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Bar-Code Detection and Decoding

BAR-CODE DETECTION AND DECODING REPORT

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Contains

Introduction

Barcodes are widely used for encoding information in a scannable format. This report presents an approach to detect and extract Barcodes from images using image processing techniques.

Methodology

Image Preprocessing

Conversion to Grayscale:

The system converts the input image into grayscale to simplify the processing steps.

Gaussian Blur:

Applies smoothing to reduce noise and improve Barcode recognition.

Implementation

Programming Language and Librarie

The project is implemented in Python using:

- OpenCV for image processing tasks.
- NumPy for numerical operations.
- Pyzbar for Barcode detection.
- Matplotlib for image visualization.

Modular Design

The code is structured into functions for each major step:

- load_and_display_image(): Loads the input image and displays it.
- convert_to_grayscale(): Converts the image to grayscale.

- apply_gaussian_blur(): Applies Gaussian blur to smooth the image.
- decode_bar_code(): Detects and decodes the Barcode.
- extract_bar_code_region(): Extracts the detected Barcode region from the image.
- detect_decode_bar_code(): Orchestrates the full Barcode detection and extraction process.

Results and Testing

Test Cases

The implementation was tested on multiple images using the following workflow:

1. Load and display the image.
2. Convert the image to grayscale.
3. Apply Gaussian blur.
4. Detect and decode Bar codes.
5. Extract and display the detected BA code region.

Observations

The detection function successfully identified and decoded Bar codes from test images. The extracted numeric data from each Bar code was displayed accurately.

Limitations

- Performance may degrade in low-light conditions.
- Bar codes with significant distortion or occlusion may not be detected accurately.
- Limited to Bar codes; does not support other barcode formats.

Conclusion and Future Work

Conclusion

This approach provides an effective way to detect and extract Bar codes from images. The system successfully identifies and extracts Bar codes with high accuracy.

Future Improvements

Potential areas for enhancement include:

- Implementing edge detection for improved accuracy.
- Enhancing robustness against noise and distortions.
- Supporting multiple barcode formats beyond Bar codes.