Course Contents- Covered.
As on 31-03-2022

Introduction

Image Processing Introduction
History of Photography
Applications and Usage
Concept of Dimensions
Image Formation on Camera
Camera Mechanism
Concept of Pixel
Perspective Transformation
Concept of Bits per Pixel
Types of Images
Color Codes Conversion
Gray scale to RGB Conversion
Concept of Sampling
Pixel Resolution
Concept of Zooming
Zooming methods
Spatial Resolution
Pixels Dots and Lines per inch
Gray Level Resolution
Concept of Quantization
Concept of Dithering
Histograms Introduction
Brightness and Contrast
Image Transformations
Histogram Sliding
Histogram Stretching
Histogram Equalization
Gray Level Transformations
Concept of convolution
Concept of Masks
Concept of Blurring
Concept of Edge Detection
Prewitt Operator
Sobel operator
Robinson Compass Mask
Krisch Compass Mask
Laplacian Operator
Fourier series and Transform
Convolution theorem

I. Features and filters: Low-level vision

- Linear filters
- Edges and contours

- Binary image analysis-Dilation and Erosion
- Binary image analysis-Opening and Closing
- Background subtraction
- Texture
- Motion and optical flow
- Edge detection using Image Gradients
- Canny Edge Detection Algorithm

II. Grouping and fitting: Mid-level vision

- Segmentation and clustering algorithms
- Boundary Detection
- Hough Transform Line detection
- Hough Transform Circle Detection
- General Hough Transform
- Fitting lines and curves to Edges
- Robust fitting, RANSAC
- Deformable contours
- Interactive segmentation

III. Multiple views

- Local invariant feature detection and description
- Image transformations and alignment
- 2x2 Image transformations
- 3x3Image transformations
- Projective Transformations
- Affine Transformations
- Homogeneous Coordinates.
- Planar homography
- Epipolar geometry and stereo
- Object instance recognition
- Image warphing
- Image stitching
- Image Blending Algorithms
- Harris corner detection-interest point detection
- SIFT Detector
- SIFT Descriptor
- Blobs Detection
- SURF Detection
- SURF Descriptor
- Integral Images
- HAAR features detection using Integral Images

IV. Recognition: High-level vision

- Basics of Object detection and recognition.
- Supervised classification algorithms

- Deep learning, Convolutional neural networks

To be covered.

- Motion and optical flow.
- Epipolar geometry and stereo.