



The
University
Of
Sheffield.

Electronic &
Electrical
Engineering.

EEE6218 VISUAL INFORMATION PROCESSING

Credits: 15

Course Description including Aims

This unit focuses on theoretical and practical aspects for visual information processing methods and algorithms. It will start with signal processing concepts and extend them to multi-dimensions for image and video processing. It will introduce signal filtering and transform techniques and emphasise their use in compression, enhancement, denoising and scaling applications for visual content. The students will get a realistic notion of the acceptable complexity of these algorithms and learn about their performance with respect to characteristics of the human visual system. The coursework component of this unit aims to provide an understanding of using software tools, such as MATLAB, in solving problems and implementing simple image/video processing algorithms.

This unit aims to

1. Introduce concepts of filtering, signal transform and multi-resolution techniques in image and video processing;
2. Provide an understanding of video/image processing functions in a modern video applications;
3. Introduce the concepts of image and video compression;
4. Present an overview of various video processing algorithms for picture quality assessment and improvement;
5. provide hands-on experience in image and video processing

Outline Syllabus

Filtering and Transform concepts: filters, filter banks, 2D transforms and wavelet transforms in video/image processing, multi-resolution (MR) analysis and MR domain processing, **Image and video processing:** Digital imaging concepts, image/video enhancement, image/video restoration, image/video compression and image fusion: **Algorithm evaluation:** algorithm implementation in MATLAB, complexity and picture quality assessment.

Time Allocation

30 lectures, 2 coursework support sessions, 2 programming sessions and 2 problem solving classes

Recommended Previous Knowledge

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.
MATLAB programming

Assessment

80% Formal examination 3/4 questions

20% Coursework relating to algorithm implementation and covers objective 6

Recommended Books

M. Vetterli & J. Kovacavic	Wavelets & Sub-band coding	(available online at http://www.waveletsandsubbandcoding.org/)
R. Gonzalez & R. Wood	Digital image processing	Prentice Hall.
S. Heath	Multimedia and Communications Technology	Focal Press
A. M. Tekalp	Digital video processing	Prentice Hall
Gerard de Haan	Digital Video Post Processing	

Objectives

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

1. demonstrate the understanding of the theory on signal transforms, wavelet theory and multiresolution analysis (MRA).
2. use the MRA techniques for image/video processing and analysis applications.
3. demonstrate the understanding of the image/video compression techniques
4. design simple algorithms for visual information engineering
5. implement simple algorithms for visual information engineering using software tools.
6. Demonstrate an understanding of algorithm evaluation in terms of picture quality and algorithm complexity