Test Plan Report

TED ÜNİVERSİTESİ

Project Title:

3DifyMe

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Course Name and Code:

CMPE 492

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1. Introduction

This document serves as a comprehensive Test Plan Report for the "3DifyMe" project. It encompasses the detailed testing methodologies, objectives, and strategies adopted to ensure the seamless functionality of the application's core features, including video and live processing, image processing, user interface (UI) operations, and error handling mechanisms. The testing process is structured to validate the system's reliability, performance, and robustness under varying scenarios and conditions. By addressing key functionalities such as video playback, anaglyph creation, real-time updates, and UI responsiveness, this report aims to confirm that the system meets the predefined quality standards and is ready for deployment. It further identifies potential risks, establishes mitigation strategies, and delineates roles and responsibilities to ensure an efficient testing lifecycle.

2.Video and Live Processing Test Plan

2.1. Scope

This part of the test plan focuses on the video processing and live camera streaming functionalities of the project. The goal is to ensure that these features operate as intended, are integrated seamlessly, and provide stable performance under various conditions. This plan also covers error handling for invalid inputs and performance assessment during live and recorded video processing.

2.2. Objectives

The objectives set the foundation for this test plan by outlining the key goals and expected outcomes, providing a clear direction for the testing process. These are the objectives of testing of video and live processing:

- Ensure functionality for video file playback and live camera streaming.
- Verify that video frames and live camera feeds are processed correctly, including generating anaglyph images.
- Test the stability and responsiveness of UI elements during video and live feed interactions.
- Identify and resolve potential performance bottlenecks, particularly in real-time scenarios.
- Ensure error handling for invalid video files.

2.3. Features to be Tested

2.3.1. Video Processing:

- Loading, decoding, and playing various video file formats (e.g., .mp4, .avi).
- Real-time processing of video frames, including applying visual effects.
- Generation and display of anaglyph images from video frames.
- Handling invalid, unsupported, or corrupted video files gracefully.

2.3.2. Live Camera Processing:

- Capturing and processing frames from a live camera feed.
- Applying effects (e.g., anaglyph creation) to real-time camera frames.
- Ensuring smooth frame rate and minimal latency during live processing.

2.4. Test Methodology

Test methodology describes the testing strategies and approaches used to ensure all aspects of the application are assessed comprehensively.

Unit Testing:

- Validate individual methods responsible for video and live frame processing (e.g., `setup_video_processing`, `update_video_frame`, `update_frame`, `create_anaglyph`).

Integration Testing:

- Test interactions between modules, ensuring smooth communication and data flow.

Performance Testing:

- Measure processing speed (frames per second) for both video playback and live camera feeds.
- Evaluate memory and CPU usage under varying load conditions.

2.5. Test Environment

This section specifies the technical setup and requirements needed to conduct the tests effectively. Since we provide the test conditions from personal computers, what we write in this section defines our common conditions.

Operating System: Windows 10/11.

Hardware Requirements:

- CPU: Minimum Intel i5 or equivalent.
- GPU: Optional.
- RAM: Minimum 8GB.
- Webcam: Standard HD (720p) or Full HD (1080p).

Software Requirements:

- Python 3.9+.
- Libraries: OpenCV 4.x, PyQt5 5.x, NumPy 1.21+.

2.6. Test Schedule

The test schedule provides a structured timeline and assigns responsibilities, ensuring the testing process proceeds efficiently and meets deadlines. The test schedule can be examined from the table below.

Task	Responsible	Date
Unit Testing	Bengisu Tuğrul , Elif Arslan	20.12.2024
Integration Testing	Bengisu Tuğrul , Elif Arslan	21.12.2024

2.7. Roles and Responsibilities

These are the responsibilities and roles during the testing process:

- Write and execute unit tests.
- Fix identified issues and optimize code for performance.
- Conduct integration and system testing.
- Document test results and report issues.

2.8. Risks

2.8.1. Performance Issues:

- **Low Frame Rate:** One of the primary risks is the potential for low frame rates during real-time processing, especially when working with live camera feeds or high-resolution videos. This issue may arise on lower-end hardware, resulting in video playback or live streaming that appears choppy or laggy, which could affect user experience and usability.
- **Processing Delay:** Real-time video and live camera frame processing can introduce latency. The delay may occur when applying visual effects (e.g., anaglyph creation) or processing video frames, which could impact the responsiveness of the application. A noticeable delay between user interaction (e.g., pausing or playing video) and visual updates can degrade the experience.

- **Limited Hardware Support:** Variations in CPU and GPU power across different hardware setups could lead to unpredictable performance. For instance, users with older or less capable devices may experience slower frame processing times or difficulty handling high-definition video feeds, leading to an inconsistent user experience.

2.8.2. Stability Risks:

- **Application Crashes:** Crashes or freezes during video playback or live camera streaming are a significant risk. Such instability could occur due to unhandled exceptions, resource allocation failures, or issues with third-party libraries like OpenCV or PyQt5. If the application crashes while processing a video or live feed, it could result in loss of user progress or data.
- **Memory Leaks:** Improper memory management during video and live camera feed processing may lead to memory leaks, where the system fails to release memory that is no longer in use. Over time, this can cause the application to slow down, freeze, or crash due to excessive memory consumption. Memory management needs to be closely monitored during stress testing to identify potential leaks.

2.8.3. Compatibility Risks:

- **Cross-Platform Inconsistencies:** The application may behave differently across various operating systems, such as Windows, Linux, or macOS. For example, differences in how video decoding libraries like OpenCV work across platforms or how hardware (e.g., webcams, GPUs) is accessed can cause unexpected issues, such as failure to load certain video formats or camera feeds. Compatibility testing across a range of OS environments will be crucial to ensure consistent performance.
- **Hardware Variability:** The application may face challenges with different camera models, graphics cards, or processors, which could lead to discrepancies in live camera feed processing, frame rendering, or video playback. Different hardware configurations may have varying levels of support for the required software libraries, and the application should be tested against a wide range of devices to ensure universal compatibility.

2.8.4. Error Handling Risks:

- **Unsupported Video Formats:** If the application fails to properly handle unsupported or corrupted video files, users may encounter crashes or a lack of clear feedback. This risk can be mitigated by ensuring that invalid video files trigger appropriate error messages and prevent the application from crashing.
- **Device Failures:** Live camera processing could be disrupted by issues such as camera disconnection, driver failures, or device incompatibilities. The application should handle such failures gracefully, providing clear error messages or fallbacks without crashing the entire system.

2.8.5. External Dependencies:

- **Library or API Changes:** If there are updates or changes to external libraries (e.g., OpenCV, PyQt5) or operating system updates that affect their functionality, the application may encounter unforeseen issues. These could include compatibility

problems, deprecated methods, or breaking changes that could disrupt core functionalities such as video playback or live streaming.

- **Network Dependency (for future features):** If the application includes any future network-dependent features (e.g., live streaming over the internet), risks related to network instability, bandwidth limitations, or server downtimes could arise. These risks would impact the quality of the video stream or cause disruptions in live streaming functionality.

2.8.6. User Error Risks:

- **Improper Input Handling:** Users may input invalid video files, select incompatible formats, or fail to connect the camera properly. These user errors could lead to application crashes or unpredictable behavior. Effective error messages, validation checks, and fail-safes will be essential to handle these situations without negatively affecting the user experience.

By addressing these risks through testing, decreasing strategies, and performance optimizations, the team can ensure that the PyQt5 video and live processing features remain reliable, and user-friendly under various environments.

