Subject: Video Analysis Techniques for Surveillance (VATS)
Code: 32446
Institution: Escuela Politécnica Superior
Degree: Master's program in Research and Innovation in Information and Communications Technologies (I²-ICT)
Level: Master
Type: Elective [biometric security and surveillance]
ECTS: 6

COURSE GUIDE: Video Analysis Techniques for Surveillance (VATS)

Academic year: 2017-2018

Program: Master's program in Research and Innovation in Information and Communications Technologies (I²-ICT)

Center: Escuela Politécnica Superior

University: Universidad Autónoma de Madrid

Last modified: 30/05/17

Status: Published 30/05/17

Subject: Video Analysis Techniques for Surveillance (VATS)
Code: 32446
Institution: Escuela Politécnica Superior
Degree: Master's program in Research and Innovation in Information and Communications Technologies (I²-ICT)
Level: Master
Type: Elective [biometric security and surveillance]
ECTS: 6

1. ASIGNATURA / COURSE (ID)

Técnicas de Análisis de Secuencias de Vídeo para Videovigilancia
Video Analysis Techniques for Surveillance (VATS)

1.1. Programa / Program

Máster Universitario en Investigación e Innovación en Tecnologías de la Información y las Comunicaciones (I²-TIC)

Master in Research and Innovation in Information and Communications Technologies (I²-ICT) [Officially certified]

1.2. Course code

32446

1.3. Course areas

Signal Theory and Communications

1.4. Tipo de asignatura / Course type

Optativa   [itinerario: Seguridad Biométrica y Videovigilancia]
Elective   [itinerary: Biometric Security and Surveillance]

1.5. Semester

Second semester

1.6. Credits

6 ETCS

1.7. Language of instruction

The lectures, seminars and lecture notes are in English.

Subject: Video Analysis Techniques for Surveillance (VATS)
Code: 32446
Institution: Escuela Politécnica Superior
Degree: Master's program in Research and Innovation in Information and Communications Technologies (I²-ICT)
Level: Master
Type: Elective [biometric security and surveillance]
ECTS: 6

1.8.   Recommendations / Related subjects

Knowledge of digital image and video processing is useful to follow the course.

Related subjects are:
- Machine Learning: theory and applications
  [Aprendizaje Automático: teoría y aplicaciones]
- Applied Bayesian Methods
  [Métodos bayesianos aplicados]
- Biometrics
  [Biometría]

1.9.   Lecturers

Add @uam.es to all email addresses below.

Lectures and labs:

Dr. Juan Carlos San Miguel Avedillo (Coordinator)
Departamento de Tecnología Electrónica y de las Comunicaciones
Escuela Politécnica Superior
Office: C-205 (C Building, 2nd floor)
Tel.: +34 914976996
e-mail: juancarlos.sanmiguel
Web: https://intranet.eps.uam.es/Publico/Ficha?ID_Persona=890
Attending hours for students: Please send an e-mail to set an appointment.

Dr. José M. Martínez Sánchez
Departamento de Tecnología Electrónica y de las Comunicaciones
Escuela Politécnica Superior
Office: C-201 (C Building, 2nd floor)
Tel.: +34 914972258
e-mail: josem.martinez
Web: https://intranet.eps.uam.es/Publico/Ficha?ID_Persona=863Attending
hours for students: Please send an e-mail to set an appointment

Subject: Video Analysis Techniques for Surveillance (VATS)
Code: 32446
Institution: Escuela Politécnica Superior
Degree: Master's program in Research and Innovation in Information and Communications Technologies (I²-ICT)
Level: Master
Type: Elective [biometric security and surveillance]
ECTS: 6

1.10. Objetivos de la asignatura / Course objectives

The main objective of video analysis for video-surveillance is the extraction of useful semantic information: detection of people presence and trajectory, detection of irregular events, etc. The general objective of this course is to present automatic video-surveillance systems (with single or multiple cameras), to describe the practical application of generic video analysis techniques in this domain, and to present specific video-surveillance applications: people detection and tracking, abandoned/stolen object detection, etc.

[El principal objetivo del análisis de secuencias de vídeo en el entorno de la videovigilancia es la extracción de información semántica útil: detección de presencia y trayectoria de personas, detección de eventos irregulares, etc. El objetivo general de esta asignatura es presentar los sistemas automáticos de videovigilancia (con una o múltiples cámaras), describir la aplicación práctica de técnicas generales de análisis de secuencias de vídeo en este ámbito, y presentar aplicaciones específicas de vídeo-seguridad: detección y seguimiento de personas, detección de robo o abandono, etc.]

