



## Centre for Image Processing & Analysis

The Centre for Image Processing & Analysis (CIPA) is one of 3 research centres within the Research Institute for Networks and Communications Engineering (RINCE) (a PRTL1 funded national centre for excellence in Information and Communications Technology (ICT)).

The focus of the centres research is in the area of Computer Vision and more specifically Image Processing & Analysis (IPA). Our digital and non-digital IPA research programmes relate to issues involved in the acquisition (custom sensor design), processing, quantitative analysis, classification, visualisation and systems engineering (integration) for a wide range of computer vision applications. Specifically, CIPA focuses on the issues involved in the automation or semi automation of image feature segmentation, and its associated quantitative analysis, at both a micro and macro level. CIPA currently consists of 20 researchers based in DCU and the Mater Hospital. These researchers are working on computer vision (specifically image segmentation), medical imaging (specifically computer aided detection / diagnosis) and their associated visualisation projects.

### Expertise

The core expertise provided by the Centre for Image Processing & Analysis (CIPA) is in its ability to develop and design novel computer based solutions that will allow the automatic extraction of key image features [specifically from 2D, video, 3D and 4D data sources] with a view to a robust and reliable quantitative analysis, classification or tracking of the key information/data within the scene.

### Key Projects

Currently our main research programs are funded by 2 SFI grants (1 project in medical imaging, 1 in quantitative image processing & analysis), 2 Enterprise Ireland commercialization grants and 3 IRCSET awards (PhD Studentships). CIPA were recently were awarded 2 INVENT 2006 Invention Disclosure Awards and have 2 patents currently pending. Current & recent projects include:

- Computer Vision: 3D Imaging / Industrial Vision, Colour Texture Analysis, Visually Guided Robotic Mobile Platforms, High resolution 3D image acquisition systems
- Medical Imaging (Computer Aided Detection and Diagnosis): Skin Cancer Feature Detection and Measurement, Morphological Analysis of the Colon, Functional Analysis of Cardiac Images, Application of computer vision to the life science community
- Visual Biometrics: Face feature segmentation and classification, Real-time Motion Segmentation and Tracking
- Image Visualisation: 3D Human Modelling, Bio-medical Visualisation, 3-D Computer Graphics
- Visual Programming for Computer and Machine Vision

**Selected Academic Linkages:** RCSI, National Biophotonics & Imaging Platform (Imaging Ireland), Range of European and North American Universities.

**Selected Other Linkages:** Mater Hospital, Robotiker Infotech (Spain), Agilent, Biomedical Diagnostics Institute, Range of industrial partners.

## Educational / Outreach Programme:

CIPA currently teaches in to a wide range of DCU educational & outreach programmes:

### 2nd Level:

#### **SFI Secondary Teacher Assistant Researcher (STAR)**

“My experience in DCU has been both enjoyable and interesting. I have learnt a great deal, not only about the research been done but also the skills and competencies needed to be a researcher”

### 3rd Level:

#### **EE425: Image Processing & Analysis**

This module concentrates on developing the fundamentals necessary to design and develop a wide range of imaging solutions. Such solutions relate to the fields of computer and machine vision, video data processing, imaging graphics, imaging science, multimedia and enhanced reality systems.

### Summer Internships:

#### **SFI UREKA (Undergraduate Research Experience & Knowledge Awards)**

. “This project gave me the opportunity to work in a team and I will be willing to pursue research in the area of machine vision in the future. Maybe what was most beneficial to me was that I learned to put into practice the knowledge that I have obtained”...  
“The fulltime research environment was a departure from the undergraduate student situation. It was a chance to apply myself for a period of time to some real engineering challenges”

### Graduate Education:

#### **Unique Major in Image Processing & Analysis is now available within the Masters in Electronic Systems**

The growth of applications in manufacturing, biomedicine, media, ICT and the life sciences is creating a strong demand for graduates in the Image Processing & Analysis field. This Major will prepare graduates to specialise in the areas of image processing and analysis, computer & machine vision, biomedical imaging and image synthesis techniques. Students taking this Major will study three core modules:

- EE544: Computer & Machine Vision
- EE502: Digital Signal Processing
- EE563: 3D Graphics & Visualisation

