
Computer Vision

MAP-I Curricular Unit

Context

This document describes a PhD level course, corresponding to a Curriculum Unit credited with 7 ECTS, intended for the MAP-I doctoral program. It is offered jointly by (i) Escola de Engenharia, Universidade do Minho (ii) Departamento de Electrónica, Telecomunicações e Informática, Universidade de Aveiro (iii) Departamento de Ciência de Computadores, Universidade do Porto, (iv) Departamento de Engenharia Electrotécnica e de Computadores, Universidade do Porto.

Course Description

The proposed unit intends to be a specialization in computer vision topics, namely image and video processing, pattern recognition and machine learning.

The impressive technological evolution of signal and image capturing hardware has slowly created a new and demanding problem: How do we handle so much data? There is a clear need for automatic tools that can help us analyse, find and annotate the massive amount of video information captured by modern technology. A *Computer Vision* learning unit is therefore vital for motivating and preparing PhD students with mathematical tools that will help them handle the various real-world problems where computer vision methods might provide robust solutions.

Teaching Staff

Miguel Tavares Coimbra (<i>Principal Instructor</i>)	FC, UP	mcoimbra@fc.up.pt
Jaime dos Santos Cardoso	FE, UP	jaime.cardoso@inescporto.pt
João Paulo Silva Cunha	DETI, UA	jcunha@det.ua.pt
Manuel João Oliveira Ferreira	DEI, UM	mjf@dei.uminho.pt

Prerequisites

Familiarity with basic signal processing methods, namely frequency domain analysis, is highly desirable. Also, some familiarity with a popular programming language such as C or Java is desirable. None of these are strictly necessary but students who have not previously taken courses in these topics may have to work harder to keep up.

Textbooks and references

- D. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Prentice Hall, 2002.
- R. Gonzalez, R. Woods, “Digital Image Processing – 3rd Edition”, Prentice Hall, 2008.
- L. Shapiro, G. Stockman, “Computer Vision”, Prentice Hall, 2001.
- M. Sonka, V. Hlavac, R. Boyle, “Image Processing, Analysis, and Machine Vision”, Brooks/Cole Publishing, 1999.

Course Objectives

The main objectives of this unit can be summarized in the following topics:

- Present and motivate the student for the various topics of *Computer Vision*.
- Provide the students with a core-set of mathematical tools, useful for most *Computer Vision* challenges.
- Introduce the student to national and international institutions and companies where *Computer Vision* is a potential solution to their real-world problems.
- Help the student develop rigorous research and development methodologies.

Course Topics

- **Chapter I - Image and Video Processing**
 - **Definitions:** optics and image formation; digital image; colour models; medical imaging; noise.
 - **Low-level feature extraction:** colour; texture; shape.
 - **Image pre-processing:** filtering; enhancement.
 - **Motion analysis:** block matching; optical flow: motion as a low-level feature; visual tracking.
- **Chapter II - Image Segmentation**
 - **Basic methods:** thresholding; colour segmentation; region-based segmentation; mathematical morphology.
 - **Segmentation by clustering:** background subtraction; mean-shift; k-means; graph-theoretic clustering; normalised cuts.
 - **Segmentation by fitting:** fitting lines; fitting curves; robust methods.
- **Chapter III – Pattern Recognition**
 - **Fundamentals:** definitions; feature vectors; classes; principal component analysis.
 - **Generic pattern recognition techniques:** statistical pattern recognition, soft-computing machines, neural networks, support vector machines.
 - **Pattern recognition for computer vision:** hypothesize and test; template matching; relations between templates.
- **Chapter IV – Selected Topics**
 - **Geometry and 3D reconstruction:** geometry of multiple views; stereo vision; structure from motion.
 - **Content-based image retrieval:** introduction; popular methods; adding context to content.
 - **Medical imaging:** brain imaging; human motion analysis; molecular and cellular imaging; medical image registration.

Expected number of students

10-15

Teaching Methodology

- Theoretical presentation of *Computer Vision* topics in the form of classes and/or seminars given by lecturers of the learning unit or invited speakers.
- Practical implementation of some of the studied mathematical tools in a research lab environment.
- Integration of students into the teaching process, namely the presentation of state-of-the-art reviews on certain *Computer Vision* topics, enabling them to tighten their relationship with the learning unit and stimulating their interest on a set of specific topics.

Time scheduling

- 7 ECTS (189 hours)
- 3 hours/week for 15 weeks
- 1.5 hours/week guided study

Chapter	I	II	III	IV	Student Presentations
Lecturer / Nr. Hours	UA	UP	UP	UM	UP
Total weeks	4	3	3	4	1

Miguel Tavares Coimbra (UP): $(12 \times 1.5)/15 = 1.2$ hours/week.

Jaime dos Santos Cardoso (UP): $(9 \times 1.5)/15 = 0.9$ hours/week.

João Paulo Silva Cunha (UA): $(12 \times 1.5)/15 = 1.2$ hours/week.

Manuel João Oliveira Ferreira (UM): $(4 \times 1.5)/15 = 1.2$ hours/week.

Evaluation Criteria

- **50%** - A written final exam covering the topics studied in the learning unit.
- **50%** - A written scientific article, concerning either results obtained during their experimental work or a state-of-the-art review on a *Computer Vision* topic, which must be presented orally in a public seminar.

CURRICULUM VITAE

PERSONAL DETAILS

Name: Miguel Tavares Coimbra
Date of Birth: 15/05/1975
Nationality: Portuguese
Address: Rua Clube dos Caçadores, 905, 1º DTTZ
4430-057 Vila Nova de Gaia
Portugal
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EDUCATION

- 2004-2006 Post-Doc studies at IEETA, University of Aveiro, Portugal. Work consisted in using computer vision methods for the creation of computer tools for clinical analysis of a variety of video exams. Examples include automatic annotation of endoscopic capsule exams, single particle tracking for low SNR confocal microscopy exams, and numerical quantification of patient 3D motion during epileptic seizures.
- 1999-2004 PhD in Electronic Engineering, Queen Mary, University of London, “Compressed Domain Processing with Applications to Surveillance”. Research consisted in the study of compressed domain information of encoded digital video. This resulted in the development of fast tools that approximate traditional image and video processing methods. The test scenario for these tools was a real underground train CCTV surveillance system.
- 1993-1998 BEng in Electrical and Computer Engineering with specialization in Telecommunications, at Faculdade de Engenharia da Universidade do Porto, Portugal. Final average: 16. Distinction for graduating in the top 5% of students.