2.9. Test Cases

2.9.1. Test Case: Video Frame Processing

Test Case ID	UT-VF-001
Test Case Name	Video Frame Processing
Objective	Verify that video frames are processed and displayed correctly.
Pre-condition	A valid video file is available.
Test Steps	1. Load a valid video file. 2. Call update_video_frame(). 3. Verify the UI labels display frames.
Expected Result	Frames are displayed without errors.
Pass Criteria	Frames are processed correctly.
Fail Criteria	Frames are missing or distorted.
Dependencies	OpenCV, PyQt5, valid video files.
Test Data	Video file (e.g., .mp4, 640x480).
Expected Outcome	Frames are displayed accurately.
Tested by	Bengisu Tuğrul, Elif Arslan

2.9.2. Test Case: Camera Frame Update

Test Case ID	UT-CF-002
Test Case Name	Camera Frame Update
Objective	Verify that live camera frames are processed and updated correctly.
Pre-condition	A functional webcam is available.
Test Steps	1. Start the live camera feed. 2. Call update_frame(). 3. Verify the UI labels display live feed.
Expected Result	Live feed updates correctly.
Pass Criteria	Frames update without delay.
Fail Criteria	Frames freeze or do not update.
Dependencies	OpenCV, PyQt5, webcam.
Test Data	Standard 720p webcam feed.
Expected Outcome	Live feed is updated seamlessly.
Tested by	Bengisu Tuğrul, Elif Arslan

2.9.3. Anaglyph Creation

Test Case ID	UT-AG-003
Test Case Name	Anaglyph Creation
Objective	Verify the generation of an anaglyph image.
Pre-condition	A valid frame is available.
Test Steps	1. Provide a valid frame (640x480). 2. Call create_anaglyph(). 3. Inspect the output image.
Expected Result	Anaglyph is generated correctly.
Pass Criteria	Image has red-cyan mapping.
Fail Criteria	Image has incorrect colors.
Dependencies	OpenCV, NumPy.
Test Data	Frame (e.g., .jpg, 640x480).
Expected Outcome	Correct red-cyan anaglyph image.
Tested by	Bengisu Tuğrul , Elif Arslan

Here’s a detailed explanation of what is happening at each step of the create_anaglyph function while testing the function:

2.9.3.1. Grayscale Conversion

- **Process:** The input frame is converted to a grayscale image using cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY).
- **Purpose:** This simplifies the image, reducing it to a single intensity channel. Grayscale is essential for detecting edges and gradients, as colors aren't needed for this step.
- **Saved Image:** **output_gray.jpg**
  This shows the grayscale version of the input frame, where the intensity of each pixel represents its brightness.

Figure : output_gray.jpg

2.9.3.2. Blurring

- **Process:** A Gaussian blur is applied to the grayscale image using cv2.GaussianBlur(gray, (3, 3), 0).
- **Purpose:** This reduces noise and smoothens the image, ensuring that small, irrelevant details do not interfere with edge detection.
- **Saved Image:** **output_blur.jpg**
  This shows the blurred version of the grayscale image, where edges appear smoother and noise is minimized.

Figure: output_blur.jpg

2.9.3.3. Gradient Calculation (X and Y Directions)

- **Process:** Gradients (rate of change of intensity) are computed along the X and Y axes using Sobel kernels:
    - grad_x detects horizontal edges.
    - grad_y detects vertical edges.
- **Purpose:** Gradients reveal the edges in the image, which are crucial for determining depth.
- **Saved Images:**
    - **output_grad_x.jpg:** Displays the horizontal gradients.
    - **output_grad_y.jpg:** Displays the vertical gradients.

    These images highlight the intensity changes in the respective directions, with edges appearing brighter.

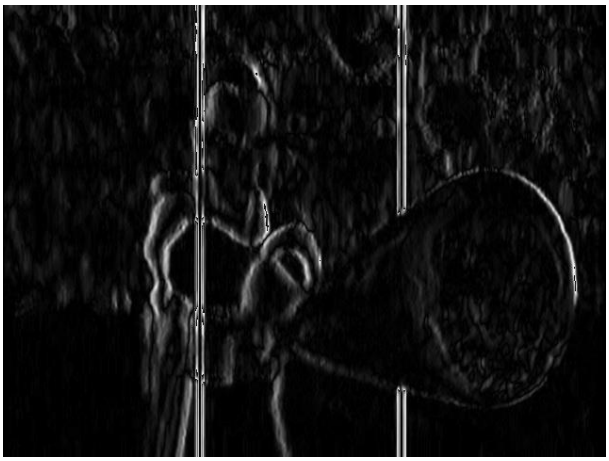

Figure: output_grad_x.jpg

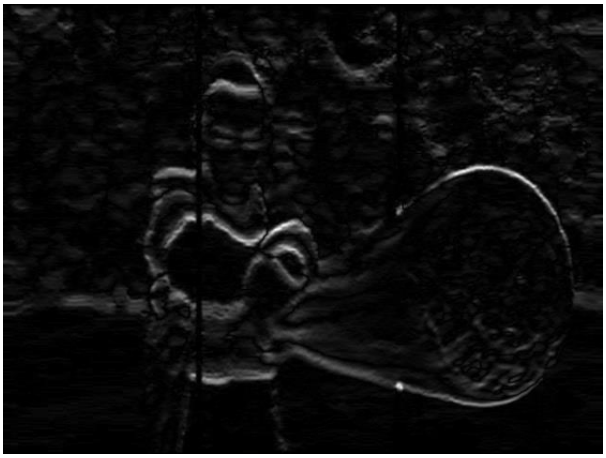

Figure : output_grad_y.jpg

2.9.3.4. Depth Map

- **Process:** The depth map is calculated as the magnitude of the combined gradients. The result is normalized to the range [0, 255] for visualization.
- **Purpose:** The depth map represents the "3D structure" of the image, where edges with higher gradient magnitudes indicate stronger depth cues.
- **Saved Image:** **output_depth_map.jpg**
  This shows the normalized depth map, where edges appear brighter and smoother areas appear darker.

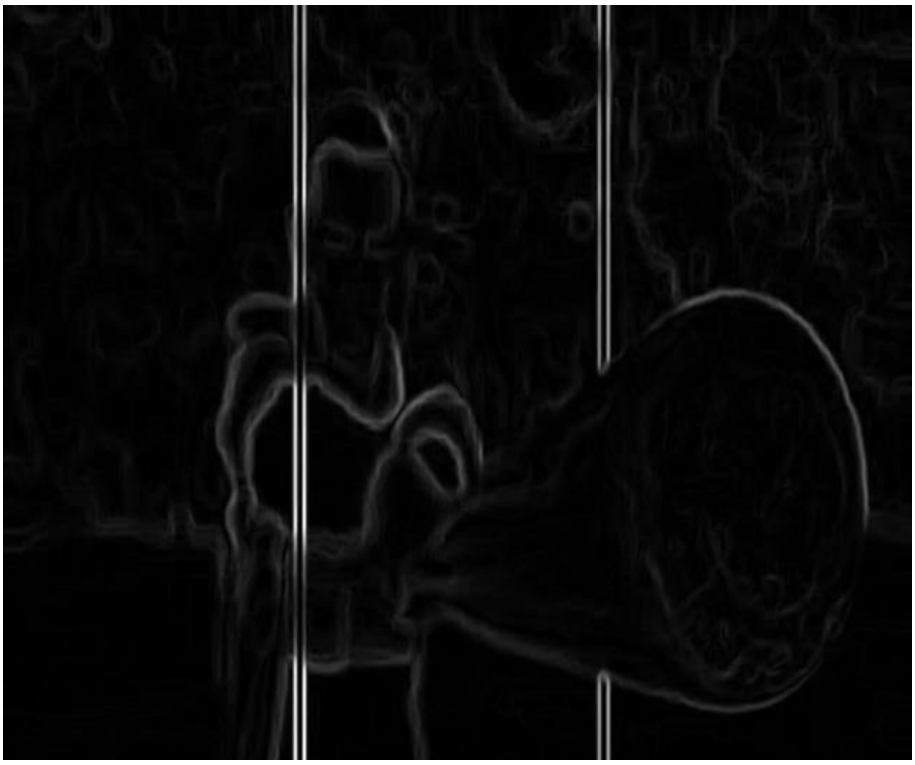

Figure: output_depth_map.jpg

2.9.3.5. Channel Splitting

- **Process:** The input frame's color channels (Blue, Green, and Red) are separated using cv2.split(frame).
- **Purpose:** Each channel is processed separately to create the anaglyph effect, where red, green, and blue are shifted independently.