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1. <http://www.cipa.dcu.ie>

Plus at least one module from the following set:

- EE564: 3D Image Analysis
- EE565: BioMedical Image Acquisition
- EE553: Object Oriented Programming

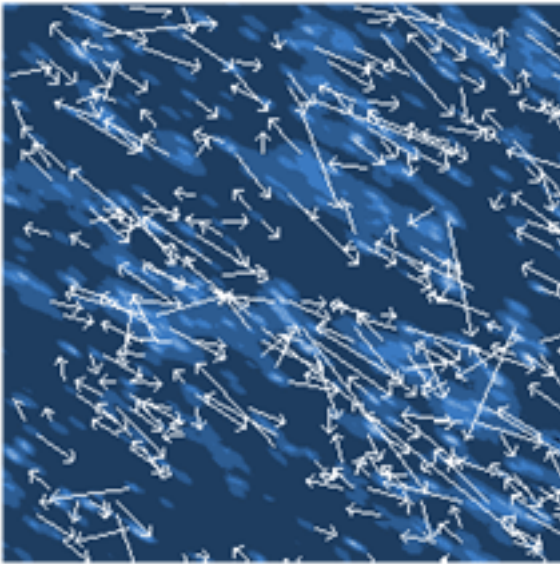
**IRCSET PhD Studentships:** CIPA currently hosts a number of IRCSET funded PhD students.

CIPA is also involved in a range of graduate school initiatives, including the **Biomedical Engineering and Medical Device Technologies**.

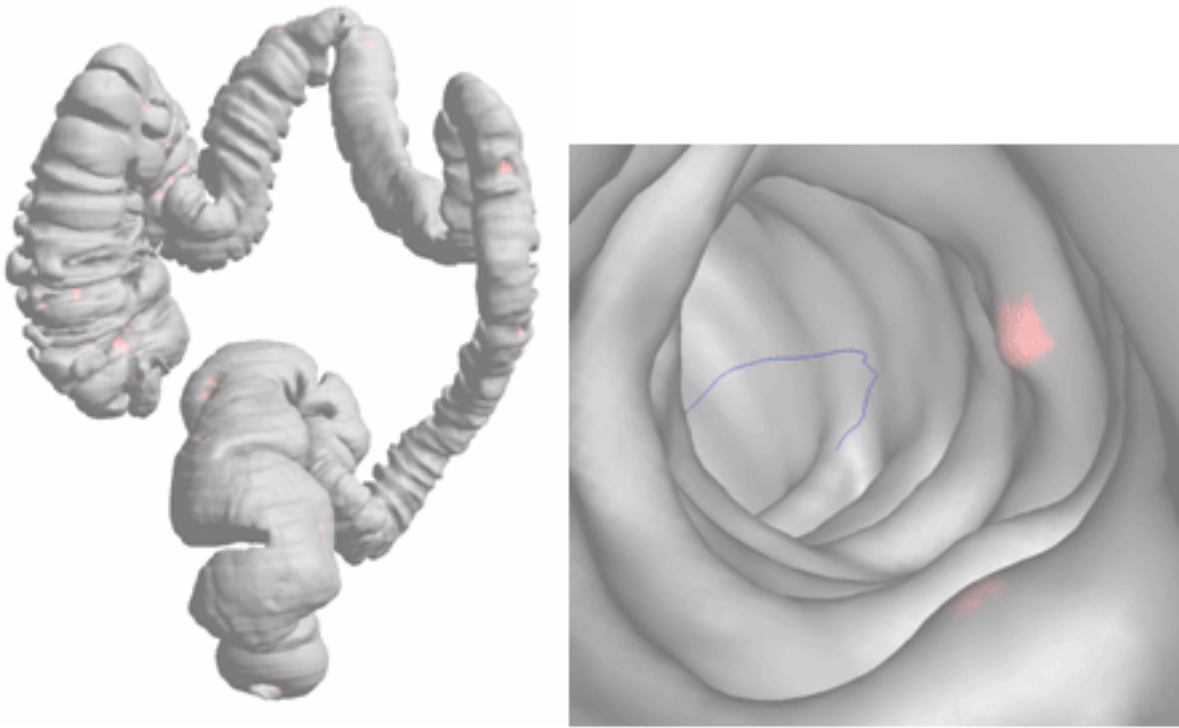
CIPA makes a large amount of its software available for both public use (NeatVision) and to the wider scientific community.