PROFESSIONAL AND ACADEMIC EXPERIENCE

- 2006-... Assistant Professor of the Computer Science Dep., Faculty of Sciences of the University of Porto, Portugal.
- 1998-1999 Researcher at INESC-Porto. Worked in the VIDION project in collaboration with RTP, the Portuguese public television provider. Work consisted in the development of the ‘Search workstation’ for RTP’s multimedia digital archive. It included search, real-time navigation and on-line visualization of results.

TEACHING EXPERIENCE

- 2006-... Graduate and Undergraduate Courses at Universidade do Porto
- 2007/08
 - Human-Computer Interaction
 - Computer Vision (MSc. Level)
 - Computer Vision (PhD. Level)
 - Signal and Image Processing (MSc. Level)
 - 2006/07
 - Introduction to Informatics (43 undergraduates)
 - Data Structures and Algorithms (183 undergraduates)
 - Graphical Interfaces (138 undergraduates)
 - Signal and Image Processing (7 graduates)
 - Monograph (individual)

- 2002-2003 Lab Monitor for ‘Image Processing’ at Queen Mary, University of London, under the supervision of Dr. Ebroul Izquierdo.
- 2002-2003 Lab Monitor for ‘Multimedia’ at Queen Mary, University of London, under the supervision of Dr. Ebroul Izquierdo.
- 1999-2000 Lab Monitor for ‘C++ Programming’ at King’s College London, under the supervision of Dr. Sergio Velastin.

STUDENT SUPERVISION

- PhD Theses Fahran Riaz
Computer Assisted Analysis of Narrow-Band Imaging Endoscopy Exams
Beginning in January 2008.
- Master Theses Luís Guardão
Computer based recognition of NBI images of the gastrointestinal tract for vascular and mucosa pit pattern classification
 2007-... (ongoing)
- Fabio Hedayioglu
Improving tele-stethoscope accuracy using signal processing
 2007-... (ongoing)
- Daniel Pereira (co-supervision)
Analysis of brain activity alpha-patterns using fMRI data.
 2007-... (ongoing)
- Francisco Oliveira
Real-Time Computer Vision Tools for Capsule Endoscopy Exam Analysis
 2006-... (ongoing)
- Monograph Nelson Gomes
Plataformas de processamento de imagem digital: ao encontro de um propósito mais abrangente.
(Survey and evaluation of digital image processing platforms)
 2007

PUBLICATIONS - JOURNAL PAPERS

1. M. Coimbra, M. Mackiewicz, M. Fisher, C. Jamieson, J. Soares, J.P. Silva Cunha, “Computer Vision Tools for Capsule Endoscopy Exam Analysis”, invited paper in *Eurasip NewsLetter*, vol. 18/1, March 2007, pp. 1-19.
2. J.P. Silva Cunha, M. Coimbra, P. Campos, J. Soares, “Automated Topographic Segmentation and Transit Time Estimation in Endoscopic Capsule Exams”, accepted for publication in *IEEE Transactions in Medical Imaging*.
3. M. Coimbra, and J.P. Silva Cunha, “MPEG-7 visual descriptors – Contributions for automated feature extraction in capsule endoscopy”, in *IEEE Trans. Circuits and Systems for Video Technology*, vol. 16/5, 2006, pp. 628-637.
4. M. Coimbra, and M. Davies, “Approximating optical flow within the MPEG-2 compressed domain” in *IEEE Transactions on Circuits and Systems for Video Technology*, Volume: 15 , Issue: 1 , Jan. 2005, pp. 103-107.

PUBLICATIONS - CONFERENCE PAPERS

1. M. Coimbra, J. Kustra, P. Campos, J.P. Silva Cunha, "Combining Color with Spatial and Temporal Position of the Endoscopic Capsule for Improved Topographic Classification and Segmentation", in Proc. of SAMT 2006, Athens, Greece, 2006.
2. J.P. Silva Cunha, M. Coimbra, J. Kustra, P. Campos, J. Soares, "Posição e Velocidade Espacial da Cápsula Endoscópica como Ferramenta de Apoio ao Diagnóstico Clínico", (abstract) in 26th National Meeting in GastroEnterology, Porto, Portugal, 2006.
3. J. Soares, F. Baldaque, L. Lopes, M. Coimbra, J.P. Silva Cunha, "Precisão e Eficiência da Anotação Topográfica Manual de Exames de Cápsula Endoscópica", (abstract) in 26th National Meeting in GastroEnterology, Porto, Portugal, 2006.
4. J.P. Silva Cunha, M. Coimbra, C. Vollmar, S. Noachtar, "Quantification of 3d Motion Data for Seizure Semiology Analysis in Epilepsy", (abstract) in 18th National Meeting in Epileptology, Porto, Portugal, 2006.
5. J.P. Silva Cunha, M. Coimbra, P. Campos, J. Soares, "Faster Wireless Capsule Exam Analysis using Automatic Tools", (abstract), in Proc. of International Conference on Capsule Endoscopy 2006, Miami, USA, 2006.
6. M. Coimbra, J.P. Silva Cunha, P. Campos, J. Soares, "Capview.org: A Research Framework for the Development of Automatic Tools for Capsule Endoscopy", (abstract), invited paper in Proc. of 4th Iberian Meeting of Capsule Endoscopy, Coimbra, Portugal, 2006.
7. J.P. Silva Cunha, M. Coimbra, P. Campos, J. Soares, "The First Capview.Org Automatic Tool for Capsule Endoscopy", (abstract), invited paper in Proc. of 4th Iberian Meeting of Capsule Endoscopy, Coimbra, Portugal, 2006.
8. M. Coimbra, P. Campos, and J.P. Silva Cunha, "Topographic Segmentation and Transit Time Estimation for Endoscopic Capsule Exams", in Proc. of IEEE ICASSP 2006, Toulouse, France, 2006.
9. M. Coimbra, P. Campos, and J.P. Silva Cunha, "Extracting clinical information from endoscopic capsule exams using MPEG-7 visual descriptors", in Proc. of IEE EWIMT 2005, London, UK, 2005.
10. M. Coimbra, J.P. Silva Cunha, R. Bausinger, C. Bräuchle, A. Zumbusch, "Objective analysis of illumination noise in fluorescence microscopy", in Proc. of WIAMIS 2005, April, Montreux, Switzerland, 2005.
11. M. Coimbra, and M. Davies, "A Numerical Comparison of Compressed Domain Approximations to Optical Flow", WIAMIS 2004, Lisbon.
12. M. Coimbra, and M. Davies, "Segmentation of moving pedestrians within the compressed domain", in Proc. of IEEE ICASSP 04, Montreal, Canada, 2004.
13. M. Coimbra, and M. Davies, "A New Pedestrian Detection system using MPEG-2 Compressed Domain Information", in Proc. of IASTED International Conference on Visualization, Imaging, and Image Processing (VIIP 2003), Spain, 2003, pp. 598-602.
14. M. Coimbra, M. Davies and S. Velastin, "Pedestrian Detection using MPEG-2 Motion Vectors", in Proc. of WIAMIS 2003, London, 2003, pp. 164-169.