- **Saved Images:**

  - **output_channel_b.jpg:** Displays the blue channel.
  - **output_channel_g.jpg:** Displays the green channel.
  - **output_channel_r.jpg:** Displays the red channel.

Figure: output_channel_b.jpg:

Figure: output_channel_g.jpg:

Figure : output_channel_r.jpg:

2.9.3.6. Shift Calculation

- **Process:** Pixel shifts are calculated based on the depth map. The shift_amount determines how much each pixel is moved:
    - Red shifts to the left based on depth.
    - Blue and Green shift to the right based on depth.
- **Purpose:** These shifts create the 3D anaglyph effect by mimicking binocular disparity (differences in viewpoints between two eyes).
- **Saved Images:** Not directly saved, but the shifts are applied in the next step.

2.9.3.7. Anaglyph Assembly

- **Process:** The shifted channels are combined into a single image:
    - Red channel: Shifted to the left.
    - Blue and Green channels: Shifted to the right.
- **Purpose:** The combined image creates the 3D effect when viewed with red-cyan glasses.
- **Saved Image:** **output_anaglyph.jpg**
  This shows the final anaglyph image, where the 3D effect is visible.

Figure : output_anaglyph.jpg

2.9.4. Test Case: Video Navigation

Test Case ID	IT-VN-004
Test Case Name	Video Navigation
Objective	Ensure seamless navigation during video playback.
Pre-condition	A valid video file is available.
Test Steps	1. Start video playback. 2. Stop video and navigate back to the main menu. 3. Verify UI transitions.
Expected Result	Smooth transitions without crashes.
Pass Criteria	UI updates correctly during transitions.
Fail Criteria	UI freezes or crashes.
Dependencies	OpenCV, PyQt5, valid video files.
Test Data	Video file (e.g., .mp4, 640x480).
Expected Outcome	Navigation is smooth and reliable.
Tested by	Bengisu Tuğrul , Elif Arslan

2.9.5. Test Case: Error Handling for Invalid Files

Test Case ID	UT-EH-005
Test Case Name	Error Handling for Invalid Files
Objective	Verify application behavior with invalid video files.
Pre-condition	An invalid video file is provided.
Test Steps	1. Load an invalid file (e.g., corrupted or unsupported format). 2. Call setup_video_processing(). 3. Observe error handling.
Expected Result	Application displays an error message without crashing.
Pass Criteria	Errors are handled gracefully.
Fail Criteria	Application crashes or freezes.
Dependencies	OpenCV, PyQt5.
Test Data	Invalid file (e.g., corrupted video).
Expected Outcome	Error is handled without issues.
Tested by	Bengisu Tuğrul , Elif Arslan

2.10. Test Results

Test ID	Test Name	Status	Comments
UT-VF-001	Video Frame Processing	Passed	Frames displayed correctly.
UT-CF-002	Camera Frame Update	Passed	Live feed updated seamlessly.
UT-AG-003	Anaglyph Creation	Passed	Anaglyph image generated.
IT-VN-004	Video Navigation	Passed	Smooth navigation observed.
UT-EH-005	Error Handling for Invalid Files	Passed	Errors handled gracefully.

2.11. Conclusion

The tests have confirmed that the video and live processing features are functioning as expected. Video frame processing, live camera updates, anaglyph creation, video navigation, and error handling tests have all passed successfully. The application processes valid video files correctly, handles live camera feeds in real-time. Error handling for invalid file inputs and device failures was implemented, ensuring the application continues to respond without crashing. The user interface functions smoothly during video navigation.

Overall, the video and live processing features are operating as intended, and the video and live processing is ready for usage.

3. Test Case - Image

This document includes the test plans and test cases for validating the core image processing features in the "3DifyMe" project. The main focus is on testing the depth map generation and anaglyph creation functions to ensure they work correctly. The test plans outline the objectives, scope, and strategies for testing each function, while the test cases describe different scenarios to check for proper functionality, error handling, and performance. The goal is to confirm that depth maps are generated accurately and that anaglyph images are created without issues, ensuring the system works reliably under various conditions. We know that as a team, in our syllabus we are asked only about test plans and test cases information as a table, because of that we are only putting this information in this document.

Test Plan for “adjust_brightness_contrast” functionality in our application.

Test Plan ID	TP-3DIFYME-IMGPROC-CONTRAST-001-BrightnessContrast
Test Plan Name	Brightness and Contrast Adjustment Test Plan
Version	1.0
Author	Hamza Emin Hacıoğlu
Objective	To ensure brightness and contrast adjustments modify the image as per the provided alpha and beta parameters without introducing artifacts.
Scope	Validates the adjust_brightness_contrast method on grayscale and color images under varying conditions (low contrast, overexposed, underexposed).
Test Strategy	Unit Testing: Test the effect of different alpha (contrast) and beta (brightness) values. - Boundary Testing: Test extreme values (e.g., alpha=0, alpha=3, beta=-255, beta=255).
Test Criteria	**Pass:** Image brightness and contrast adjust correctly with no visual artifacts. **Fail:** Output images are over/under-saturated or distorted.
Test Deliverables	Test cases, logs, and reports summarizing the outcomes.
Dependencies	OpenCV library, test image datasets, Python environment**.**
Approval	Name: Hamza Emin Hacıoğlu Role: Group Member

Test Case 1: Brightness and Contrast Adjustment - Standard Values

Test Case ID	TC-BC-001
Test Case Name	Brightness and Contrast Adjustment with Standard Alpha and Beta
Objective	To verify that the adjust_brightness_contrast function adjusts brightness and contrast correctly for a standard image using typical alpha and beta values.
Pre-condition	A valid image file is available.
Test Steps	1. Call adjust_brightness_contrast(image, alpha=1.5, beta=50) with a valid image. 2. Verify that the image brightness and contrast are adjusted correctly. 3. Inspect the output for visual artifacts (e.g., oversaturation).
Expected Result	The image should have increased contrast and brightness as per the alpha and beta values without visual distortion.
Pass Criteria	The image is adjusted with no visual artifacts. - The changes in brightness and contrast are perceptible.
Fail Criteria	- The image appears overexposed or underexposed. - Visual artifacts are noticeable (e.g., color distortions or pixelation).
Dependencies	OpenCV library, valid test image dataset.
Test Data	A standard grayscale or color image (e.g., test_image.jpg).
Expected Outcome	The image should show enhanced contrast and brightness, but no saturation or distortion issues.

Test Case 2: Brightness and Contrast Adjustment - Extreme Values

Test Case ID	TC-BC-002
Test Case Name	Brightness and Contrast Adjustment with Extreme Alpha and Beta
Objective	To validate that the adjust_brightness_contrast function handles extreme values of alpha and beta without introducing distortion.
Pre-condition	A valid image file is available.
Test Steps	1. Call adjust_brightness_contrast(image, alpha=3.0, beta=255) with a valid image. 2. Call adjust_brightness_contrast(image, alpha=0, beta=-255) to test extreme negative values. 3. Inspect the output image for overexposure, underexposure, and artifacts.
Expected Result	The image should adjust correctly, with the contrast and brightness values applied. No artifacts should appear.
Pass Criteria	- No oversaturation or visual distortion. - Extreme values applied correctly with the expected change in appearance.
Fail Criteria	- The image is distorted or saturated beyond reasonable limits. - The output is visually incorrect or overly bright/dark.
Dependencies	OpenCV library, valid test image dataset.
Test Data	A grayscale or color image that can demonstrate the effects of extreme adjustments (e.g., test_image.jpg).
Expected Outcome	The image should adjust according to the extreme values of alpha and beta and should not show excessive distortion or artifacts.