**General Public:**

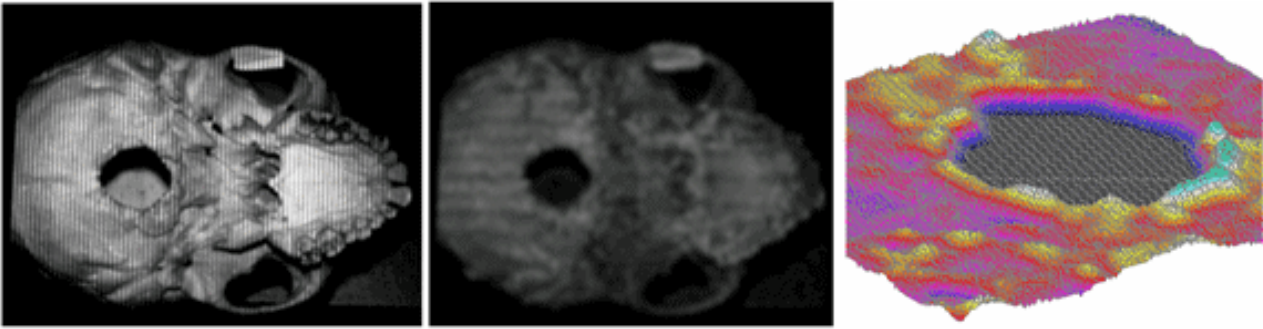
## CIPA Photos



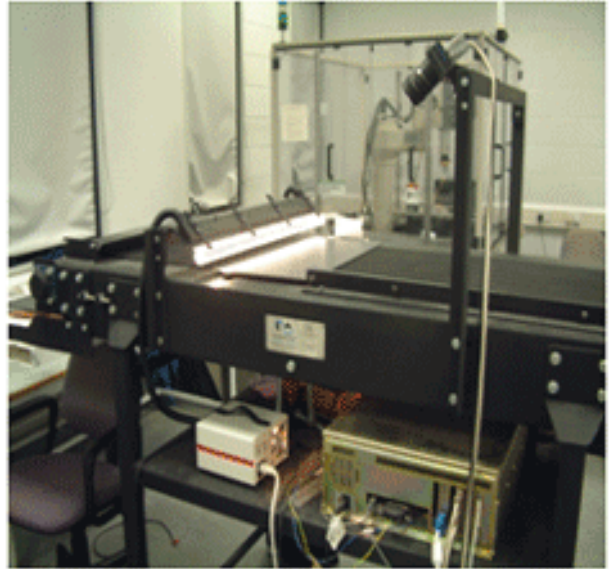
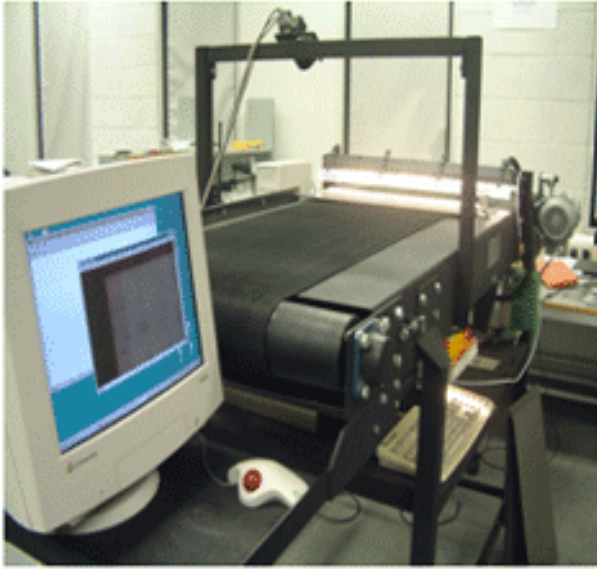
Automatic image based feature extraction and tracking of cellular/micro structures



