

School of Computer Science and Statistics

ECTS Module Descriptor 2011-12

Module Code	CS4D4
Module Title	Vision Systems
Pre-requisites	A working knowledge of C++
ECTS	5
Chief Examiner	Dr. Kenneth Dawson-Howe
Teaching Staff	Dr. Kenneth Dawson-Howe
Delivery	<p>The teaching strategy employed on this course is a mixture of lectures and problem-solving tutorials/laboratories. The laboratory assignments allow the students to appreciate the difficulties of actually realising real solutions using computer vision. The tutorials allow the students to develop a better understanding of the material and to practise the design of appropriate solutions. Students make use of OpenCV, an open source, computer vision library, to experiment with many of the computer vision techniques, and to implement their assignments.</p>
Aims	<p>The aim of this module is to give students a firm understanding of the theory underlying the processing and interpretation of visual information and the ability to apply that understanding to ubiquitous computing and entertainment related problems. It provides them with an opportunity to apply their problem-solving skills to an area which, while it is firmly part of computer science/engineering, draws strongly from other disciplines (physics, optics, psychology). The course is based around problems so that the technology is always presented in context and during some tutorials students work in groups to design solutions to real world problems using the techniques that they have been taught. In addition, the course has a significant practical component so that students can appreciate how difficult it can be to apply the technology.</p>

Learning Outcomes	<p>When students have successfully completed this module they should be able to:</p> <ul style="list-style-type: none"> • design solutions to real-world problems using computer vision. • develop working computer vision systems using C++. • critically appraise computer vision techniques. • explain, compare and contrast computer vision techniques.
Syllabus	<p>Specific topics addressed in this module include:</p> <ul style="list-style-type: none"> • image digitisation and colour; • binary image processing including mathematical morphology, connected components analysis, and motion analysis; • geometric image transforms; • noise and smoothing; • edge based processing including edge detection, contour extraction and representation; • recognition techniques including template matching, statistical pattern recognition, and the Hough transform; • texture; • region based processing;
Assessment	<p>The labs and assignments account for 20% of the final mark and the exam 80%. Students must answer 2 out of 3 exam questions.</p>
Bibliography	<ol style="list-style-type: none"> 1. Image Processing, Analysis and Machine Vision. Milan Sonka, Vaclav Hlavac & Roger Boyle, Thompson, Third Edition 2008. 2. Learning OpenCV, Gary Bradski & Adrian Kaehler, O'Reilly, 2008.
Website	<p>http://www.scss.tcd.ie/CourseModules/CS4053/</p>