Test Case 3: Brightness and Contrast Adjustment - Boundary Testing

Test Case ID	TC-BC-003
Test Case Name	Boundary Testing for Brightness and Contrast Adjustment
Objective	To test the boundary conditions of alpha (contrast) and beta (brightness), ensuring the function behaves as expected at the limits of the input range.
Pre-condition	A valid image file is available.
Test Steps	1. Call adjust_brightness_contrast(image, alpha=0, beta=0) and verify that the image is unchanged. 2. Call adjust_brightness_contrast(image, alpha=3, beta=255) and verify the result. 3. Call adjust_brightness_contrast(image, alpha=0, beta=-255) and verify the result.
Expected Result	The image should correctly handle extreme values for alpha and beta, producing expected visual changes without distortion.
Pass Criteria	- The image is unchanged when alpha and beta are 0. - The function handles extreme values without introducing errors or unexpected results.
Fail Criteria	- The function causes the image to distort or fail to apply expected brightness/contrast changes.
Dependencies	OpenCV library, valid test image dataset.
Test Data	A grayscale or color image (e.g., test_image.jpg).
Expected Outcome	The image should remain unchanged when alpha=0 and beta=0, and the adjustments should be visible for extreme values.

Test Plan for “apply_gamma_correction” functionality in our application.

Test Plan ID	TP-3DIFYME-IMGPROC-CONTRAST-002-GammaCorrection
Test Plan Name	Gamma Correction Test Plan
Version	1.0
Author	Hamza Emin Hacıoğlu
Objective	Validate that gamma correction enhances brightness appropriately and preserves details, using varying gamma values.
Scope	Focus on the apply_gamma_correction method's ability to handle grayscale and RGB images with gamma values >1 and <1.
Test Strategy	- Unit Testing: Test the method with gamma values such as 0.5, 1.0, and 2.0. - Performance Testing: Verify the efficiency of applying gamma correction on large images.
Test Criteria	**Pass:** Images adjust brightness smoothly without losing details. **Fail:** Images are overly dark/bright or exhibit visible banding.
Test Deliverables	Test cases, analysis reports, and bug logs.
Dependencies	OpenCV, numpy library, and a diverse image dataset.
Approval	Name: Hamza Emin Hacıoğlu Role: Group Member

Test Case 1: Gamma Correction - Standard Values

Test Case ID	TC-GC-001
Test Case Name	Gamma Correction with Standard Gamma Values
Objective	To validate that the apply_gamma_correction function adjusts the image brightness correctly using standard gamma values such as 1.0, 2.0, and 0.5.
Pre-condition	A valid image file is available.
Test Steps	1. Apply apply_gamma_correction(image, gamma=1.0) on a standard image. 2. Apply apply_gamma_correction(image, gamma=2.0) for an enhancement effect. 3. Apply apply_gamma_correction(image, gamma=0.5) to darken the image. 4. Inspect the output for expected brightness changes without loss of detail or banding.
Expected Result	The image brightness should change according to the gamma value, with no visible distortion or loss of image details.
Pass Criteria	- The image brightness should adjust smoothly. - No visible artifacts such as banding or loss of detail.
Fail Criteria	- The image becomes too dark or bright. - The image exhibits visible banding or significant detail loss.
Dependencies	OpenCV, numpy library, valid test image dataset.
Test Data	A variety of test images (grayscale and RGB) with varying brightness levels.
Expected Outcome	The image should demonstrate smooth brightness adjustments, with details preserved for all gamma values.

Test Case 2: Gamma Correction - Extreme Gamma Values

Test Case ID	TC-GC-002
Test Case Name	Gamma Correction with Extreme Gamma Values
Objective	To test the behavior of the apply_gamma_correction function when using extreme gamma values like very high (e.g., 5.0) and very low (e.g., 0.1) to check the image's ability to handle such adjustments.
Pre-condition	A valid image file is available.
Test Steps	1. Apply apply_gamma_correction(image, gamma=5.0) to apply extreme enhancement. 2. Apply apply_gamma_correction(image, gamma=0.1) to darken the image significantly. 3. Inspect the output for expected brightness change without introducing artifacts.
Expected Result	The image should adjust as expected based on extreme gamma values, without introducing visible artifacts like banding or loss of detail.
Pass Criteria	- The image should be significantly brighter or darker based on the extreme gamma value. - No visible artifacts like banding or pixelation
Fail Criteria	- The image becomes overexposed or too dark. - The image exhibits visible banding or degradation of detail.
Dependencies	OpenCV, numpy library, valid test image dataset.
Test Data	A variety of test images (grayscale and RGB) with varying brightness and contrast levels.
Expected Outcome	The image should show significant brightness adjustments without losing detail, even with extreme gamma values.

Test Case 3: Gamma Correction - Performance with Large Images

Test Case ID	TC-GC-003
Test Case Name	Gamma Correction Performance on Large Images
Objective	To test the performance of the apply_gamma_correction function when applied to large images, ensuring it runs efficiently without crashing or significant delays.
Pre-condition	A valid large image file is available (e.g., 4000x3000 pixels).
Test Steps	1. Apply apply_gamma_correction(large_image, gamma=1.2) to a large image. 2. Measure the time taken to apply the gamma correction. 3. Verify that the process completes without significant delays or crashes.
Expected Result	The gamma correction should apply to the large image without significant performance degradation.
Pass Criteria	- The process should complete within a reasonable time frame (e.g., < 5 seconds for a 4000x3000 image). - No memory overflow or crashes should occur.
Fail Criteria	- The process takes too long (e.g., > 10 seconds) or crashes. - The output image is incorrect or incomplete.
Dependencies	OpenCV, numpy library, valid test image dataset, performance testing tools
Test Data	A large test image (e.g., 4000x3000 pixels).
Expected Outcome	The gamma correction should apply successfully and efficiently to large images without performance issues.

Test Plan for “equalize_histogram” functionality in our application.

Test Plan ID	TP-3DIFYME-IMGPROC-CONTRAST-003-HistogramEqualization
Test Plan Name	Histogram Equalization Test Plan
Version	1.0
Author	Hamza Emin Hacıoğlu
Objective	Ensure histogram equalization improves contrast while preserving natural image quality
Scope	Tests equalize_histogram for grayscale and color (BGR) images, with a focus on low-contrast inputs.
Test Strategy	- Unit Testing: Validate histogram equalization on varying image types. - Integration Testing: Ensure compatibility with pipeline outputs.
Test Criteria	**Pass:** Enhanced contrast with no unnatural color shifts or artifacts. **Fail:** Over-enhancement, loss of details, or unnatural appearance.
Test Deliverables	Test cases, performance metrics, and visual comparison reports.
Dependencies	OpenCV, sample grayscale and color images.
Approval	Name: Hamza Emin Hacıoğlu Role: Group Member

Test Case 1: Histogram Equalization - Standard Grayscale Image

Test Case ID	TC-HE-001
Test Case Name	Histogram Equalization on Standard Grayscale Image
Objective	To validate that the equalize_histogram method improves the contrast of a standard grayscale image without introducing any artifacts or unnatural color shifts.
Pre-condition	A valid grayscale image with low contrast is available.
Test Steps	1. Load a low-contrast grayscale image. 2. Apply equalize_histogram(image) to the image. 3. Inspect the output image for improved contrast and preserved natural detail. 4. Compare the output image to the original for visual quality and contrast enhancement.
Expected Result	The contrast of the grayscale image should improve, with no unnatural artifacts or loss of detail.
Pass Criteria	- The image should exhibit improved contrast. - The image should maintain natural quality with no visible artifacts.
Fail Criteria	- The image becomes over-enhanced or loses detail. - The image exhibits unnatural artifacts such as color shifts or banding.
Dependencies	OpenCV, valid test grayscale image dataset.
Test Data	A set of low-contrast grayscale images.
Expected Outcome	The contrast of the grayscale image should improve without introducing artifacts or losing natural appearance.