OTHER PUBLICATIONS

1. M. Coimbra, "Poderá um computador 'ver' imagens de cápsula endoscópica?", in EndoNews, Vol: 15, Jul. 2006, pp. 9.

FINANCED PROJECTS

1. MovEpi3D - Motion quantification of 3D body motion during epileptic seizures; Funding Organization: FCT; Role: Investigator; Funding: 128.796€; Duration: 3 years.
2. GERES-Med - Grid-Enabled REpositorieS for medical applications; Funding Organization: FCT; Role: Investigator; Funding: 199.560€; Duration: 3 years.
3. CapView – Automated Tools for Endoscopic Capsule Exam Analysis; Funding Organization: FCT; Role: Investigator; Funding: 87.300€; Duration: 3 years.

EVENTS

1. M. Coimbra and M. Davies, "Fast Optical Flow Estimation within the MPEG-2 Compressed Domain", in *Challenge of Convergence 2003 Exhibition*, University of Surrey, 7th July 2003.

PATENTS

1. M. Coimbra and M. Davies, PCT International Application No. PCT/EP2004/051325, "Optical Flow Estimation Method", Queen Mary & Westfield College, 1st July 2004.

REVIEWER ACTIVITIES

Journals	<i>IEEE Transactions on Circuits and Systems for Video Technology</i> <i>IEEE Transactions on Medical Imaging</i> <i>IEE Transactions in Image and Video Processing</i> <i>Eurasip Journal on Applied Signal Processing</i> <i>Electronic Letters</i>
Conferences	<i>PCS 2007</i> <i>ICIAR 2007</i> <i>ICIAR 2006</i> <i>BMVC 2004</i> <i>IASTED VIIP 2003</i>

OTHER DATA

2007	Organized a three day workshop on the topic: Design and Development of Video-Games (CDVJ'07 – Criação e Desenvolvimento de vídeo-jogos). Invited speaker: Verónica Orvalho, UPC, Barcelona. Participation: 30 students of 7 different Portuguese Faculties and Universities.
2003	Collaborated in the organization of the IEEE WIAMIS 2003 conference, at Queen Mary, University of London.
1998	Four month studies at Coventry University, UK, integrated in the European ERASMUS student interchange program. Participated in a collaboration project with a local hospital that consisted in the creation of an on-line telemedicine website. This system allowed encrypted access to a medical database, providing a variety of image processing tools for clinical analysis of visual exams.

Short CV

2002-2006

João Paulo Silva Cunha
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Short Biography

João Paulo Silva Cunha, is Associate Professor at the Dep. of Electronics, Telecommunications and Informatics of the University of Aveiro, Portugal and visiting professor at the University of Munich, Germany. He is the creator (1997) and leader of the “Healthcare Information and systems” R&D group of IEETA (<http://www.ieeta.pt/sias>) where he has currently 17 co-workers of which several PhD and MSc students. He is/was principal researcher of more than 10 projects funded by different R&D agencies in the area of biosignal and medical multimedia data processing. He has been researcher in several European projects such as: INFOBIOMED, TEAM-HOS and HANSA.

Dr. Cunha is Senior Member of the IEEE (2004), where he joined the Engineering in Medicine and Biology Society (1986 as a student member). He is habitual reviewer of several IEEE journals, such as the IEEE Trans. on Biomedical Eng., IEEE Trans. on Signal Processing and the IEEE Trans. on Information Technology in Biomedicine. Dr. Cunha is member and vice-president of the Portuguese Medical Informatics Association, member of the director’s board of the Portuguese Biomedical Engineering Association and member of the following clinical neurophysiology associations: Portuguese League Against Epilepsy, the Portuguese EEG and Neurophysiology Association (non-MD member) and the European Epilepsy Academy (EUREPA). He is holder of several prizes, of which is the most relevant the “Best contribution to clinical epileptology - Claudio Munari award of excellency” delivered by EUREPA in 2002. Dr. Cunha is co-author of more than 120 publications, of which, in the last five year, he has published 3 book chapters and 11 papers in scientific journals.

Project participation

The SIAS R&D group has been involved in the following projects in the last 5 years.

