

Report On Computer Vision ELC Activity

E3CO-2425 EVENSEM

Real Time Application Based On Computer Vision



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1. Introduction

The goal of this project is to implement a real-time computer vision algorithm that transforms a live webcam video stream into a cartoon-like visual output. This stylized transformation mimics artistic illustrations and is widely used in photo/video filters found in apps like Snapchat, Instagram, and others.

2. Tools and Technologies

- **Language:** MATLAB
 - **Toolbox Used:** Image Processing Toolbox
 - **Functions Used:** webcam, imbilatfilt, medfilt2, edge, rgb2gray, imcomplement, repmat, imshow, drawnow
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3. Methodology

1. **Webcam Input:** The live feed is captured using MATLAB's webcam object.
 2. **Smoothing:** Bilateral filtering is applied using imbilatfilt to smooth color regions while preserving edges.
 3. **Color Quantization:** Image intensity values are reduced (e.g., rounded to nearest 32) to mimic posterized or cartoonish colors.
 4. **Edge Detection:** Canny edge detection is applied on a pre-processed grayscale version of the frame. Edges are inverted and thickened using dilation.
 5. **Combining:** The processed edge map is merged with the quantized color image to generate the cartoonified output.
 6. **Live Display:** The final cartoonified frame is shown in real time using imshow.
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4. Results

The final output is a real-time video feed in which each frame is processed and displayed in cartoon style. Color flattening and strong black outlines provide an illustrated effect that mimics cartoon visuals. Frame rate is acceptable for demonstration purposes, and the application runs without crashing even on Ctrl+C interruptions.

5. ELC Expectations Fulfilled

Expectation 1:

This real-time project gave hands-on experience with webcam handling, edge-preserving filters, posterization techniques, and real-time frame processing in MATLAB. These are key building blocks for real-time CV applications.

Expectation 2:

Although traditional performance metrics like precision and recall are not directly applicable to image stylization, we evaluated effectiveness through perceptual quality and frame stability. Visual quality and responsiveness served as practical evaluation metrics.

6. Limitations and Future Work

- Frame rate may lag on older systems.
- Currently processes video in real time, but does not record or save output.
- Future improvements could include GPU acceleration, UI controls, or adding filters like sketch or blur modes.

7. Conclusion

The real-time cartoonify application demonstrates the feasibility of live image stylization using MATLAB. It integrates key computer vision techniques and offers a functional prototype of a modern filter pipeline. This activity fulfilled both technical and practical learning goals of the ELC.