Test Case 2: Histogram Equalization - Standard Color (BGR) Image

Test Case ID	TC-HE-002
Test Case Name	Histogram Equalization on Standard Color (BGR) Image
Objective	To test the equalize_histogram function on a color (BGR) image, ensuring that contrast is enhanced without causing color shifts or losing detail.
Pre-condition	A valid color (BGR) image with low contrast is available.
Test Steps	1. Load a low-contrast color image (BGR). 2. Apply equalize_histogram(image) to the color image. 3. Inspect the output image for enhanced contrast, ensuring that color integrity is preserved. 4. Compare the output image to the original for visual quality and contrast enhancement.
Expected Result	The color image should have enhanced contrast without color distortion or loss of detail.
Pass Criteria	- The color image should exhibit improved contrast. - The image should retain accurate color representation and no visible artifacts.
Fail Criteria	- The color image exhibits unnatural color shifts or becomes over-enhanced. - The image loses detail or exhibits visible artifacts.
Dependencies	OpenCV, valid test color (BGR) image dataset.
Test Data	A set of low-contrast color (BGR) images.
Expected Outcome	The color image should show improved contrast with preserved natural colors and no artifacts.

Test Plan for noise reduction with bilateral filtering functionality in our application.

Test Plan ID	TP-3DIFYME-NOISE-BILATERAL-001
Test Plan Name	Noise Handling Test Plan - Bilateral Method
Version	1.0
Author	Hamza Emin Hacıoğlu
Objective	Validate that the bilateral filter removes noise effectively while preserving edge details in the image.
Scope	This test focuses on the noise removal functionality using the bilateral filter in the remove_noise function.
Test Strategy	- **Unit Testing**: Test the bilateral filter with various noisy images. - **Performance Testing**: Measure processing time for noise removal.
Test Criteria	**Pass Criteria:** Noise is significantly reduced while edge details are preserved. Processing time is within acceptable limits. **Fail Criteria:** Over-smoothing occurs, blurring edges or key features. Processing time exceeds acceptable limits.
Test Deliverables	- Test Cases - Test Reports - Bug Reports
Dependencies	- Python - OpenCV library - High-noise test images
Approval	Name: Hamza Emin Hacıoğlu Role: Group Member

Test Case 1: Noise Removal with Bilateral Filter - Standard Noisy Image

Test Case ID	TC-NOISE-001
Test Case Name	Bilateral Filter on Standard Noisy Image
Objective	Validate that the bilateral filter removes noise effectively while preserving edge details in a standard noisy image.
Pre-condition	A valid noisy image with Gaussian noise is available.
Test Steps	1. Load a noisy image with Gaussian noise. 2. Apply the remove_noise function with the bilateral filter. 3. Inspect the output image for reduced noise and preserved edge details. 4. Compare the processed image with the original noisy image for noise reduction and edge preservation.
Expected Result	The noise should be significantly reduced while preserving the edges and key features of the image.
Pass Criteria	- Noise reduction should be visible without affecting edge details. - The image should retain its sharpness and important features.
Fail Criteria	The bilateral filter over-smooths the image, blurring edges and features. - Noise is not sufficiently reduced or becomes more pronounced.
Dependencies	OpenCV, valid test noisy image dataset.
Test Data	A set of noisy images with Gaussian noise.
Expected Outcome	The image should exhibit reduced noise with preserved sharp edges and features

Test Case 2: Performance Testing - Bilateral Filter on Large Noisy Image

Test Case ID	TC-NOISE-002
Test Case Name	Performance Testing for Bilateral Filter on Large Noisy Image
Objective	Measure the performance (processing time) of the bilateral filter when applied to a large noisy image.
Pre-condition	A large noisy image with Gaussian noise is available.
Test Steps	1. Load a large noisy image with Gaussian noise. 2. Apply the remove_noise function with the bilateral filter. 3. Measure the processing time for noise removal. 4. Inspect the output image for effective noise removal and edge preservation. 5. Compare the processing time with the acceptable limits (e.g., 1-2 seconds for large images).
Expected Result	The bilateral filter should remove noise effectively without exceeding the defined processing time.
Pass Criteria	- Noise is effectively removed. - Processing time should be within acceptable limits (e.g., under 5 seconds for large images).
Fail Criteria	- Noise is not adequately removed. - Processing time exceeds acceptable limits.
Dependencies	OpenCV, valid test noisy image dataset, performance monitoring tools.
Test Data	A set of large noisy images with Gaussian noise.
Expected Outcome	The bilateral filter should efficiently reduce noise without causing long processing delays.

Test Plan for noise handling with wavelet filtering functionality in our application.

Test Plan ID	TP-3DIFYME-NOISE-WAVELET-002
Test Plan Name	Noise Handling Test Plan - Wavelet Method
Version	1.0
Author	Hamza Emin Hacıoğlu
Objective	Ensure that the wavelet denoising method effectively reduces noise while maintaining image details and dynamic range.
Scope	This test focuses on the noise removal functionality using the wavelet denoising method in the `remove_noise` function.
Test Strategy	- **Unit Testing**: Validate the wavelet method on grayscale and RGB images. - **Performance Testing**: Measure runtime.
Test Criteria	**Pass Criteria:** Noise reduction is noticeable, and key details are retained. Processed images have an acceptable dynamic range. **Fail Criteria:** Over-smoothing or artifacts are introduced. Processing runtime exceeds acceptable thresholds.
Test Deliverables	- Test Cases - Test Reports - Bug Reports
Dependencies	Python 3.x - OpenCV library - scikit-image library - High-noise test images
Approval	Name: Hamza Emin Hacıoğlu Role: Group Member

Test Case 1: Wavelet Denoising on Grayscale Image

Test Case ID	TC-NOISE-WAVELET-001
Test Case Name	Wavelet Denoising on Grayscale Noisy Image
Objective	Ensure that the wavelet denoising method effectively reduces noise while maintaining key details in a grayscale image.
Pre-condition	A valid grayscale noisy image with Gaussian or salt-and-pepper noise is available.
Test Steps	1. Load a noisy grayscale image (with noise such as Gaussian or salt-and-pepper). 2. Apply the wavelet denoising method from the remove_noise function. 3. Inspect the output image to check for reduced noise and retained details. 4. Evaluate the dynamic range and detail preservation.
Expected Result	Noise should be noticeably reduced, and key features of the image should be retained. The dynamic range should remain acceptable.
Pass Criteria	- Significant noise reduction is visible. - Key details and features of the image should remain intact. - No over-smoothing or artifacts.
Fail Criteria	- Over-smoothing of the image. - Loss of image details. - Artifacts or unnatural appearance introduced.
Dependencies	OpenCV, scikit-image, grayscale noisy image dataset.
Test Data	Grayscale images with noise (Gaussian, salt-and-pepper).
Expected Outcome	The image should have reduced noise while maintaining the image's natural appearance and dynamic range.