At the end of each unit, the student should be able to:

UNIT BY UNIT SPECIFIC OBJECTIVES	
UNIT 1.- Introduction to Automatic Video Surveillance Systems	
1.1.	Understand and identify the elements of a surveillance system
1.2.	Understand and describe the key techniques used in video surveillance systems
1.3.	Understand the challenges of video-surveillance
UNIT 2.- Video Analysis for Surveillance	
2.1.	Understand specific foreground segmentation algorithms used for video-surveillance and their associated pre- and post-processing techniques
2.2.	Understand specific shadow detection algorithms used for video-surveillance and their associated pre- and post-processing techniques
2.3.	Understand specific tracking algorithms used for video-surveillance and their associated pre- and post-processing techniques
2.4.	Understand specific object detection algorithms used for video-surveillance and their associated pre- and post-processing techniques
2.5.	Understand specific event detection algorithms used for video-surveillance and their associated pre- and post-processing techniques
UNIT 3.- Video-surveillance Applications	
3.1.	Understand the technologies used for people detection and tracking, and the associated open issues
3.2.	Understand the technologies used for re-identification of people in multi-camera systems, and the associated open issues
3.3.	Understand the technologies used for abandoned/stolen object detection, and the associated open issues
3.4	Understand the technologies used for crowd analysis and the associated open issues

Subject: Video Analysis Techniques for Surveillance (VATS)
Code: 32446
Institution: Escuela Politécnica Superior
Degree: Master's program in Research and Innovation in Information and Communications Technologies (I²-ICT)
Level: Master
Type: Elective [biometric security and surveillance]
ECTS: 6

1.11. Course contents

1. Introduction to Automatic Video-surveillance Systems
2. Video Analysis for Surveillance
    2.1. Foreground segmentation
    2.2. Shadow detection
    2.3. Tracking
    2.4. Object detection
    2.5. Event analysis and understanding
3. Video-surveillance Applications
4. Evolution and open aspects in video-surveillance

1.12. Course bibliography

1. S.A. Velastin, P. Remagnino, "Intelligent Distributed Video Surveillance Systems", IET, 2006
2. O. Javed, M. Shah, "Automated Multi-camera Surveillance: Algorithms and Practice", Springer 2008
3. E. Maggio, A. Cavallaro, "Video Tracking: Theory and Practice", Wiley, 2011.
4. *Selected papers in relevant journals and conferences for topics covered in the course*

1.13. Coursework and evaluation

The course involves lectures, research-oriented student presentations, lab assignments (including implementation and documentation), seminar presentations and an exam.

In the *ordinary exam period*, the evaluation will be made according to the following scheme:

- 30 %   Student presentations
- 40 %   Lab assignments
- 30 %   Exam

The maximum grade to be obtained is 10 and each of the parts (presentations, labs and exam) will be also graded with a maximum grade of 10. In order to pass the course, it is necessary to have a pass grade (≥ 5) in the overall evaluation, as well as a pass grade (≥ 4) in the three individual parts. The grades of the individual parts are kept for the extraordinary exam period.

In order to be assessed on each individual part during the *ordinary exam period*, **attendance is mandatory**. Students are requested to assist to a minimum of 90% of lectures/labs for each individual part. The absence to lecture/labs will be only permitted under exceptional circumstances which should be justified (e.g. medical reasons). If students fail to meet the 90% assistance criterion, a fail grade will be

Subject: Video Analysis Techniques for Surveillance (VATS)
Code: 32446
Institution: Escuela Politécnica Superior
Degree: Master's program in Research and Innovation in Information and Communications Technologies (I²-ICT)
Level: Master
Type: Elective [biometric security and surveillance]
ECTS: 6

given and the students will be evaluated according to the *extraordinary exam period*.

In case of a fail grade in the ordinary exam period, in the *extraordinary exam period*, the grade will be determined by:

- 35 %   Lab assignments [if the student does not turn in a new version, the grade will be the one corresponding to the ordinary exam period]
- 65 %   Project on a proposed research topic in video-surveillance

In order to pass the course, it is necessary to have a pass grade (≥ 5) in the overall evaluation, as well as a pass grade (≥ 4) in the two individual parts.