Acronym	Title	Duration	Group role	Funding/entity	Partners
Team-Hos (Proj. Europeu)	Methodology and Tools for World-best Teamwork in Hospitals	Jan 2000 - Dez 2002	Coordinator	2.1 Meuros / IST-DGXIII	ATB, Alemanha; TecAgentur, Austria; 5 Hospitais EU
EpilBI	Epilepsy Brain Imaging System	Set 2005 - Set 2008	Coordinator	80 000 Euros / FCT	UniNova, RMN Caselas, HJM, HFF, HEM
RTS	Rede Telemática de Saúde	Maio 2004 - Dez 2006	Creator e coordinator (sub-contracted)	878 000 Euros / Aveiro Digital	HIP, HDA, Sub Reg. Saúde, Aveiro
BioDreams NT	Parâmetros Fisiológicos, Estratégias de Vinculação e Esquemas Cognitivo-Emocionais em Diferentes Organizações Psicopatológicas	Jun 2003- Mai 2005	Partner	25 000 Euros / Fund. Bial	IEPsicologia-Uminho; C. Medicina Desportiva do Porto
SIMoD	Sistema Inteligente de Monitorização Domiciliário de Variáveis Fisiológicas e Psicosociais	Jan 2003 - Dez 2004	Coordinator	206 000 Euros / PRAI Centro	HIP, HSS
Topo3D	Statistical Topographic Analysis of 3D Spatial and Temporal Distribution of Epileptic Spikes and its Sources in Realistic Brain Models	Out 2002-Jan 2005	Coordinator	160 000 Euros / FCT	HGSA, Porto; HJM, Lisbon
MovEpile	Movement Quantification in Epilepsy: A New Contribution for Epileptic Seizures Classification	Out 2000 - Set 2002	Coordinator	7.815c / Sapiens-FCT	HGSA, Porto

Table 1: Participation and co-ordination of scientific projects

Post-grad supervision and jury

#	Student	Theme	Year
1	Li Zhanjian	Quantified Movement Analysis in Video-EEG of Epileptic Seizures: Evolution to Fine Movement Detection	2001-2004
2	Miguel Tavares Coimbra	New motion tracking tools for medicine and biology	2005-2006

Table 2: Post-doc supervision

#	Type	Candidate	Title	Institution
1	D	Li Zhanjian	Movement Quantification in Epileptic Seizures	Universidade de Aveiro
2	D	José Maria Fernandes	EpiGauss: spatio-temporal characterization of brain activity in Epilepsy	Universidade de Aveiro
3	D	Ilídio Oliveira	Um ambiente computacional para a exploração integrada de informação heterogénea em cenários clínicos	Universidade de Aveiro
4	D	Liliana Ferreira	MedAlert - Sistema de Processamento de Linguagem Médica	Universidade de Aveiro

Table 3: PhD supervision

#	Type	Candidate	Title	Institution	Year
1	D	Li Zhanjian	Movement Quantification in Epileptic Seizures	Universidade de Aveiro	2002
2	D	Robin Alvarez Rueda	Estudio de la alerta en humanos basado en ondas cerebrales	Universidad Politécnica de Madrid	2006
3	D	José Maria Fernandes	EpiGauss: spatio-temporal characterization of brain activity in Epilepsy	Universidade de Aveiro	2006
4	M	Fernando Tavares Ferreira	Sistema de Gestão de Dados de uma Seroteca	Faculdade de Engenharia da Universidade do Porto	1999
5	M	Ilídio Oliveira	Aplicação de Técnicas de Computação Baseada em Agentes na Integração de Dados Heterogéneos em Ambientes Clínicos	Universidade do Minho	2002
6	M	Frederico Santos	Sistemas de Informação em Ambientes Hospitalares: Utilização de Tecnologia de Computação Móvel para Processamento de Reletórios em Voz	Universidade de Aveiro	2002
7	M	Sara Campos de Araújo	Segurança na Circulação de Informação Clínica	Faculdade de Engenharia da Universidade do Porto	2006
8	M	Ricardo Oliveira	Técnicas de Subtração de SPECT e o seu co-registo com IRM: Análise e optimização de um protocolo clínico e a sua utilidade clínica em doentes epilépticos	Faculdade de Engenharia da Universidade do Porto	2006
9	M	Michael Guerreiro	Análise diferenciada das componentes independentes de potenciais evocados P3a e P3b	Universidade do Algarve	2006

Table 4: Post-grad jury participation

Publications 2002-2006

Book chapters

- [1] J. M. Fernandes, A. Leal, and J. P. S. Cunha, "EpiGauss: spatio temporal characterization of epileptogenic activity applied to hypothalamic hamartomas," in *Image Analysis and Recognition, Lecture Notes in Computer Science 4142*, A. C. M. Kamel, Ed. Heidelberg: Springer-Verlag, 2006, pp. 680-690.
- [2] J. P. S. Cunha, A. Värri, T. Oliveira e Silva, M. B. Cunha, and G. Hellmann, "Digital Interchange Formats and Applications in Biosignal," in *Computer Techniques in Medical and Biotechnology Systems*, C. T. Leondes, Ed. Newark NJ, USA: Gordon and Breach, 2002, pp. 269-294.
- [3] I. Soares, P. Dias, C. Fernandes, P. Machado, J. Klein, A. Alves, I. Felgueiras, A. Pinho, L. Neves, B. Figueiredo, I. Jongenelen, R. Matos, S. Gonçalves, Z. Li, and J. P. S. Cunha, "Actividade Fisiológica Durante a AAI em Doentes com Perturbações Alimentares: Estudo Preliminar com Análise de Casos," in *Psicologia: Teoria, Investigação e Prática*, C. d. E. d. E. e. Psicologia, Ed. Braga: Universidade do Minho, 2002, pp. 143-158.

Papers submitted to scientific journals

- [1] J. P. S. Cunha, M. Coimbra, P. Campos, and J. Soares, "Automated Topographic Segmentation and Transit Time Estimation in Endoscopic Capsule Exams," in *IEEE Trans. on Medical Imaging*, 2nd round of review, 2006.
- [2] J. M. Fernandes, A. Leal, and J. P. S. Cunha, "EpiGauss: spatio-temporal dynamics in Occipital Lobe Epilepsy," in *Neuroimage*, submitted for publication, 2006.