Test Case 2: Performance Testing - Wavelet Denoising on Large Noisy Image

Test Case ID	TC-NOISE-WAVELET-002
Test Case Name	Performance Testing for Wavelet Denoising on Large Noisy Image
Objective	Measure the performance (runtime) of the wavelet denoising method on large noisy images.
Pre-condition	A large noisy image (grayscale or RGB) with Gaussian noise is available.
Test Steps	1. Load a large noisy image with Gaussian or salt-and-pepper noise. 2. Apply the wavelet denoising method from the remove_noise function. 3. Measure the processing time for noise removal. 4. Inspect the output image for effective noise reduction and detail preservation. 5. Compare the processing time with acceptable limits (e.g., under 5 seconds for large images).
Expected Result	The wavelet denoising method should remove noise effectively and the processing time should be within acceptable limits.
Pass Criteria	- Noise is effectively removed. - Processing time is under the acceptable limit (e.g., <5 seconds for large images).
Fail Criteria	- Noise is not effectively removed. - Processing time exceeds the acceptable threshold.
Dependencies	OpenCV, scikit-image, noisy image dataset, performance monitoring tools.
Test Data	A set of large noisy images with Gaussian or salt-and-pepper noise.
Expected Outcome	The denoising should run efficiently, removing noise without compromising runtime performance.

Test Plan for upscaling the image functionality in our application.

Test Plan ID	TP-3DIFYME-UPSCALE-DNN-003
Test Plan Name	Upscaling Test Plan - DNN Super-Resolution
Version	1.0
Author	Hamza Emin Hacıoğlu
Objective	Validate the functionality and performance of the DNN-based super-resolution method in upscaling low-resolution images.
Scope	This test focuses on the upscaling functionality of the `upscale_image` function using the DNN super-resolution model.
Test Strategy	- **Unit Testing**: Test the function with images of various resolutions and content types. - **Performance Testing**: Measure processing time and resource usage.
Test Criteria	**Pass Criteria:** Upscaled images show improved resolution without significant artifacts or blurring. Processing time and resource usage are within acceptable limits. **Fail Criteria:** Artifacts or blurring occur, or processing is unacceptably slow.
Test Deliverables	- Test Cases - Test Reports - Bug Reports
Dependencies	- Python 3.x - OpenCV library - Pre-trained model files (e.g., LapSRN_x2.pb, LapSRN_x4.pb)
Approval	Name: Hamza Emin Hacıoğlu Role: Group Member

Test Case 1: Unit Testing - Upscaling Low-Resolution Image

Test Case ID	TC-UPSCALE-DNN-001
Test Case Name	Upscaling Low-Resolution Image with DNN Super-Resolution
Objective	Ensure that the DNN-based super-resolution method effectively upscales low-resolution images without introducing artifacts.
Pre-condition	A low-resolution image (e.g., 128x128) is available.
Test Steps	1. Load a low-resolution image (e.g., 128x128 or similar). 2. Apply the upscale_image function with a DNN-based model (e.g., LapSRN_x2 or LapSRN_x4). 3. Inspect the output image for improved resolution and check for any artifacts or blurring. 4. Compare the upscaled image with a ground truth or expected result.
Expected Result	The output image should have improved resolution with no significant artifacts or blurring.
Pass Criteria	- The image resolution is clearly enhanced. - No noticeable artifacts or blurring. - Details are preserved in the upscaled image.
Fail Criteria	- The upscaled image shows noticeable artifacts or blurring. - The resolution is not significantly improved.
Dependencies	OpenCV, pre-trained DNN model files (LapSRN_x2.pb, LapSRN_x4.pb), low-resolution image dataset.
Test Data	Low-resolution images (e.g., 128x128) with various content types (e.g., landscapes, portraits, etc.).
Expected Outcome	The low-resolution image should be upscaled to a higher resolution, and the output should retain the image quality without artifacts.

Test Case 2: Performance Testing - DNN Super-Resolution on High-Resolution Image

Test Case ID	TC-UPSCALE-DNN-002
Test Case Name	Performance Testing for DNN Super-Resolution on High-Resolution Image
Objective	Measure the processing time and resource usage for upscaling a high-resolution image using the DNN super-resolution method.
Pre-condition	A high-resolution image (e.g., 2048x2048) is available.
Test Steps	1. Load a high-resolution image (e.g., 2048x2048 or higher). 2. Apply the upscale_image function using the DNN-based super-resolution model. 3. Measure the processing time for the upscaling operation. 4. Monitor CPU and memory usage during processing. 5. Compare the processing time with acceptable limits (e.g., under 10 seconds for a 2048x2048 image).
Expected Result	The upscaling process should complete within acceptable time limits, and resource usage should not exceed predefined thresholds.
Pass Criteria	- The image is upscaled efficiently without excessive delays. - CPU and memory usage stay within acceptable limits.
Fail Criteria	- Processing time exceeds the acceptable limit. - CPU or memory usage is too high during processing.
Dependencies	OpenCV, pre-trained DNN model files (LapSRN_x2.pb, LapSRN_x4.pb), high-resolution image dataset, performance monitoring tools.
Test Data	High-resolution images (e.g., 2048x2048) from various content types (e.g., nature, urban).
Expected Outcome	The high-resolution image should be upscaled efficiently, with minimal processing time and resource usage.

Test Plan for depth map creation functionality in our application.

Test Plan ID	TP-3DIFYME-DEPTHMAP-001
Test Plan Name	Depth Map Generation Test Case
Version	1.0
Author	Hamza Emin Hacıoğlu
Objective	To validate the functionality of the generate_depth_map function to ensure that depth maps are generated correctly from valid input images.
Scope	Testing the ability of the generate_depth_map function to correctly process an input image and generate a corresponding depth map.
Test Strategy	- Unit Testing: Test the function in isolation. - Boundary Testing: Test with different image sizes. - Error Handling: Test with invalid file paths.
Test Criteria	- **Pass**: Depth map is generated, displayed, and saved correctly. - **Fail**: The function throws an error or fails to generate the depth map.
Test Deliverables	- Test case documentation. - Test execution results. - Screenshots of generated depth maps.
Dependencies	- Python libraries: OpenCV, NumPy, Hugging Face Transformers, Pillow, and PyTorch. - Pre-trained DPT model ("Intel/dpt-large").
Approval	Name: Hamza Emin Hacıoğlu Role: Group Member

Test Case 1: Unit Testing - Valid Image for Depth Map Generation

Test Case ID	TC-DMG-001
Test Case Name	Valid Image for Depth Map Generation
Objective	Ensure the generate_depth_map function correctly processes a valid image and generates a corresponding depth map.
Pre-condition	A valid input image (e.g., an RGB image) is available.
Test Steps	1. Load a valid input image (e.g., 512x512 RGB image). 2. Apply the generate_depth_map function. 3. Display and save the generated depth map. 4. Inspect the output depth map for correctness.
Expected Result	The output should be a depth map with the expected depth values, displayed correctly, and saved in the correct format.
Pass Criteria	- Depth map is generated without errors. - The depth map has correct depth values. - Depth map is saved and displayed correctly.
Fail Criteria	- The function fails to generate a depth map. - The depth map has incorrect or missing depth information.
Dependencies	OpenCV, NumPy, Hugging Face Transformers, Pillow, PyTorch, pre-trained DPT model.
Test Data	Valid input RGB image (e.g., 512x512).
Expected Outcome	The function should generate a valid depth map with correct depth estimation, display it, and save the result without errors.

Test Case 2: Error Handling - Invalid Image Path

Test Case ID	TC-DMG-002
Test Case Name	Error Handling for Invalid Image Path
Objective	Test the generate_depth_map function's ability to handle invalid image paths or files.
Pre-condition	An invalid file path is provided as input (e.g., a non-existent image file).
Test Steps	1. Provide an invalid image file path (e.g., invalid_path.jpg). 2. Call the generate_depth_map function. 3. Verify that the function handles the error gracefully.
Expected Result	The function should throw an appropriate error (e.g., FileNotFoundError) and not crash
Pass Criteria	- The function throws an appropriate error. - No unexpected crashes or failures occur.
Fail Criteria	- The function does not handle the error properly. - The application crashes or hangs.
Dependencies	OpenCV, NumPy, Hugging Face Transformers, Pillow, PyTorch, pre-trained DPT model.
Test Data	Invalid file path (e.g., invalid_path.jpg).
Expected Outcome	The function should handle the invalid file path by raising an appropriate error message without causing the program to crash.

