

WM295-15 Machine Perception with Artificial Intelligence

27/28

Department

WMG

Level

Undergraduate Level 2

Module leader

Rob Thornton

Credit value

15

Module duration

10 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

This module introduces students to the fundamental principles of perception systems and how that information can be utilised to produce a response with a particular emphasis on robotics. Students will explore a range of sensing technologies and control architecture, gaining an understanding of their applications in the context of robotics. Basic machine learning techniques will also be introduced to aid the analysis and modelling of perception data. The module will equip students to critically evaluate and compare various sensing and control approaches.

Module aims

The purpose of this module is to introduce students to the key principles of perception systems, machine learning (a type of artificial intelligence), and basic control architectures with a specific focus on autonomous robotics applications.

Perception sensor data is analysed using machine learning to improve perception performance and it is the key technology for autonomous robots to learn how to interact with unstructured (or real) environments.

On completion of this module, students will be able to critically compare and contrast different sensing architectures and technologies, machine learning algorithms, for robotics control.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Perception systems e.g. lidar, radar, camera, gps, ultrasonic.

Classic AI control architectures, e.g. FSM, subsumption.

Basic Machine Learning, e.g. Introduction to data preprocessing; data extraction, data loading, data transformation, clustering, regression.

Examples of real world system architectures, e.g. ROS, AUTOSAR.

Learning outcomes

By the end of the module, students should be able to:

- Interpret and evaluate the role of different sensors and sensor fusion in autonomous robotics systems and the impact of sensors' limitations on the system [AHEP:4-C2, C6].
- Differentiate control architectures and technologies, algorithms relevant to machine perception [AHEP:4-C1, C3].
- Evaluate the coverage of different sensors and analyse the effects of different external factors [AHEP:4-C13].
- Investigate machine perception systems within a real world robotics context, with consideration for future developments [AHEP:4-C13].

Indicative reading list

[Reading lists can be found in Talis](#)

Subject specific skills

Programming microcontrollers and microprocessors.

Data processing and analysis for machine perception.

Implementing machine learning and artificial intelligence for perception.

Transferable skills

This module will contribute to the development of the following from the Warwick Core Skills framework:

Communication: Professional writing

Critical Thinking: Interpreting, analysing

Digital literacy: IT skills

Problem Solving: Problem creation, logical reasoning

Study

Study time

Type	Required
Lectures	12 sessions of 1 hour (8%)
Seminars	12 sessions of 1 hour (8%)
Practical classes	6 sessions of 1 hour (4%)
Online learning (independent)	30 sessions of 1 hour (20%)
Private study	30 hours (20%)
Assessment	60 hours (40%)
Total	150 hours

Private study description

Online learning (independent): Engagement with provided study materials and signposted resources - review, interpretation and application to example problems and case studies.

Private study: Creation of own study materials - e.g. notes, flashcards, summaries, etc.
Engagement with self-identified materials - industry reports, technical videos, podcasts, journal articles, etc.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time	Eligible for self-certification
Assessment component			
Assessment 1	30%	18 hours	Yes (extension)
Individual report on the suitability of various machine perception technologies to real world robotics applications.			

	Weighting	Study time	Eligible for self-certification
Reassessment component			
Assessment 1 reassessment			No
Individual report on the suitability of various machine perception technologies to real world robotics applications.			
Assessment component			
Assessment 2	70%	42 hours	No
Group report covering the testing and evaluation of a variety of sensors and their implementation to a robot perception problem. Subject to peer marking in line with WMG policy.			
Reassessment component			
Assessment 2 reassessment			No
Individual report covering the testing and evaluation of a variety of sensors and their implementation to a robot perception problem.			

Feedback on assessment

Formative: Verbal feedback during interactive class sessions and practical sessions; Verbal feedback during ad hoc meetings.

Summative: Written feedback and marks aligned with University 20 point marking scale.

Availability

There is currently no information about the courses for which this module is core or optional.