K L UNIVERSITY

(KONERU LAKSHMAIAH EDUCATIONAL FOUNDATION) u/s Section 3 of UGC Act, 1956
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DEPARTMENT OF ELECTRONICS & COMPUTER ENGINEERING

SCHOOL OF COMPUTING

IMAGE PROCESSING

RESEARCH GROUP

K L UNIVERSITY

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

RESEARCH GROUP NAME: **IMAGE PROCESSING**

1	Group Head Details		
	Research Group Head	e-mail ID	Mobile No.
	Dr. K.KIRAN KUMAR	Kiran5434@kluniversity.in	9441065612

2	Roles and responsibilities of the Research Group Heads

1. Research Group head is administrative head of the concerned Group.
2. To pursue research work in the area of the subject assigned and publish papers in indexed and high impact factor journals. Take up consultancy in the area of specialization.
3. To guide Ph.D Scholars both full time and part time and monitor their progress.
4. To establish Centre of Excellence in the area of specialization.
5. To assign term papers to UG students, involve the students securing more than 70% of marks in the research activity of the group.
6. To guide PG students in their project works and involve them in the research activity of the group.
7. To take up class work teaching in the subjects of their specialization.
8. To pursue writing of text books by taking guidance from Prof. A. Anand Kumar.
9. To arrange faculty training for improving the teaching skills and research activity.
10. To arrange teaching by industrial experts in the subjects taught by the group.
11. To put up proposals for internal and external funded projects. Ph.D holders have to put up project proposals worth minimum of Rs.20-50 lakhs and others Rs.10-15 lakhs.
12. To procure software tools required by the group.
13. To prepare a road map clearly bringing out action plan with time schedules for a systematic progress of research activities.
14. To monitor the progress of class work of M.Tech students.
15. To plan for practice school for PG students of 1 year duration.

	16. To finalize the list of high impact factor journals for publication of research work carried out by the group. 17. Research Group meetings have to be held every week to review and discuss new plans and record the minutes with action plans for implementation. 18. Research Groups activities to be displayed at the place of their labs. 19. To look after the administration of all sections of students of a particular year like 2nd year. 20. All files connected with the groups will be maintained by Research Group Head.
3	Names of all the Faculty members, attached to the Research Group

S .NO	NAME	DESIGNATION	QUALIFICATION
1	Dr.S.Balaji	Prof	PhD
2	Prof.N.Venkatram	Prof	M.S
3	Dr.J.V.N.Ramesh	Assoc.Prof	PhD
4	Dr.Syed Khasim	Assoc.Prof	PhD
5	Sri G.S.Sarma	Asst.Prof	M.Tech
6	Smt S.Nagendram	Asst.Prof	M.Tech
7	Sri.G.Rajesh Chandra	Asst.Prof	M.Tech
8	Sri.J.Avinash	Asst.Prof	M.Tech
9	Ms.P.S.G.Aruna Sri	Asst.Prof	M.Tech
10	Sri K.Sandeep	Asst.Prof	M.Tech

Image Processing Research Group (IPRG)

A group of people motivated to work in Image Processing Domain. IPRG is a community of engineers who share an interest to join in the evolution of image processing research domains. The objective of IPRG is to provide details which helps in the research as well as information sharing.

Image processing is any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or, a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it.

Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images (producing the input image in the first place) is referred to as imaging.

Few types of evidence are more incriminating than a photograph or videotape that places a suspect at a crime scene, whether or not it actually depicts the suspect committing a criminal act. Ideally, the image will be clear, with all persons, settings, and objects reliably identifiable. Unfortunately, though, that is not always the case, and the photograph or video image may be grainy, blurry, of poor contrast, or even damaged in some way.In such cases, investigators may rely on computerized technology that enables digital processing and enhancement of an image.

The first step in digital image processing is to transfer an image to a computer, digitizing the image and turning it into a computer image file that can be stored in a computer's memory or on a storage medium such as a hard disk or CD-ROM. Digitization involves translating the image into a numerical code that can be understood by a computer. It can be accomplished using a scanner or a video camera linked to a frame grabber board in the computer.

The computer breaks down the image into thousands of pixels. Pixels are the smallest component of an image. They are the small dots in the horizontal lines across a television screen. Each pixel is converted into a number that represents the brightness of the dot. For a black-and-white image, the pixel represents different shades between total black and full white. The computer can then adjust the pixels to enhance image quality.

Image sources

Camera technology: CCDs spatial and signal resolution, pixel array, color capture, multiple passes vs 3-CCD sensor arrangements

Scanners: Medical devices: MRI, CT, Ultra sound

Synthetic images: Computer representation of images and formats: Color representation schemes: RGB, YCrCb, YUV RGB, JPEG, TIFF, look up tables (LUTs)

Operations on images

- *Basic distinctions*: Spatial frequency domain, point, and kernel based operations.
- *Image improvement:* denoising, deblurring, histogram equalization
- *Geometric transformations:* affine transformation in 2D and 3D, the homogeneous coordinates system.
- *Image analysis:* Segmentation (pixel values based, watershed algorithm, level set algorithm, pulsed neural network algorithm), pattern recognition (pattern matching, neural network based recognition).