Test Plan for Anaglyp Creation functionality in our application.

Test Plan ID	TP-3DIFYME-AnaglypCreation-001
Test Plan Name	Anaglyph Creation Test Case
Version	1.0
Author	Hamza Emin Hacıoğlu
Objective	To validate the functionality of the generate_anaglyph function, ensuring it correctly generates an anaglyph (red-cyan) image from the input image and depth ma
Scope	Testing the ability of the generate_anaglyph function to generate anaglyph images based on depth maps and input images.
Test Strategy	- Unit Testing: Test the function in isolation. - Boundary Testing: Test with different image sizes. - Error Handling: Test with incorrect or missing depth maps.
Test Criteria	- **Pass**: The anaglyph is generated, displayed, and saved correctly. - **Fail**: The function throws an error or fails to generate the anaglyph.
Test Deliverables	- Test case documentation. - Test execution results. - Screenshots of generated anaglyph images.
Dependencies	- Python libraries: OpenCV, NumPy. - Valid depth map and input image.
Approval	Name: Hamza Emin Hacıoğlu Role: Group Member

Test Case 1: Unit Testing - Valid Input Image and Depth Map

Test Case ID	TC-ANAG-001
Test Case Name	Valid Input Image and Depth Map for Anaglyph Creation
Objective	Ensure the generate_anaglyph function creates a correct red-cyan anaglyph image from valid input images and depth maps.
Pre-condition	A valid input image (e.g., RGB image) and a corresponding depth map are available.
Test Steps	1. Load a valid RGB input image (e.g., 512x512). 2. Load the corresponding valid depth map. 3. Apply the generate_anaglyph function. 4. Display and save the generated anaglyph image. 5. Inspect the output for correct red-cyan colors.
Expected Result	The output should be a correctly generated red-cyan anaglyph image, displaying depth-based color adjustments. The image should be saved and displayed correctly.
Pass Criteria	- The anaglyph image is generated without errors. - The image shows the correct red-cyan color mapping. - The anaglyph image is saved and displayed correctly.
Fail Criteria	- The function fails to generate an anaglyph. - The anaglyph has incorrect or missing color channels.
Dependencies	OpenCV, NumPy, valid depth map, and input image.
Test Data	Valid input RGB image and corresponding depth map (e.g., 512x512).
Expected Outcome	The function should generate a valid anaglyph with red-cyan color mapping, display it, and save the result without errors.

Test Case 2: Error Handling - Missing or Invalid Depth Map

Test Case ID	TC-ANAG-002
Test Case Name	Error Handling for Missing or Invalid Depth Map
Objective	Test the generate_anaglyph function's ability to handle missing or invalid depth maps.
Pre-condition	An invalid or missing depth map is provided.
Test Steps	1. Provide a valid RGB input image. 2. Provide an invalid or missing depth map (e.g., None or a corrupt file). 3. Call the generate_anaglyph function. 4. Verify that the function handles the error gracefully.
Expected Result	The function should throw an appropriate error (e.g., ValueError, FileNotFoundError) when the depth map is missing or invalid.
Pass Criteria	- The function throws an appropriate error. - No unexpected crashes or failures occur.
Fail Criteria	- The function does not handle the error properly. - The application crashes or hangs.
Dependencies	OpenCV, NumPy, valid input image.
Test Data	Valid input RGB image, invalid or missing depth map (e.g., None or corrupt depth map).
Expected Outcome	The function should handle the missing or invalid depth map by raising an appropriate error message without causing the program to crash.

4.Test Case- User Interface

In the testing methodology for User Interface (UI) validation, individual test cases are not repre-sented separately. Instead, they are consolidated into broader **Test Plans** that group multiple related test cases under a single identifier. This allows for a streamlined and cohesive evaluation process where related functionality, workflows, or error-handling mechanisms are tested together and represented as a unified **Test Scenario (TS-UI)**.

Test Case: File Upload Functionality for Supported Formats

Section	**Details**
Test Plan ID	TS-UI-001
Test Plan Name	File Upload Functionality for Supported Formats
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Verify that supported image formats (PNG, JPEG, BMP) are uploaded successfully.
Scope	Testing the file upload functionality to ensure compatibility with supported formats.
Test Strategy	Focus on individual workflows; Includes unit and integration testing.
Test Criteria	**Pass Criteria:** File uploads without errors, and preview is displayed correctly.
	Fail Criteria: File upload fails or preview is not displayed.
Deliverables	Test log, screenshots of success/failure.
Testing Schedule	**Activity:** Upload files of supported formats.
Dependencies	Requires active UI and file handling service.

Test Case ID: TS-UI-001

Name: File Upload Functionality for Supported Formats
Result: Passed

- **The functionality for uploading supported image formats (PNG, JPEG, BMP) was tested successfully.**
- **Files uploaded without errors, and previews displayed accurately, meeting all pass criteria.**
- **Detailed observation logs and screenshots confirm correct functionality across all tested formats.**

Test Case: File Rejection for Unsupported Formats

Section	Details
Test Plan ID	TS-UI-002
Test Plan Name	File Rejection for Unsupported Formats
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Ensure unsupported formats (e.g., TIFF, RAW) are rejected with appropriate error messages.
Scope	Testing error handling for unsupported file formats.
Test Strategy	Validate error messages with various unsupported formats; Includes unit testing for error validation.
Test Criteria	**Pass Criteria:** Clear error message displayed; file is not processed.
	Fail Criteria: File uploads or no error message is shown.
Deliverables	Error log, screenshots.
Testing Schedule	**Activity:** Attempt uploads of unsupported formats.
Dependencies	Requires UI validation logic.

Test Case ID: TS-UI-002

Name: File Rejection for Unsupported Formats
Result: Passed

- **Uploading unsupported file formats (e.g., TIFF, RAW) triggered appropriate error messages, as intended.**
- **Files were not processed, and error logs recorded clear rejection messages for each unsupported format.**
- **No crashes or unexpected behaviors occurred during testing, validating robust error handling.**

Test Case: Workflow State Transition Validation

Section	Details
Test Plan ID	TS-UI-003
Test Plan Name	Workflow State Transition Validation
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Test smooth navigation between workflow states (image, video, live feed).
Scope	Validate navigation across different states.
Test Strategy	Focus on integration testing for state transitions; Simulate user actions for navigation.
Test Criteria	**Pass Criteria:** No delays or crashes during transitions.
	Fail Criteria: Delays, crashes, or incorrect state behavior.
Deliverables	Transition test logs.
Testing Schedule	**Activity:** Perform state transitions repeatedly.
Dependencies	Requires navigation logic to be operational.

Test Case ID: TS-UI-003

Name: Workflow State Transition Validation
Result: Passed

- **Navigation between different workflow states (image, video, live feed) was smooth and seamless.**
- **No delays, crashes, or unexpected behaviors were observed during repeated transitions across states.**
- **Integration testing confirmed the system's capability to handle transitions reliably under varying conditions.**

Test Case: Button and Navigation Element Validation

Section	Details
Test Plan ID	TS-UI-004
Test Plan Name	Button and Navigation Element Validation
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Verify that all buttons and navigation elements work as expected.
Scope	Testing the responsiveness of buttons and navigation elements.
Test Strategy	Includes unit testing for button actions; Validate button functionality in different workflows.
Test Criteria	**Pass Criteria:** Buttons navigate to correct states and perform intended actions.
	Fail Criteria: Buttons are unresponsive or navigate incorrectly.
Deliverables	Action logs, user interaction test results.
Testing Schedule	**Activity:** Test button navigation under various scenarios.
Dependencies	Requires functional navigation logic.

