UAB
Universitat Autònoma de Barcelona

3D Visualisation

2026/2027

Code: 104391
Credits: 6

Degree programme	Type	Course
Computational Mathematics and Data Analytics	OB	2

Contact lecturer

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Teaching staff

Enric Marti Godia

Group languages

You can consult this information at the end of the document.

Prerequisites

Linear Algebra

Objectives

The main objective of this lecture is to provide students with the theoretical framework necessary to undertsand the 3D-vision.

Learning outcomes

- CM19 (Use homographic transformations and conformal representation.) Use homographic transformations and conformal representation.
- CM21 (Select the suitable data compression in each case to preserve the desired properties.) Select the suitable data compression in each case to preserve the desired properties.
- KM18 (Identify the group of quaternions and their application to geometry and visualisation.) Identify the group of quaternions and their application to geometry and visualisation.
- SM18 (Use quaternions in data representation algorithms.) Use quaternions in data representation algorithms.

Contents

Representation of a 3D moving scene

- 3D Euclidean space
- Rigid-body motion
- Rotations
- Homogenous representation

Image formation

- Representation of images
- Geometric model of image formation
- Projective geometry

Epipolar geometry

- Essential matrix
- The eight-point linear algorithm
- Planar scenes and homography
- The homography matrix

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Programming	27	1.08	
Solving problems	27	1.08	
Problems	8	0.32	
Study	29	1.16	
Theory	27	1.08	
Seminars	14	0.56	
Tutorship sessions	10	0.4	

There will be three types of directed activities: theory classes where the concepts of the subject will be introduced, problem classes where the students will manipulate these concepts and seminary classes where

specific software will be used to obtain accurate representations of three-dimensional objects.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Final exam	40%	3	0.12	CM19, KM18
Midterm exam	40%	3	0.12	CM19, KM18
Seminar work	20%	2	0.08	CM21, SM18

The evaluation will consist of an intrasemestral exam that will count 40% of the note, an examination at the end of the semester that will count 40% of the note and the remaining 20% will be obtained from the work made in the seminar classes. Assistance to the seminars is compulsory

In case that the continuous assessment note thus obtained does not reach 5, the student who has completed 2/3 of the evaluation activities may take a recovery exam whose grade will substitute that of the two partial exams. A student taking the recovery exam and together with the seminar's note passing the course will be awarded the final note of 5 independently of the actual note of the recovery exam.

Awarding an honors matriculation qualification is the decision of the teaching staff responsible for the subject. UAB regulations indicate that MH can only be granted to students who have obtained a final grade equal to or higher than 9.00. Up to 5% of MH of the total number of enrolled students can be awarded.

A student will be considered non-evaluable (NA) if he has not taken part in a set of activities whose weight is equivalent to a minimum of two-thirds of the subject's total grade.

The single assessment of the subject will consist of the following assessment activities:

- Taking the final exam, for 40% of the grade.

- Delivery on the day of the final exam of the assignments requested in the seminars, for 20% of the final grade. In particular, attendance at seminars is mandatory.

- Taking an oral exam, for 40% of the grade.

If necessary the written exam can be re-evaluated. If a student passes with the recovery exam, then the final note will be a 5 independently of the actual note of the recovery exam. The oral exam and seminars can not be re-evaluated.

In this subject, the use of Artificial Intelligence (AI) technologies is allowed as an integral part of the development of the work, provided that the final result reflects a significant contribution of the student in the analysis and personal reflection. The student must clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how these have influenced the process

and the final result of the activity. The lack of transparency in theuse of AI will be considered a lack of academic honesty and may lead to a penalty in the grade of the activity, or greater penalties in serious cases.

In case of doubt about the interpretation of the evaluation method, the Catalan written version remains as the reference.

Bibliography

Faugeras, Olivier, Three-dimensional computer vision : a geometric viewpoint,1993.

Yi Ma and [al.], An Invitation to 3-D vision : from images to geometric models, Ma, Yi, ed., 2004.

Hartley, Richard, Zisserman, Andrew, Multiple view geometry in computer vision, Cambridge Univ. press, 2008

Forsyth, David A., Ponce, Jean, Computer vision : a modern approach,2003.

D. Shreiner, G. Sellers, J. Kessenich, B. Licea-Kane, OpenGL Programming Guide, 8th Eds, 2013, Addison-Wesley. Red book.

OpenGL Superbible - Comprehensive Tutorial and Reference, 7th eds, Addison-Wesley, 2016. Blue book.

Edward Angel, David Shreiner, Interactive Computer Graphics - A top-down approach using OpenGL, 6th ed, Pearson Education, 2012.

Software

OpenGL or similar.

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	1	Catalan	first semester	morning-mixed
(SEM) Seminars	1	Catalan	first semester	morning-mixed