Papers published in scientific journals

- [1] R. O'Dwyer, J. P. S. Cunha, C. Vollmar, B. Feddersen, and R. Burgess, "Lateralizing Significance of Quantitative Analysis of Head Movements during Seizures of Patients with Temporal Lobe Epilepsy " *Epilepsia*, accepted for publication, 2006.
- [2] C. Fonseca, J. P. S. Cunha, R. E. Martins, V. Ferreira, J. P. Marques de Sá, M. A. Barbosa, and A. Martins da Silva, "A Novel Dry Active Electrode for EEG Recording," *IEEE Transactions on Biomedical Engineering*, accepted for publication, 2006.
- [3] M. Coimbra and J. P. S. Cunha, "MPEG-7 Visual Descriptors - Contributions for Automated Feature Extraction in Capsule Endoscopy," *IEEE Trans. Circuits and Systems for Video Technology*, vol. 16, pp. 628-637, 2006.
- [4] R. Oliveira, J. M. Fernandes, J. Ramalheira, and J. P. S. Cunha, "Técnicas de Subtração de SPECT e seu co-registo com IRM: Análise e optimização de um protocolo clínico e sua utilidade clínica em doentes Epilépticos," *Electrónica e Telecomunicações*, vol. 4, pp.719-728, 2006.
- [5] J. M. Fernandes, A. Martins da Silva, G. Huiskamp, D. N. Velis, I. Manshanden, J. C. de

- Munck, F. Lopes da Silva, and J. P. S. Cunha, "What Does an Epileptiform Spike Look Like in MEG? Comparison Between Coincident EEG and MEG Spikes," *Journal of Clinical Neurophysiology*, vol. 22, pp. 68-73, 2005.
- [6] L. Ferreira, A. Teixeira, and J. P. Cunha, "Extracção de Informação de Relatórios Médicos," *Electrónica e Telecomunicações*, vol. 4, pp. 421-427, 2005.
- [7] F. M. Santos and J. P. Cunha, "Sistema Digital de Relato em Voz para Medicina Baseado em PDAs," *Electrónica e Telecomunicações*, vol. 4, pp. 97-102, 2003.
- [8] J. M. Fernandes, A. Martins da Silva, J. Ramalheira, P. M. G. Pereira, and J. P. S. Cunha, "Functional and Morphologic Data Fusion for Epileptogenic Foci Localisation," *Electrónica e Telecomunicações*, vol. 3, pp. 677-682, 2002.
- [9] A. J. R. Leal, V. Passao, E. Calado, J. P. Vieira, and J. P. S. Cunha, "Interictal spike EEG source analysis in hypothalamic hamartoma epilepsy," *Clinical Neurophysiology*, vol. 113, pp. 1961-1969., 2002.
- [10] Z. Li, A. Martins da Silva, and J. P. S. Cunha, "Movement Quantification in Epileptic Seizures: A New Approach to Video-EEG Analysis," *IEEE Transactions on Biomedical Engineering*, vol. 49, pp. 565-573, 2002.
- [11] L. A. Meireles, J. L. Azevedo, J. P. S. Cunha, and F. X. Malcata, "On-line determination of biomass in a microalga bioreactor using a novel computerized flow injection analysis system," *Biotechnol. Prog.* 2002, vol. 18, pp. 1387-1391, 2002.

Papers published in congress proceedings

- [1] M. Coimbra, P. Campos, and J. P. S. Cunha, "Topographic Segmentation and Transit Time Estimation for Endoscopic Capsule Exams," in *IEEE ICASSP - International Conference on Acoustics, Speech and Signal Processing*. Toulouse, France: IEEE, 2006.
- [2] M. Coimbra and J. P. S. Cunha, "Combining Color with Spatial and Temporal Position of the Endoscopic Capsule for Improved Topographic Classification and Segmentation," in *1st International Conference on Semantics and Digital Media Technology 2006 (SAMT 2006)*. Athens, Greece, 2006.
- [3] J. P. S. Cunha, I. Cruz, I. Oliveira, A. S. Pereira, C. T. Costa, A. M. Oliveira, and A. Pereira, "The RTS Project: Promoting secure and effective clinical telematic communication within the Aveiro Region," in *eHealth 2006*. Málaga, Spain, Invited Paper, 2006, pp. 1-10.
- [4] L. Ferreira, A. Teixeira, and J. P. Cunha, "Information Extraction from Medical Reports," in *3rd International Workshop on Natural Language Understanding and Cognitive Sciences*. Paphos, Cyprus, 2006.
- [5] J. P. S. Cunha, C. Vollmar, Z. Li, J. M. Fernandes, B. Feddersen, and S. Noachtar, "Movement Quantification Epileptic Seizures: A New Technical Contribution to the Evaluation of Seizure Semiology," presented at 25th Annual International Conference of the IEEE EMBS, Cancun, Mexico, 2003.

Abstracts published in scientific journals

- [1] A. Meier, J. P. S. Cunha, C. Mauerer, C. Vollmar, and S. Noachtar, "Quantified analysis of wrist and trunk movements differentiates between hypermotor and automotor seizures," in *Epilepsia*, vol. 46, suppl. 6, A. Arzimanoglou and P. Ryvlin, Eds. Paris, France: Epilepsia, 46, suppl. 6, Blackwell Publishing, 2005, pp. 157.
- [2] R. O'Dwyer, J. P. S. Cunha, C. Vollmar, C. Mauerer, R. Burgess, A. Ebner, and S. Noachtar, "Lateralizing significance of quantitative analysis of versive head movements during seizures of patients with temporal lobe epilepsy" in *Epilepsia*, vol. 46, suppl. 6, A. Arzimanoglou and P. Ryvlin, Eds. Paris, France: Epilepsia, 46, suppl. 6, Blackwell Publishing, 2005, pp. 304. – **"Young Investigator Award" of the IFCN**
- [3] S. Ulowetz, J. P. S. Cunha, C. Mauerer, C. Vollmar, B. Feddersen, and S. Noachtar, "Quantitative movement analysis of extent of wrist movements identifies hypermotor seizures in a non-selected sample of focal epileptic motor seizures," in *Epilepsia*, vol. 46, suppl. 6, A. Arzimanoglou and P. Ryvlin, Eds. Paris, France: Epilepsia, 46, suppl. 6, Blackwell Publishing, 2005, pp. 157.
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Abstracts published in Conference proceedings

