



The
University
Of
Sheffield.

Electronic &
Electrical
Engineering.

EEE6081 VISUAL INFORMATION ENGINEERING

Credits: 10

Course Description including Aims

This unit focuses on signal processing technologies for visual information engineering and their usage. It aims to introduce current signal transform techniques and low level visual features and to emphasise the use of these techniques for applications such as compression and retrieval of digital images and video. It also aims to provide an understanding of using software tools in designing and implementing technologies for visual information engineering.

This unit aims to

1. Introduce signal transform techniques.
2. Explore the use of transform tools in image and video compression.
3. Introduce feature based image/video description and their applications.
4. Provide hands on experience in visual information engineering

Outline Syllabus

Transform techniques: Image and video de-correlation, introduction to 2D transforms, wavelet transforms, filter bank and lifting based implementation, transform applications in imaging. **Visual content engineering:** Introduction to digital imaging, multi-resolution (MR) analysis and MR domain processing, image and video compression, motion estimation in video, Image fusion. **Visual information extraction:** Low-level visual features and extraction, application in content-based retrieval, international standards.

Time Allocation

18 lectures, 3 coursework support sessions and 3 problem solving classes.

Recommended Previous Courses

Recommended prior knowledge includes:

Mathematical background for signal and systems analysis – LTI systems, convolution, impulse response, the concept of transforms, the Fourier Transform, FIR filters and design.

Assessment

80% Formal examination (answer 3 out of 4 questions in 2 hours)

20% Coursework

Recommended Books

M. Vetterli & J. Kovacavic Wavelets & Sub-band coding

R. Gonzalez & R. Wood Digital image processing

(available online at
<http://www.waveletsandsubbandcoding.org/>)
Prentice Hall.

S. Heath	Multimedia and Communications Technology	Focal Press
J. Proakis & D. Manalokis	Digital Signal Processing	Prentice Hall
A. M. Tekalp	Digital video processing	Prentice Hall
A del Bimbo	Visual Information retrieval	Morgan Kaufmann

Objectives

By the end of the unit, a successful candidate will be able to

1. Demonstrate the understanding of the basic theory on signal transforms.
2. Demonstrate the understanding of wavelet theory.
3. Use the common transform techniques for image/video compression.
4. Model, extract and use visual features for image/video descriptions.
5. Design simple algorithms for visual information engineering
6. Implement simple algorithms for visual information engineering using software tools.