, Free space: 167.6 GB

Use Case 2: Preview and download generated watermarked PDF file
As an end user, I should be able to preview the PDF file and download it

Test Case 5:

Test Case Id: TC005

Description: To preview and download generated PDF file

Prerequisite: TC004 is executed successfully

Step#	Test Step	Expected Result	Actual Result	Result (Pass/Fail)
1	TC004 is executed	User should be on Download.html page	User is on Download.html page	Pass
2	Click Preview button	Generated document should be previewed in browser PDF viewer	Generated PDF document suffixed with _Watermarked is opened in PDF viewer	Pass
3	Download the file	File should be downloaded	File downloaded	Pass
4	Click Home button	User should be navigated to HomePage	Navigated to HomePage.html	Pass

CHAPTER 7: CONCLUSIONS

7.1 Conclusion

The project "Digital Image Watermarking for PDF Files" has been developed keeping the requirement of regular web users in mind trying to find a place to watermark the document quickly.

This project has been made free to use by general public and contains the most basic type of watermarking, i.e., Image Watermarking, which is mostly used by industry and even students to protect their documents against data theft, security, copyright protection, etc.

This website does not require one to sign in to watermark their document and hence no user data is stored on the web server by this website. The files uploaded on the server for watermarking are deleted along with the watermarked file once the user has downloaded the file from the website.

The website will be routinely updated and more features will be added on users' feedback received and will be secured with more security protocol.

7.2 Limitations of the System

Below are some of the limitations of the system that are listed:

- The website currently accepts only image file of the format: jpg, jpeg and png.
- The PDF file of max. size 5 MB can only be uploaded along with an image file of 100 kb. Size.
- Multiple PDF files cannot be uploaded at a time. This website can watermark only one file at a time.
- There is no facility to sign in on the website and hence no user data is retained. Once the file has been downloaded by the user it cannot be retrieved again from the server.

7.3 Future Scope of the Project

Below are some of the future scopes that can be added into this project:

- The feature of "Text Watermarking" will be added in this website.
- To enable editing of watermarking will be enabled to adjust the watermark on the PDF as per the user's requirement.
- The "Profile creation/sign in" facility will be added in the future updated so that users can store their files on the server for certain number of days.
- The max. file sizes will be increased in the coming updates.
- The option to select multiple files in order to watermark them at the same time is to be added in the future updates.

REFERENCES

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- https://www.w3schools.com/
- https://stackoverflow.com/
- https://www.javatpoint.com/
- https://codehs.com/

Books:

- Effective Java by Joshua Bloch
- Java - E. Balaguruswamy
- Clean Code by Robert C. Martin Java - The Complete Reference by Herbert Schildt
- Head First Object-Oriented Analysis Design by Brett D. McLaughlin, Gary Pollice & David West
- Java Performance: The Definite Guide by Scott Oaks