Module Specification

Introduction to Machine Vision

Version: 2023-24, v3.0, 06 Jul 2023

Contents

Part 1: Information

Module title: Introduction to Machine Vision

Module code: UFMFLQ-15-2

Level: Level 5

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Vision is a powerful sense in humans; it allows us to make sense of, to navigate through and to interact with the world about us. In our everyday life, machine vision has already become well established in many areas ranging from manufacturing, to medicine, to security. Developments in machine vision will play a key role in the realisation of future autonomous and smart devices, such as robots, to interact with us as humans, to understand and respond to our needs, i.e. human-computer interaction. This module provides an introduction to the state of the art as

well as exploring future directions in machine vision. The course content is both industry- and research-led and aims to provide students with skills that meet the needs of industry.

Features: Not applicable

Educational aims: This module equips students with knowledge in machine vision concepts and applications as well as image processing techniques. It employs examples from industry and research to inform teaching and learning.

Outline syllabus: 1Typically, the syllabus will contain the following topics:

Machine vision concepts and introduction to machine vision applications.

Image formation (e.g. pinhole camera model) and representations (e.g. binary, greyscale and colour images):

Basic image processing and analysis techniques including histogram analysis, image segmentation and morphological operations.

3D Image analysis including laser triangulation, stereo triangulation and photometric stereo

Features descriptors

Introduction to machine learning methods such as artificial neural networks and deep learning

Machine vision in Robotics such as vision based simultaneous localisation and mapping

Management appraisal

Generating machine vision code

Part 3: Teaching and learning methods

Teaching and learning methods: Scheduled Learning includes a twelve pattern of 2 hour laboratory sessions supported by 1 hour lectures.

Independent learning includes hours engaged with essential reading, coding and testing, assignment completion, etc.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Apply a range of algorithmic methods to provide imaging-based solutions to problems in differing domains.

MO2 Explain the principles of a range of image acquisition, image processing and machine learning methods.

MO3 Select available technologies and techniques to meet users' needs using the requirements of an application task with reference to the capabilities and limitations of current machine vision systems.

MO4 Implement machine vision algorithms in software and evaluate their respective performance in resolving a practical problem.

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 150

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/DE7237B6-8C1B-2C54-D07F-A89CC54CC852.html?lang=en-GB&login=1

Part 4: Assessment

Assessment strategy: The assessment for this module is as follows:

An end of semester Exam to assess the student's understanding of concepts and techniques. The paper to be comprised both of questions with multiple short-answer sections as well as of longer case study type questions – the latter based around topical practice- and research-informed materials. Together these assess for recollection of key facts as well as breadth and depth of understanding via application of knowledge in machine vision system modelling, design and analysis. Students will be required to answer from a selection of questions.

An individual assignment for which the student submits a single report covering both the structured activities undertaken during the tutorial sessions plus a project based learning style task, centred on a practice-led real-world case study problem.

Resit is the same as the first sit.

Assessment tasks:

Examination (Online) (First Sit)
Description: Online Examination
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Written Assignment (First Sit)
Description: Assignment (up to 4000 words)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Examination (Online) (Resit)

Description: Online Examination
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Written Assignment (Resit)
Description: Assignment (up to 4000 words)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Robotics [Frenchay] BEng (Hons) 2022-23

Robotics {Foundation}[Sep][SW][Frenchay][5yrs] BEng (Hons) 2021-22

Robotics {Foundation}[Sep][FT][Frenchay][4yrs] BEng (Hons) 2021-22