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 (I^2-ICT)
Level: Master
Type: Elective [biometric security and surveillance]
ECTS: 6

COURSE GUIDE: Video Analysis Techniques for Surveillance (VATS)

Academic year: 2015-2016

Program: Master's program in Research and Innovation in Information and Communications Technologies (I^2-ICT)
Center: Escuela Politécnica Superior
University: Universidad Autónoma de Madrid

Last modified: 2015/04/14
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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 (I^2-TIC)

Master in Research and Innovation in Information and Communications Technologies (I^2-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.

1.8. Recommendations / Related subjects

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

Related subjects are:

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

1.9. Lecturers

Add @uam.es to all email addresses below.

Lectures and labs:

Dr. Miguel Ángel García García
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Attending hours for students: Please send an e-mail to set an appointment.

1.10. Objetivos de la asignatura / Course objectives

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.

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.

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
UNIT 4.- Evolution and open aspects in video-surveillance	
4.1	Understand the current trends for video-surveillance
4.2	Understand the requirements for future video-surveillance

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, student presentations of research papers, lab assignments (including implementation, documentation and presentation), seminar presentations and an exam.

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

- 35 % Student presentations of research papers
- 40 % Lab assignments
- 25 % 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 case of a fail grade in the ordinary exam period, in the ***extraordinary exam period***, the grade will be determined by:

- 40 % Lab assignments [if the student does not turn in a new version, the grade will be the one corresponding to the ordinary exam period]
- 60 % 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.