

Image Fusion

Project by

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TABLE OF CONTENTS

- Introduction
- Problem Statement
- Objectives
- Literature Review
- Methodology
- Future Scope
- References

Introduction

- It is challenge to get clear and detailed images in low light conditions in various fields such as surveillance, security, and medical imaging.
- Due to noisy, blurry, and lacking in essential details,it makes difficult to discern crucial information and perform accurate analyses .
- Our Project “ **Image fusion**” offer a promising solution to this problem.
- It can combine multiple images into a fewer images,usually a single one which is an enhanced image that integrates the best features of each input ,which significantly improve image visibility, reduce noise, and enhance overall clarity.

Problem Statement

- Medical images taken under low light condition
- Different image modalities(e.g., CT and MRI)
- Noise and Artifacts
- Computational Efficiency

Objectives

1

To enhance image quality or combine images from different sensors.

2

Noise Reduction by filtering & minimise Artifacts like ghosting or blurring .

3

Real time Processing ,preservation of important features , reduction of redundancy .

LITERATURE REVIEW

- Historical Context: Imaging technology has advanced significantly since 1985, impacting both civilian and military applications.
- Image Fusion: An emerging tool for handling diverse image types, including remote sensing and medical images, by combining visible and infrared light.
- Current Usage: Primarily used in the medical industry to overcome limitations of single-modality imaging, improving diagnostic capabilities.
- Fusion Goals:
 - Enhance image contrast
 - Improve overall image quality
 - Provide richer information

METHODOLOGY

Image fusion types

Spatial domain

- High Pass Filtering(HPF)
 - Principal Component Analysis(PCA)
- etc.

Frequency domain

- Discrete Cosine Transform(DCT)based
 - Discrete Wavelet Transform(DWT)based
- etc.

In our project, we have done image fusion using Discrete Wavelet Transform(DWT) and Principal Component Analysis(PCA).