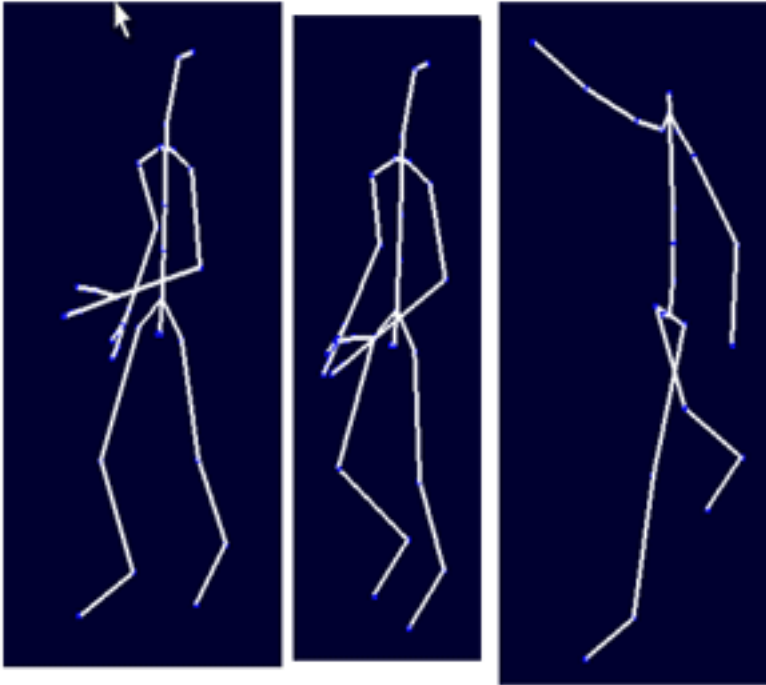
Computer Aided Detection & Diagnosis in Medical Imaging: Reconstructed colon with clinically relevant polyps flagged. Left: External view. Right: Internal view with automatic centre line highlighted.



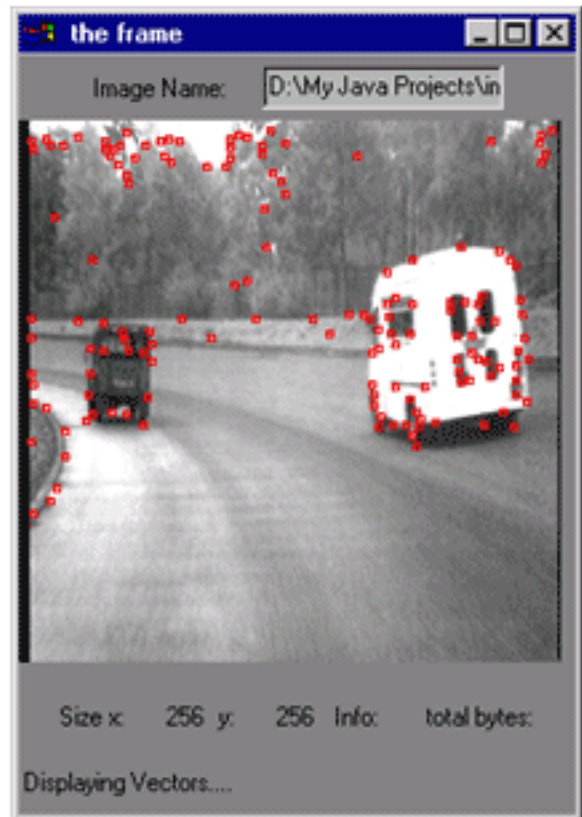
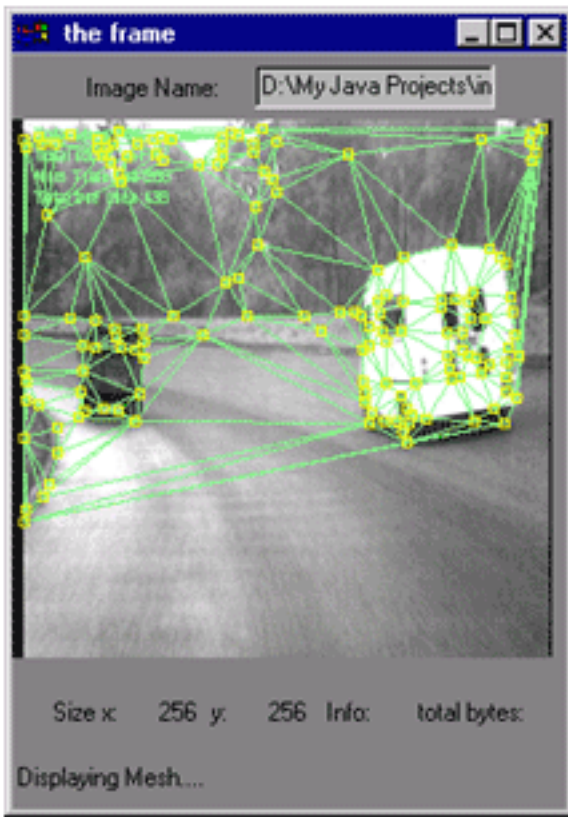
3D quantitative image analysis of surfaces