- [1] J. P. S. Cunha, M. Coimbra, P. Campos, and J. Soares, "The First Capview.Org Automatic Tool for Capsule Endoscopy," presented at 4th Iberian Meeting of Capsule Endoscopy, Coimbra, 2006
- [2] M. Coimbra, J. P. S. Cunha, P. Campos, and J. Soares, "Capview.org: A Research Framework for the Development of Automatic Tools for Capsule Endoscopy," presented at 4th Iberian Meeting of Capsule Endoscopy, Coimbra, 2006.
- [3] J. P. S. Cunha, "Multimedia Integration in Clinical Environments: Engineering Applications to Neurosciences," presented at VII Conferencia Científica Internacional de la Universidad de Ciego de Ávila, Ciego de Ávila, Cuba, 2006.
- [4] J. P. S. Cunha, M. Coimbra, P. Campos, and J. Soares, "Faster Wireless Capsule Exam Analysis using Automatic Tools," presented at International Conference on Capsule Endoscopy 2006, Miami, FL, 2006.
- [5] J. P. S. Cunha, M. Coimbra, J. Kustra, P. Campos, and J. Soares, "Posição e Velocidade Espacial da Cápsula Endoscópica como Ferramenta de Apoio ao Diagnóstico Clínico," presented at 26th National Meeting in GastroEnterology, Porto, 2006.
- [6] J. P. S. Cunha, M. Coimbra, C. Vollmar, and S. Noachtar, "Quantification of 3D Motion Data for Seizure Semiology Analysis in Epilepsy," presented at 18th National Meeting in Epileptology, Porto, Portugal, 2006.
- [7] P. Dias, J. Klein, J. P. S. Cunha, and I. Soares, "Psychophysiological correlates during the Adult Attachment Interview: Preliminary data with clinical and non-clinical groups," presented at International Association for Relationship Research Conference - IARR 2006 Crete, Grece, 2006.
- [8] J. M. Fernandes, A. Leal, and J. P. S. Cunha, "EpiGauss: analysing spatio temporal patterns in occipital epilepsy," presented at 7th European Congress on Epileptology, Helsinki, 2006.
- [9] R. Oliveira, J. M. Fernandes, J. Ramalheira, and J. P. S. Cunha, "SISCOM techniques: analysis and optimization of a clinical protocol," presented at 28th International Congress

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- [10] I. Soares, J. P. S. Cunha, C. Fernandes, P. Machado, O. Costa, and M. C. Silva, "Attachment and autonomic regulation: Development of BioDreAMS - version 2.0 and application to a non-clinical group," presented at BIAL Foundation Conference "A quem e Além do Cérebro", Porto, Portugal, 2006.
- [11] J. Soares, F. Baldaque, L. Lopes, M. Coimbra, and J. P. S. Cunha, "Precisão e Eficiência da Anotação Topográfica Manual de Exames de Cápsula Endoscópica," presented at 26th National Meeting in GastroEnterology, Porto, 2006.
- [12] M. Coimbra, P. Campos, and J. P. Silva Cunha, "Extracting clinical information from endoscopic capsule exams using MPEG-7 visual descriptors," presented at IEE 2nd European Workshop on the Integration of Knowledge, Semantics and Digital Media Technology (EWIMT 2005), London, UK, 2005.
- [13] M. Coimbra, J. P. S. Cunha, R. Bausinger, C. Bräuchle, and A. Zumbusch, "Objective Analysis of Illumination Noise in Fluorescence Microscopy," presented at Workshop on Image Analysis for Multimedia Interactive Services, Montreux, Switzerland, 2005.
- [14] P. Dias, I. Soares, C. Fernandes, J. Klein, Z. Li, P. Machado, and J. P. S. Cunha, "Autonomic correlates of attachment organization in eating disorders.," presented at 36th Annual Meeting of the Society for Psychotherapy Research., Montréal, Canada, 2005.
- [15] P. Dias, I. Soares, J. Klein, P. Machado, C. Fernandes, C. Silva, and J. P. Silva Cunha, "Attachment Organizations and Autonomic Regulation in Eating Disorders Assessed by a Digital Multimedia System " presented at 45th Annual Meeting of the Society for Psychophysiological Research, Lisbon, Portugal, 2005.
- [16] J. M. Fernandes, A. Leal, and J. P. S. Cunha, "Electroencephalogram and Functional Magnetic Resonance Imaging: Applicability and Performance of Heart Induced Artefact Removal Methods," presented at 17th Annual Meeting on Epileptology of the Portuguese Neurology Society, Coimbra, 2005.
- [17] J. Klein, P. Dias, I. Soares, P. Machado, J. P. Silva Cunha, C. Silva, and C. Fernandes, "Autonomic Correlates of Attachment Organizations and Experiences: Preliminary Data," presented at 45th Annual Meeting of the Society for Psychophysiological Research, Lisbon, Portugal, 2005.
- [18] Z. Li, I. Soares, J. M. Fernandes, and J. P. Silva Cunha, "BioDReAMS 2.0 - A Multimedia System for Assessment of Attachment and Physiological Correlation," presented at 45th Annual Meeting of the Society for Psychophysiological Research, Lisbon, Portugal, 2005.
- [19] R. Pinto, C. Menezes, J. M. Fernandes, J. P. S. Cunha, M. F. Secca, and A. Leal, "Synchronous Electroencephalogram and Functional Magnetic Resonance Imaging Recording for Clinical Neurology applications," presented at 17th Annual Meeting on Epileptology of the Portuguese Neurology Society, Coimbra, 2005.
- [20] I. Soares, J. P. S. Cunha, Z. Li, P. Dias, and J. Klein, "Assessment of Attachment and Physiological Correlates Based on a Multimedia Information System: BioDReAMS 2.0.," presented at Biennial Meeting of the Society for Research in Child Development., Atlanta, USA, 2005.