Image Restoration

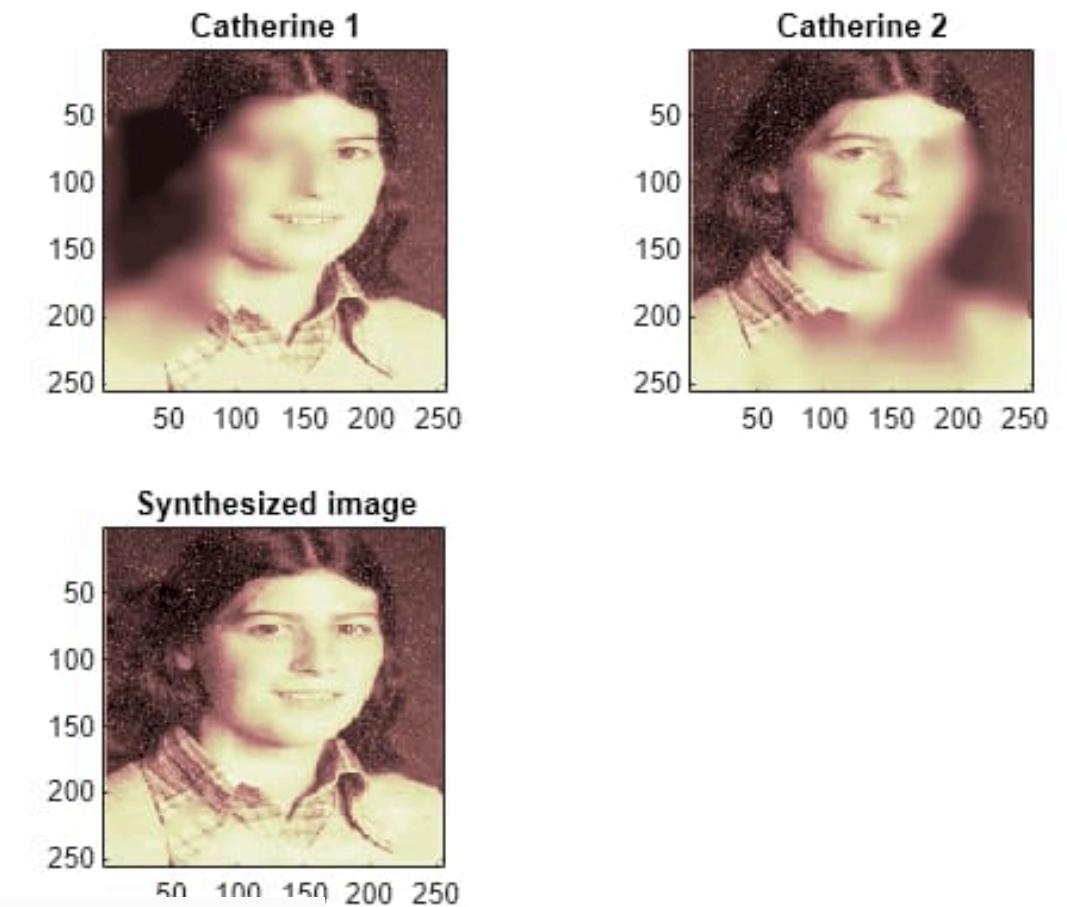
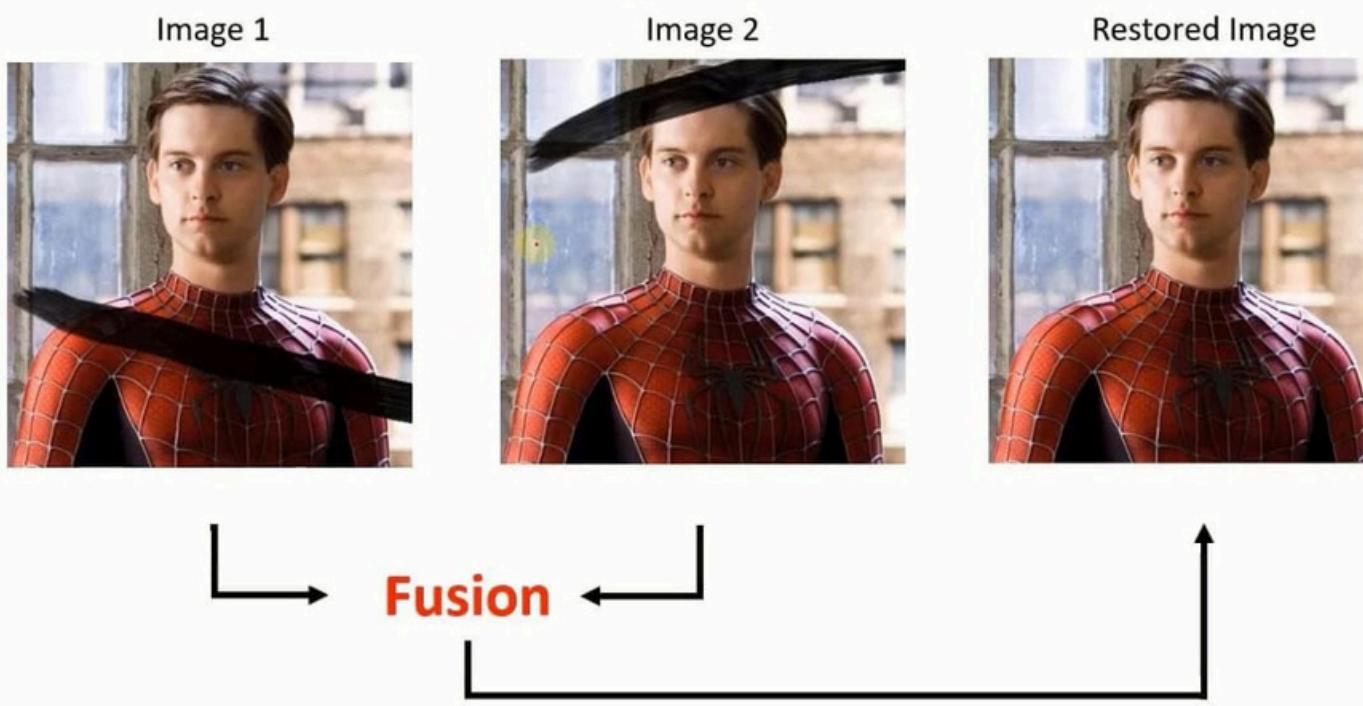