3D Imaging Datasets:
- Image stacks from MRI and CT sources
- A brief overview of the DICOM format, Matlab commands to read DICOM data

- MRI/CT coordinate systems, pixel/slice indexing and spatial dimensions, right-handedness of implicit coordinate systems
- Spatial transformation of 3D data
- Co-registration between multiple sources of imaging data using mutual information

There are many categories of digital image processing like

- **Content Based Image retrieval:** Automatic retrieval of images from a database by colour and shape feature
- **Image compression:** is a mathematical technique used to reduce the amount of computer memory needed to store a digital image. The computer discards some information, while retaining sufficient information to make the image pleasing to the human eye. Enhancement of a compressed image may reveal artifacts of the compression process. Evidence that information has been discarded from the image may limit its usefulness in a criminal investigation.
- **Image enhancement techniques:** can be used to modify the brightness and contrast of an image, to remove blurriness, and to filter out some of the noise. Using mathematical equations called algorithms, the computer applies each change to either the whole image or targets a particular portion of the image. For example, global contrast enhancement would affect the entire image, whereas local contrast enhancement would improve the contrast of small details, such as a face or a license plate on a vehicle. Some algorithms can remove background noise without disrupting key components of the image. Following image enhancement, measurement extraction is used to gather useful information from an enhanced image.
- **Image Segmentation/Classification:** Extracting information from a digital image often depends on first identifying desired objects or breaking down the image into homogenous regions (a process called 'segmentation') and then assigning these objects to particular classes (a process called 'classification'). This is a fundamental part of computer vision, combining image processing and pattern recognition techniques. Homogeneous may refer to the color of the object or region, but it also may use other features such as texture and shape. The methodology can be used to identify tumours in medical images, crops in satellite imagery, cells in biological tissue, or human faces in standard digital images or video. Each segmentation/classification implementation has the same fundamental approach; however, specific objects and imagery often require dedicated techniques for improved success.

- **Biometric Recognition :** Facial / multimodal biometrics, Fingerprint pattern restoration by digital image processing techniques

- **Digital forensics:** The Digital Forensics is interested in the use of computational methods in solving forensic problems and cybercrime.

  - Multimedia copyright protection and watermarking / fingerprinting
  - Event Sequencing, Pattern Recognition, Digital Watermarking, Image Analysis, Bioinformatics, Computer Vision, Source Device Identification
  - Multimedia forensics analysis and attacks
  - Watermarking and data hiding

- o Antiforensics and counter antiforensics
- o Multimedia security and privacy issues
- o Copyright infringement detection and tracing
- o Integrity and preservation of forensics evidences
- o Multimedia content retrieval
- o Applications of security and forensics
- o Cryptography for multimedia
- o Techniques and applications in biometrics
- o Digital steganography

- **Image Scrambling and Denoising:** One of the fundamental challenges in the field of image processing and computer vision is image denoising, where the underlying goal is to estimate the original image by suppressing noise from a noise-contaminated version of the image. Image noise may be caused by different intrinsic (i.e., sensor) and extrinsic (i.e., environment) conditions which are often not possible to avoid in practical situations. Therefore, image denoising plays an important role in a wide range of applications such as image restoration, visual tracking, image registration, image segmentation, and image classification, where obtaining the original image content is crucial for strong performance. While many algorithms have been proposed for the purpose of image denoising, the problem of image noise suppression remains an open challenge, especially in situations where the images are acquired under poor conditions where the noise level is very high.

  - a. Denoising of time-of-flight depth images and sequences
  - b. Non-local image reconstruction
  - c. Multiframe superresolution
  - d. Demosaicing
  - e. Error Concealment
  - f. Wavelet-based denoising of images
  - g. Non-local means denoising of images

- Medical Image Processing
  - o Texture based detection and classification of diffuse and focal illness from Ultrasound Images
  - o Structured reporting for medical images
  - o DICOM infrastructure implementation
  - o Quality assessment of medical images and video
  - o Objective quality assessment of medical video streams
  - o parallel MRI+compressive sensing
  - o Robust Segmentation Methods for Aortic Pulse Wave Velocity Measurement
  - o Skeletonization and segmentation for cerebral vessel delineation
  - o Generalized profiling with application to arteriovenous malformation segmentation
  - o Segmentation of lung airways
  - o Denoising of medical images
  - o Numerical model observers in medical image quality assessment
  - o Skeletonization for best path calculation in 3-D MRI images of blood vessels
  - o Fast and memory-efficient 3D segmentation and morphology
  - o MRI segmentation of the developing newborn brain

Journals

- International Journal of Image Processing (IJIP)
- International Journal on Graphics, Vision and Image Processing (GVIP)
- EURASIP Journal on Image and Video Processing
- International Journal of Signal Processing, Image Processing and Pattern Recognition
- International Journal of Computer Vision
- International Journal of Pattern Recognition and Artificial Intelligence (IJPRAI)
- International Journal of Wavelets, Multi resolution and Information Processing (IJWMIP)
- International Journal of Image and Graphics (IJIG)
- Journal of Computer Vision Research (Videre)
- Image Processing On Line (IPOL)
- Biomedical Imaging and Intervention Journal
- International Journal of Signal and Image Processing
- BMC Medical Imaging
- Canadian Journal on Image Processing and Computer Vision
- Journal of Pattern Recognition Research
- Signal & Image Processing : An International Journal
- Biomedical Imaging and Intervention Journal

E-books

- Genetic and Evolutionary Computation for Image Processing & Analysis
- Document Image Analysis
- Applications of Digital Signal Processing
- Selected Works in Bioinformatics
- Image Segmentation
- Image Processing in C
- Digital Image Processing by William K. Pratt
- Basic Introduction to Image Processing
- Image Processing by oreilly
- Fundamentals of Image Processing by Hany Farid
- Digital Image Forensics by Hany Farid
- Basic Introduction to Image Processing by zmb

Research Institutes

Image Processing & Computer Vision Research Interest Group

Computer Vision and Image Processing Research Group

Indian Institute of Science Education and Research

Indian Institute of Information Technology Design and Manufacturing

National Institute of Advanced Studies

Indian Institute of Remote Sensing

Indian Institute of Space Science and Technology

Research Oriented Labs in Industry

Honeywell Technology Solutions Lab

GE Healthcare Home

LG Soft India

Bosch India