- [21] S. Ulowetz, J. P. S. Cunha, C. Mauerer, C. Vollmar, B. Feddersen, and S. Noachtar, "Quantitative movement analysis of extent of wrist movements identifies hypermotor seizures in a non-selected sample of focal epileptic motor seizures," presented at Annual meeting of the German Society of Neurology, Wiesbaden, Germany, 2005. – **Prémio “Poster Preis 2005”**
- [22] P. Dias, I. Soares, C. Fernandes, J. Klein, P. Machado, and J. P. S. Cunha, "Attachment and autonomic regulation in eating disorders," presented at 35th Annual Meeting of the Society for Psychotherapy Research, Rome, Italy, 2004.
- [23] J. M. Fernandes, "3D Dipole cluster analysis - applications to Epilepsy," presented at V Simpósio de Análise Multimodal em Epilepsia, IEETA, Universidade de Aveiro, Aveiro, Portugal, 2004.
- [24] A. Meier, J. P. S. Cunha, C. Mauerer, C. Vollmar, and S. Noachtar, "Quantitative analysis of wrist and trunk movements differentiates between hypermotor and automotor seizures," presented at Annual Meeting of the German Society for Neurophysiology, Jena, Germany, 2004.
- [25] R. O'Dwyer, J. P. S. Cunha, C. Vollmar, C. Mauerer, A. Ebner, and S. Noachtar, "Quantification of ipsilateral and contralateral head movements during seizures in patients with temporal lobe epilepsy," presented at Annual Meeting of the German Society for Neurophysiology, Jena, Germany, 2004.
- [26] A. Trigo, J. P. S. Cunha, M. B. Cunha, W. Xavier, and N. S. Ferreira, "Wireless bedside vital signs monitoring unit," presented at Med-e-Tel 2004, Luxemburg, 2004.
- [27] P. Wagner, J. P. S. Cunha, C. Mauerer, C. Vollmar, B. Feddersen, and S. Noachtar, "Comparison of quantitative ipsilateral and contralateral head movements in patients with frontal and temporal lobe epilepsies," presented at Annual Meeting of the German Society for Neurophysiology, Jena, Germany, 2004.
- [28] J. P. S. Cunha, C. Vollmar, Z. Li, B. Feddersen, and S. Noachtar, "A new video processing method for semiology quantitative evaluation," presented at American Epilepsy Society 57th Annual Meeting, Boston, 2003.
- [29] J. P. S. Cunha, C. Vollmar, Z. Li, J. M. Fernandes, B. Feddersen, and S. Noachtar, "Movement quantification during epileptic seizures: technical contribution to quantitative evaluation of seizure semiology," presented at 25th International Epilepsy Congress, Lisbon, Portugal, 2003.
- [30] J. M. Fernandes, "Epileptic spikes: searching for a pattern in power," presented at IV Simpósio de Análise Intermodal em Epilepsia, Hospital Júlio de Matos, Lisboa, 2003.
- [31] J. P. S. Cunha, Z. Li, and A. Martins da Silva, "Quantification of movements during seizures using EEG/Video analysis," presented at 5th European Congress on Epileptology, Madrid, Espanha, 2002.
- [32] J. P. S. Cunha, Z. Li, and A. Martins da Silva, "A new quantified approach to video-eeeg analysis in epileptic seizures," presented at 6th World Multiconference on Systemics, Cybernetics and Informatics, Orlando, USA, 2002.
- [33] P. Dias, I. Soares, C. Fernandes, J. Klein, A. Freitas, I. Felgueiras, A. I. Ferreira, A. Pinho,

- L. Neves, B. Figueiredo, I. Jongenelen, R. Matos, S. Gonçalves, P. Machado, and J. P. S. Cunha, "Attachment Organization and Autonomic Regulation in Eating Disordered Patients," presented at Society for Psychotherapy Research International Conference 2002, Santa Barbara, CA, USA, 2002.
- [34] J. M. Fernandes, "Are MEG spikes equal to the ones we find in EEG? A quantitative approach," presented at III Simpósio de Análise Multimodal em Epilepsia, IEETA, Universidade de Aveiro, Aveiro, Portugal, 2002.
- [35] P. M. G. Pereira, M. F. Secca, A. Leal, C. Ribeiro, A. Martins, and J. P. S. Cunha, "Volumetry and T2 Relaxometry of the Amygdala Complex in Temporal Lobe Epilepsy," presented at European Congress of Radiology, Vienna, Austria, 2002.
- [36] P. M. G. Pereira, M. F. Secca, A. J. R. Leal, C. Ribeiro, P. Evangelista, P. Rosado, and J. P. S. Cunha, "Temporal Lobe Epilepsy: Clinical Correlations with Quantitative Magnetic Resonance Imaging," presented at 10th Scientific Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM), Honolulu, Hawaii, 2002.

Patents

- [1] J. P. S. Cunha, V. Ferreira, I. Salvado, R. E. Martins, C. Fonseca, J. P. Marques de Sá, M. A. Barbosa, and A. Martins da Silva, *Um Eléctrodo de Tipo Seco e Activo para a Detecção de Bio-potenciais*, Portugal Patent n°. 102 999, 2004.

Standards

- [1] A. Varri, T. Penzel, P. Jacobi, J. P. S. Cunha, C. Zywietz, and N. Brown, "prENV 14271: File Exchange Format for Vital Signs," Prestandard ENV 14271, European Committee for Standardisation (CEN), Brussels, Belgium, 2002.

Articles on non-scientific journals

- [1] J. P. S. Cunha, "Um novo sistema de análise computarizada de vídeo-EEG," in *Tecnologia Médica*, 2002, pp. 28-31.
- [2] J. P. S. Cunha, "Calculadoras médicas," in *Tecnologia Médica*, 2002, pp. 16-17.
- [3] J. P. S. Cunha, "Guidelines clínicas acessíveis nas suas mãos," in *Tecnologia Médica*, 2002, pp. 11-13.
- [4] J. P. S. Cunha, "Prescrição baseada em PDAs," in *Tecnologia Médica*, 2002, pp. 16-17.
- [5] J. P. S. Cunha, "Uma revolução na prática clínica?," in *Tecnologia Médica*, 2002, pp. 20-21.
- [6] J. P. S. Cunha, "Regras de avaliação no seu PDA," in *Tecnologia Médica*, 2002, pp. 15-15.
- [7] J. P. S. Cunha, "Integração e Fusão de Informação Multimodal," in *Tecnologia Médica*, 2001, pp. 28-31.

