Media Informatics Assignment 2 - Report

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1. Introduction

This report covers the implementation of three phases for the Media Informatics Assignment 2:

1. Motion-Based Hidden Letter Detection

2. Audio Extraction and Denoising

3. Interlaced Video Simulation

Each phase has specific goals and methods outlined below, alongside the results obtained from the tasks.

2. Phase 1: Motion-Based Hidden Letter Detection

- Goal: The goal of this phase was to extract a hidden message embedded in the video 'video_with_letters.mp4' by detecting motion in the frames.

- Method:

 * Read video frames and convert them to grayscale.

 * Apply frame differencing and contrast enhancement to detect motion.

 * Skip frames with motion ratios greater than 5% to reduce noise.

 * Save binary difference masks for each frame in a folder called 'motion_frames'.

- Results:

 * The hidden message was successfully extracted from the video.

 * Screenshots of the motion frames revealing the letters are provided.

3. Phase 2: Audio Extraction and Denoising

- Goal: This phase involved extracting audio from 'video_with_audio.mp4', applying noise reduction, and saving the modified audio.

- Method:

 * Extract the audio from the video file.

 * Apply a noise reduction filter to the audio using Python.

 * Save the denoised audio as a '.wav' file.

- Results:

 * The audio was successfully extracted and denoised.

 * The denoised audio file is provided.

4. Phase 3: Interlaced Video Simulation

- Goal: Simulate the interlaced video effect by manipulating video frames from 'video_with_audio.mp4'.

- Method:

 * Generate two versions of the video:

 * 'video_odd_interlaced.mp4': Darken even rows (odd field).

 * 'video_even_interlaced.mp4': Darken odd rows (even field).

 * Apply a zoom effect by downscaling the video, applying interlacing, and then upscaling it again.

* Extract the first frame from each version and create a side-by-side comparison. - Results:

 * The interlaced videos and the combined PNG image were successfully created.

* Screenshots comparing the interlaced frames are provided.

5. Code Execution and Instructions

- Code: All phases are implemented in a Jupyter notebook.

- Instructions:

* To run the notebook, upload it to Google Colab or execute it locally with the required dependencies (such as OpenCV and MoviePy).

* Ensure that the video files ('video_with_letters.mp4' and 'video_with_audio.mp4') are correctly loaded into the environment.

* The output of each phase is displayed inline using Matplotlib.

6. Conclusion

This assignment successfully demonstrated techniques in motion detection, audio processing, and video simulation. All tasks were completed and the corresponding media outputs (video, audio, and images) were generated.