IMAGE UNDERSTANDING AND COMPUTER VISION

Overview of topics

Visual systems
- Taxonomy
- Visual system in nature

Visual processing - natural and computational solutions
- Image formation
- Image enhancement
- Early vision and detection of visual primitives
- Grouping and segmentation
- Surface and object formation - stereo vision, surface shape from shading & texture
- Motion

Image and object representation
- Colour, tone and texture
- Geometric features
- Shape

Object recognition
- Computational representations
- Models and model matching

Case studies in image analysis

Current research - selected topics

CVIPtools

This is an image processing package available on the network and also from Linux CDs.
To use CVIPtools type: `cvip`
The package is menu-driven and most operations should be self-explanatory. There is an on-line help. More details on the package and the associated libraries can be find in the book by Umbaugh (see below). Unfortunately many functions in CVIPtools do not work correctly and we are in process of obtaining a more reliable package - you'll be kept informed.

HIPR: On-line teaching files

Throughout the lectures I will refer to various topics available on HIPR (Hypertext Image Processing Reference, created by the University of Edinburgh). HIPR contains a great deal of additional information, illustrative material and suggestions for exercises (which you can try using Visilog), so do use it (and other teaching files) as a resource to complement the lectures. It is available at

http://www.dai.ed.ac.uk/HIPR2/

There is also a link to HIPR from the module syllabus page

http://www.cs.bham.ac.uk/resources/modules/2001/syls/syl-02523.html

Access to other Web resources

Module syllabus page (**bookmark it** please)

http://www.cs.bham.ac.uk/resources/modules/2001/syls/syl-02523.html

Computer Vision Resource

http://www.cs.cmu.edu/afs/cs/project/cil/ftp/html/vision.html

Pilot European Image Processing Archive

http://peipa.essex.ac.uk

Recommended Textbooks

- Sonka, M. Hlavac, V. Boyle, R. (1999) *Image Processing, Analysis and Machine Vision*, Thomson (computer vision).
- Bruce, V., Green, P.R., Georgeson, M. (1996) *Visual Perception: Physiology, Psychology and Ecology*, Psychology Press (biological vision).
- Umbaugh, S.E. (1998) *Computer Vision and Image Processing*. Prentice-Hall. (image processing and analysis).

Other textbooks

- Ballard, D. & Brown, C. (1982) Computer Vision, Prentice Hall.
- Fischler M A & Firschein, O. (1987) Intelligence: the Eye, the Brain and the Computer. Addison Weseley (AI).
- Frisby, J.P. (1979) Seeing: Illusion, Brain and Mind, Oxford University Press,
- Gonzalez, R.C. & Woods, R.E. (1992) Digital Image Processing, Addison-Wesley.
- Gregory, R.L. (1966) The Eye and Brain, Weidenfeild & Nicolson.
- Marr, D. (1982) Vision, A Computational Investigation into the Human Perception and Processing of Visual Information, Freeman.
- Petrou, M., Bodsdogianni, P. (1999) Image Processing: The Fundamental,. Wiley.
- Russ, J.C. (1992) The Image Processing Handbook, CRC Press.
- Watt, R. (1991) Understanding Vision, Academic Press.
- Winston, P.H. (1984) Artificial Intelligence (3rd edition), Addison-Wesley.

Selected journals

Artificial Intelligence
Computer Vision, Graphics and Image Processing
    CVGIP: Graphical Models and Image Processing
    CVGIP: Image Understanding
Expert Systems
IEEE Proceedings on Medical Imaging
IEEE Proceedings on Pattern Analysis and Machine Intelligence
IEEE Proceedings on Remote Sensing
IEEE Proceedings on Systems, Man and Cybernetics
Image and Vision Computing
Pattern Recognition
Pattern Recognition Letters

Cognitive Psychology
Perception and Psychophysics
Vision Research
Visual Cognition

Selected conference proceedings on computer vision and image processing

- Proceedings of the n-th International Joint Conference on Artificial Intelligence (IJCAI)
- IEE Proceedings of n-th International Conference on Image Processing and Its Applications
- Proceedings of the British Machine Vision Conference (since 1996) (BMVC)