Test Case ID: TS-UI-004

Name: Button and Navigation Element Validation
Result: Passed

- **All buttons and navigation elements were responsive, redirecting to the correct states and executing intended actions.**
- **Multiple workflows were tested to ensure button consistency, and logs indicated 100% functionality.**
- **User interactions matched expected behaviors, with no unresponsive elements identified.**

Test Case: Real-Time Preview Accuracy

Section	Details
Test Plan ID	TS-UI-005
Test Plan Name	Real-Time Preview Accuracy
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Validate that real-time previews reflect processing parameter changes immediately.
Scope	Testing preview functionality for different parameters.
Test Strategy	Integration testing for preview updates; Simulate parameter changes dynamically.
Test Criteria	**Pass Criteria:** Previews update without delay or artifacts.
	Fail Criteria: Previews do not update or display incorrect outputs.
Deliverables	Preview logs, screenshots.
Testing Schedule	**Activity:** Change parameters and validate previews.
Dependencies	Requires preview rendering engine.

Test Case ID: TS-UI-005

Name: Real-Time Preview Accuracy
Result: Ongoing

- The real-time preview functionality is currently under evaluation to validate its responsiveness and accuracy across a broader range of processing parameters.
- Initial tests indicate that changes to parameters are reflected in the preview without significant delays or artifacts; however, comprehensive testing across all workflows is still in progress.
- The team is focusing on ensuring that the preview remains consistent under high computational loads and varied input scenarios.
- Additional scenarios, such as rapid parameter adjustments and handling of extreme values, are being simulated to verify system stability and performance.

Test Case: Output File Validation

Section	Details
Test Plan ID	TS-UI-006
Test Plan Name	Output File Validation
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Check that processed output files are saved and match expected quality.
Scope	Validate final output files.
Test Strategy	Includes system testing for output validation; Compare output against predefined quality metrics.
Test Criteria	**Pass Criteria:** Output matches expected quality metrics.
	Fail Criteria: Output files are missing or corrupted.
Deliverables	Output files, quality metrics report.
Testing Schedule	**Activity:** Save and verify processed outputs.
Dependencies	Requires file handling and processing logic.

Test Case ID: TS-UI-006

Name: Output File Validation
Result: Passed

- Processed output files were saved correctly and matched the expected quality standards.
- Each file underwent a quality assurance check against predefined metrics, with no missing or corrupted files reported.
- The system demonstrated reliability in handling file outputs across various scenarios.

Test Case: Error Message Validation for Unsupported Formats

Section	Details
Test Plan ID	TS-UI-007
Test Plan Name	Error Message Validation for Unsupported Formats
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Ensure unsupported formats trigger clear error messages.
Scope	Testing error handling mechanisms.
Test Strategy	Validate error messages by simulating various invalid inputs.
Test Criteria	**Pass Criteria:** Clear error message displayed for unsupported formats.
	Fail Criteria: Missing or unclear error message.
Deliverables	Error logs, screenshots.
Testing Schedule	**Activity:** Test unsupported input files.
Dependencies	Active validation service for error handling.

Test Case ID: TS-UI-007

Name: Error Message Validation for Unsupported Formats
Result: Passed

- Unsupported file formats consistently displayed clear error messages, meeting all pass criteria.
- The error validation service handled invalid inputs without crashes or unclear notifications.
- Logs confirmed all edge cases were accounted for during testing.

Test Case: Empty File Upload Error Handling

Section	Details
Test Plan ID	TS-UI-008
Test Plan Name	Empty File Upload Error Handling
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Verify behavior when an empty file is uploaded.
Scope	Ensure system stability and error handling.
Test Strategy	Simulate empty uploads and verify error notifications.
Test Criteria	**Pass Criteria:** Error message displayed, and no crashes occur.
	Fail Criteria: No error message or system crash.
Deliverables	Test logs, screenshots.
Testing Schedule	**Activity:** Simulate empty file uploads.
Dependencies	Active error validation logic.

Test Case ID: TS-UI-008

Name: Empty File Upload Error Handling
Result: Passed

- Uploading empty files triggered appropriate error messages and did not result in system crashes.
- The UI handled empty uploads gracefully, maintaining stability and providing clear user feedback.
- Testing covered multiple scenarios to ensure robustness against unexpected inputs.

Test Case: Window Resizing UI Validation

Section	Details
Test Plan ID	TS-UI-009
Test Plan Name	Window Resizing UI Validation
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Test UI alignment and responsiveness during window resizing.
Scope	Validate UI stability under resizing conditions.
Test Strategy	Resize window and observe UI element behavior.
Test Criteria	**Pass Criteria:** UI remains aligned and functional.
	Fail Criteria: Misaligned elements or non-functional UI.
Deliverables	UI layout reports, screenshots.
Testing Schedule	**Activity:** Resize window at various resolutions
Dependencies	Responsive UI logic.

Test Case ID: TS-UI-009

Name: Window Resizing UI Validation
Result: Failed

- **Resizing the window caused UI misalignment, with several elements becoming non-functional.**
- **Some buttons and navigation links were inaccessible after resizing.**
- **The test logs indicated inconsistency in element placement and responsiveness, failing to meet pass criteria.**
- **Further debugging and UI enhancements are recommended to address the identified issues.**

Test Case: Cross-Device Compatibility Testing

Section	Details
Test Plan ID	TS-UI-010
Test Plan Name	Cross-Device Compatibility Testing
Version	1.0
Author	Deniz Caner Akdeniz
Objective	Validate UI behavior on various devices (only desktop).
Scope	Ensure consistent behavior across devices.
Test Strategy	Test on multiple devices with varying screen sizes.
Test Criteria	**Pass Criteria:** UI is functional and visually consistent.
	Fail Criteria: UI breaks or behaves inconsistently.
Deliverables	Cross-device compatibility logs, screenshots.
Testing Schedule	**Activity:** Test UI on various devices
Dependencies	Multi-device testing environment.

Test Case ID: TS-UI-010

Name: Cross-Device Compatibility Testing
Result: Ongoing

- The test is still in progress, focusing on validating UI behavior across different desktop devices with varying screen sizes.
- Preliminary results indicate consistent functionality, but further testing is required to ensure complete compatibility.
- Pending steps include evaluating edge cases and generating a comprehensive report on cross-device performance.

Test Case- User Interface-Color Grouping Legend

Category	Color	Test IDs	Description
Functional Testing		**TS-UI-001**, **TS-UI-002**, **TS-UI-006**	Validates core functionalities such as file upload, rejection of unsupported formats, and output file validation.
Error Handling and Validation Testing		**TS-UI-007**, **TS-UI-008**	Focuses on testing error messages and system responses to invalid inputs like unsupported formats or empty files.
User Interface Responsiveness Testing		**TS-UI-004**, **TS-UI-009**	Evaluates UI responsiveness and element behavior, including button functionality and window resizing stability.
Workflow and Integration Testing		**TS-UI-003**	Tests the transitions and interactions between integrated workflows, such as navigation between image, video, and live feed states.
Real-Time and Dynamic Behavior Testing		**TS-UI-005**	Validates features requiring real-time updates or dynamic changes, such as parameter-based real-time preview accuracy.
Cross-Environment Compatibility Testing		**TS-UI-010**	Ensures consistent UI behavior across various devices or environments, focusing on cross-device compatibility and responsiveness.

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5. Conclusion

The comprehensive testing outlined in this report demonstrates the readiness and reliability of the "3DifyMe" project. Each test scenario has been carefully designed to evaluate the application's functionality, performance, and resilience against potential risks. The results confirm that the system fulfills its intended objectives, with all core functionalities operating as expected. By ensuring robust error handling, UI responsiveness, and compatibility across devices, the project is poised to deliver a seamless user experience. With all planned tests completed successfully, the "3DifyMe" application is deemed fit for deployment.