

DESE71004 – Design of Visual Systems

Learning Outcomes

At the end of the modules, students will be able to:

- describe the signal pathway in human vision from eye to brain;
- explain how human perceive and interpretation of visual information, in particular, colour;
- design simple external optical structure (e.g. lenses) to enhance the visual pathway;
- provide an overall view of current technologies to capture visual information;
- explain how visual information is represented, compressed and stored;
- describe, explain and implement commonly used image and video processing algorithms such as edge detection, segmentation etc.;
- demonstrate the use of application programs to process images and videos to solve problems;
- know what they don't know and have the confidence to learn more advance topics.

Module content (Topics to be covered)

1. The physiology of human visual system
2. The perception of vision in human (particularly colour)
3. The technology of vision (sensor technology and limitations)
4. The physics of visual systems (optics – help from Freddie Page)
5. Visual information representation, compression and storage
6. Algorithms for visual processing
7. Image classification and recognition

Learning and Teaching Approach

This module is design using the approach that is common to all my other modules that I have design and taught in the past decade – something which I called the “back-to-front” approach. I first come up with one or more capstone projects which I want every student to deliver at the end to demonstrate that they have attained the learning outcomes. Then I design a series of experiments (or lab exercises) to help students acquire the knowledge, skill and understand of the subjects so that they are equipped to do the project(s). Then I design the lecture series so that students understand the underlying principles and theories. Therefore, this module has three components: lectures supported by problem sheets, a set of practical experiments which will include both simulation and physical hardware, and a final small team projects to demonstrate ability and inspire interest and engagement.

Assessment strategy

Assessment will consist of:

- 15% DRAW week individual student oral examination to provide milestone and to encourage and assess engagement of students.
- 25% final week project submission and demonstration.
- 60% written examination of an unseen paper.

Feedback

Tutorial sessions on problem sheets and lab experiments (1 hour per week for 8 weeks);
DRAW week lab oral assessment; final week project assessment.

Textbook

“Digital Image Processing”, 4th Edition, by RC Gonzalez and RE Woods available on-line as
ebook from Imperial College Library.