Image Mixing

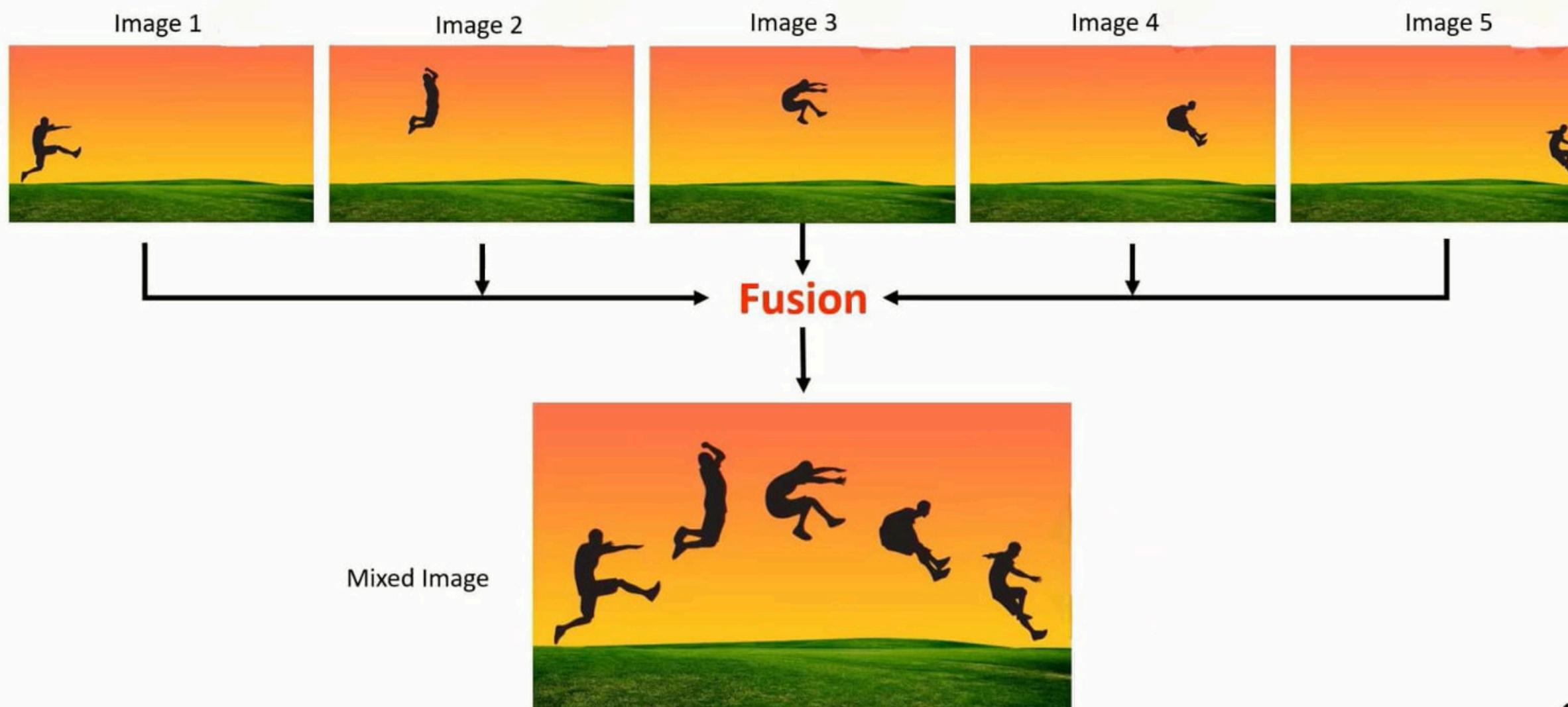
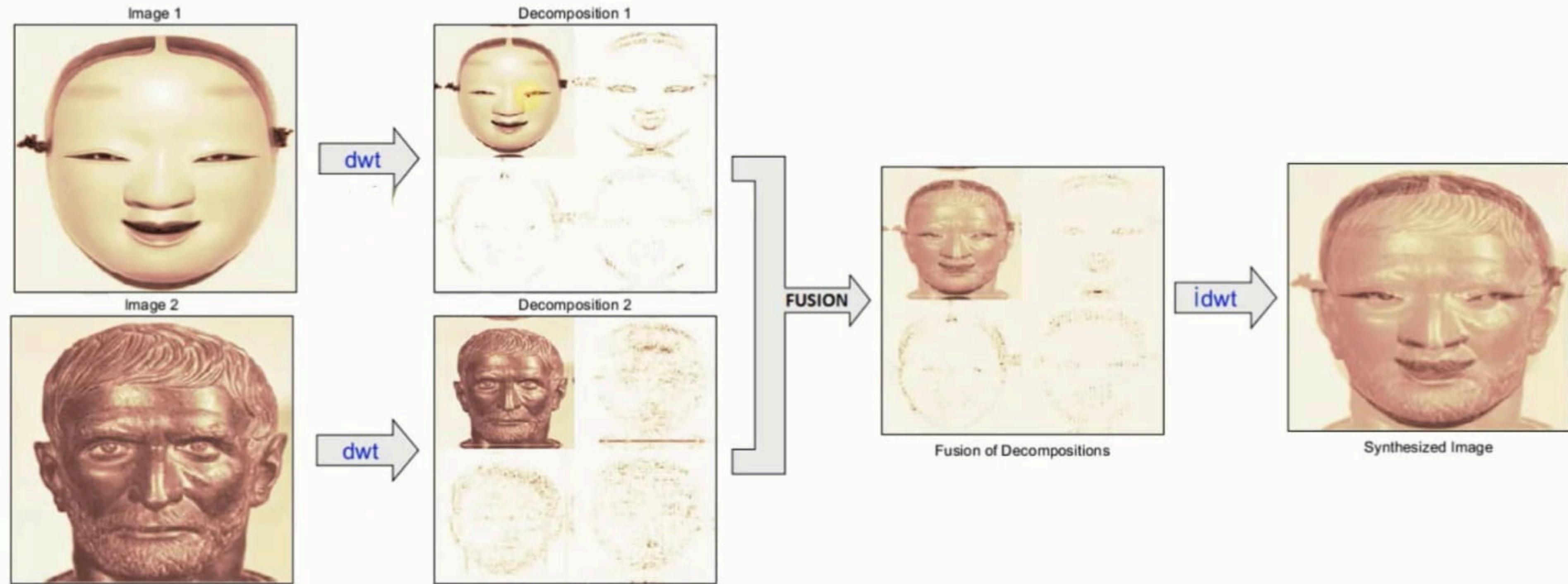
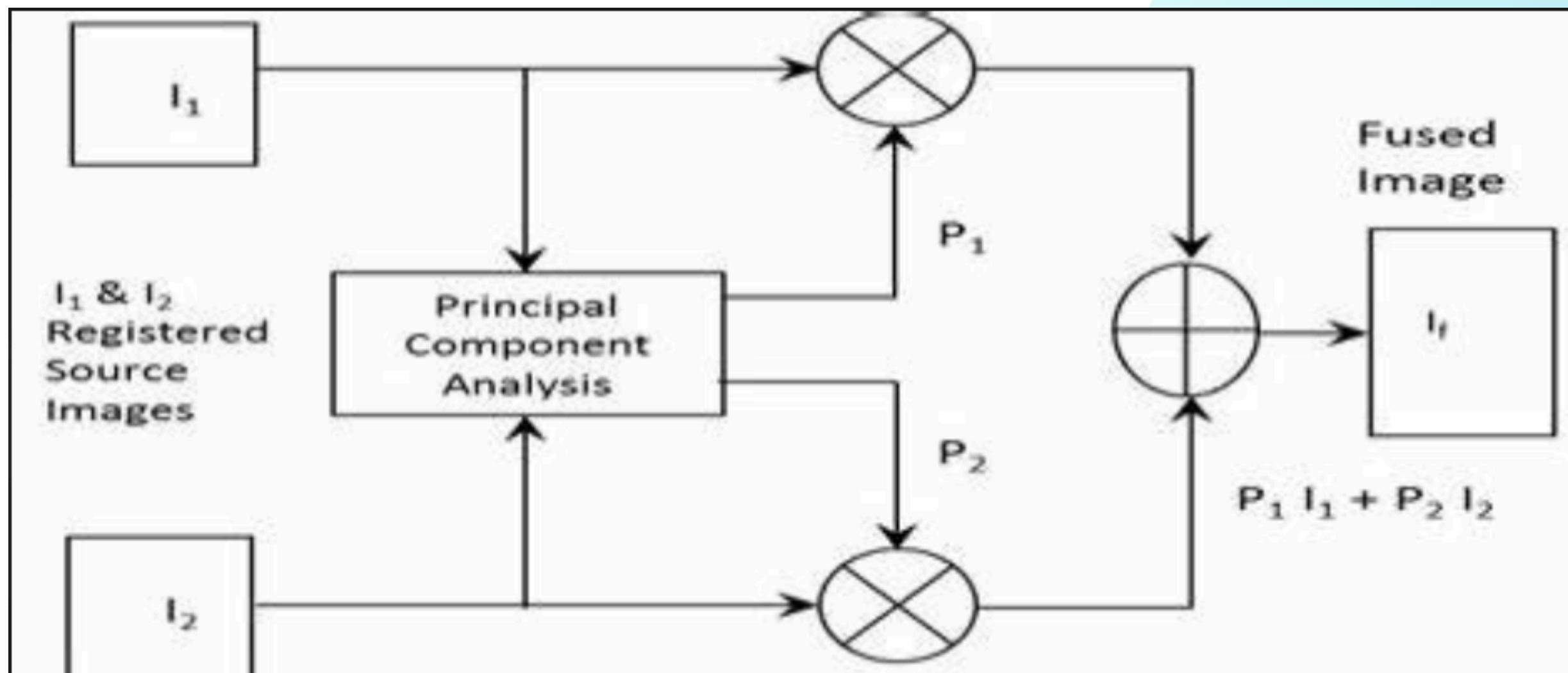


Image Fusion using Discrete Wavelet Transform



PCA:



- Here images are converted into vectors and covariance matrix is calculated for the data matrix.
- Eigen vectors are sorted in the descending order of eigen values.
- Original images are projected onto the principal components.
- Fused image is the weighted sum of the projections using the principal components.

Future Scope

- Integration of Advanced Machine Learning Techniques
 - 1) Deep Learning Approaches
 - 2) Hybrid Models
- Multi-modal and Multi-spectral Image Fusion like expanding Sensor Integration and Real-time Image Fusion. Improving fusion quality.
- User-friendly software development.

References

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**THANK
YOU**