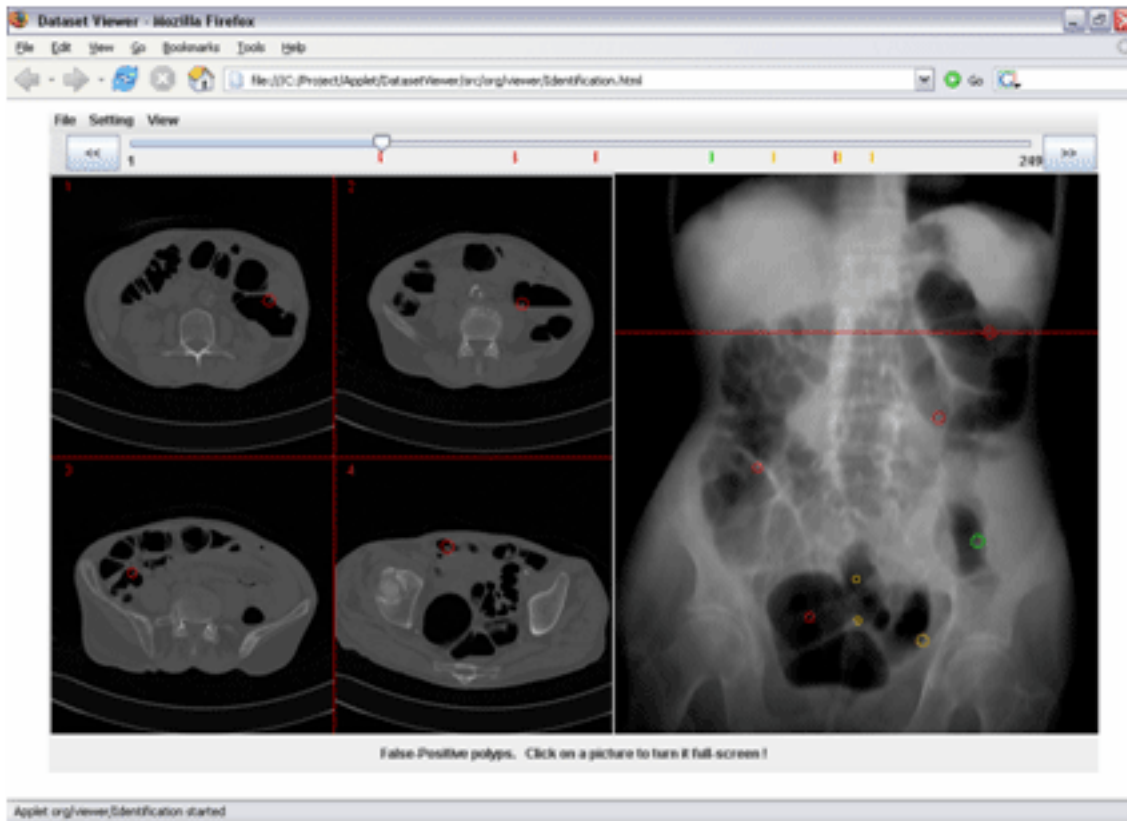
Custom industrial imaging sensors and solutions



Virtual Models from Uncalibrated Camera Views



Active Mesh Feature tracking



Remote training environment for radiologists