Curriculum vitae**Curriculum vitae****1. Dados pessoais****1. Personal data****Nome completo****Full name**

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National identity card

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Porto 28-12-1968

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2. Formação académica**2. Academic degrees**

Ano	Grau académico	Instituição	Classificação
Year	Academic degree	Institution	Classification
2004	DOUTORAMENTO	Escola de Engenharia	approved
1996	MESTRADO	Escola de Engenharia	Very Good
1992	LICENCIATURA	Universidade de Aveiro	14

3. Actividades anteriores e situação actual em termos científicos e/ou profissionais**3. Previous and current scientific and/or professional activities**

Período	Cargo ou categoria	Instituição
Period	Position or category	Institution
1992 a 2001	Research and scientific coordinator of the image processing area	INESC-Porto/Unidade ESP (Engenharia Sistemas de Produção)
2000	Development engineer and technical coordinator of the image processing and computer vision area	IDITE-Minho na Unidade Automação e Electrónica
1998 a 2000	PhD Scholarship student	Departamento de electrónica industrial - Universidade do Minho

1994 a 2000	Regent assistant professor	Universidade Lusíada - pólo de Vila Nova de Famalicão
2000 a 2004	Assistant professor	Departamento de electrónica industrial - Universidade do Minho
from 2004	Auxiliar professor	Departamento de electrónica industrial - Universidade do Minho
from 2006	Protocol established in order to develop new technologies, in the field of computer vision	Enermeter, Sistemas de Medição, Lda
from 2006	Protocol established in order to develop new technologies, in the field of computer vision	Lincis, Lda
2006 to 2007	Partnership established in order to develop new functionalities to the webots	Cyberbotics Company

4. Área de actividade científica **4. Area of scientific activity**

- Computer vision
 - Image processing
 - Image analysis
 - Artificial intelligence
 - Neural networks
 - Fuzzy logic
 - Signal processing
 - Computer graphics
 - Computer languages
-

5. Domínio de especialização **5. Domain of specialization**

Domínio de especialização **Domain of specializations**

- Industrial computer vision technique
- Texture analysis
- Color analysis and calibration techniques
- Pattern recognition
- Inference fuzzy systems

Actuais interesses de investigação **Present research interests**

- Inference fuzzy systems
- Color calibration techniques
- Wavelets transform applied to image analysis
- Human Motion Capture

Outras competências/actividades **Other skills/activities**

Computer languages
C, C++, C#
Embedded OS and software development
Windows CE programming

6. Experiência na orientação

6. Supervising experience

Co-Supervisor of the following on-going MSc thesis:

“Visão Por Computador em Ambiente Imersivo como suporte à Interface Gestual para Sistemas de Performance Audiovisual”, Rudolfo José da Silva Pinto Pereira Quintas, Escola de Engenharia da Universidade do Minho, 2005

“Tecnologias da Realidade Virtual e Processamento de imagem no suporte à Arte e Expressão Artística de cariz Corporal”, Tiago Dionísio Severino Rodrigues, Escola de Engenharia da Universidade do Minho, 2005

Co-Supervisor of the following on-going PhD thesis:

“Visualização de cenas híbridas a partir de elementos abstractos em realidade virtual e de objectos reais em sequências de imagens”, Fernando Pereira da Silva. Escola de Engenharia da Universidade do Minho.

“Técnicas de Segmentação e de Classificação em Imagens – Estudo de um Caso de Aplicação”, Pedro João Rodrigues. Escola de Engenharia da Universidade do Minho.

7. Participação em projectos

7. Participation in research projects

2004 to 2006

AIVA: Intelligent Aeronave with Artificial Vision, Cristina Santos, Manuel João Ferreira, Paulo Carvalho, José Afonso, João Monteiro, Luís Silva, Heitor de Almeida, Filipe Silva, Helder Carvalho, Coordinator (DEM): Luís Ferreira da Silva, IN2TEC, Internal Contest of Engineering School, Starting date: October 2004, End: October 2006.

2004

Technical coordinator of DISPLAX - Interactive Window (www.displax.com).

2000

Technical coordinator of the computer vision and image processing group, at IDITE-MINHO, under the scope of SIPROFIT project. Development of the Electronic tailor, Inspec100% and Confec100% sub-projects.

1994 to 2001

Scientific coordinator of the computer vision group at INESCPorto, under the scope of the VISCOR (computer vision applied to cork industry) and DigitSonic (computer vision applied to shoe industry) projects.

1998 a 1999

Leader of the computer vision development team at DEI, under the scope of the VIPTEx project (computer vision applied to textile industry).

1992 a 1994

Member of the computer vision team at INESCPorto, under the scope of the LaserMadeira (Computer vision applied to furniture industry) project.

8. Prémios e Distinções

8. Prizes and awards

Ano Year	Nome do Prémio ou Distinção Name of the prize or award	Nome da entidade promotora Name of the granting entity
2004	biggest attraction of COMTEC '04, highlighting its origin 100% national product.	"The Best of COMTEC 2004", given by BIT magazine

2005	honrosa mention to the work «Bluethoth para Actuação e Sensorização Distribuída»,	ENDIEL
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9. Publicações

9. Publications

Teses / Thesis

Desenvolvimento de um protótipo para a identificação, classificação e quantificação de defeitos, aplicável em ambiente industrial. PhD Thesis, 2004, Universidade do Minho

Aplicação de técnicas de processamento de imagem ao controlo de qualidade na linha de produção em indústrias tradicionais, MSc Thesis, 1996, Universidade do Minho

Capítulos de livros / Chapters in books

Cristina P Santos, Manuel J Ferreira, "Computer Vision and Fuzzy Rules applied to a dispensing application in an Industrial Desktop Robot", Editor: Munir Merdan, Industrial Robots – from design to applications, Advanced Robotics Systems International, 2006.

Artigos em revistas de circulação internacional com arbitragem científica / Papers in international scientific periodicals with referees

C. P. Santos, Manuel João Ferreira, Computer Vision and Fuzzy Rules applied to an Industrial Desktop Robot, Assembly and Automation, 2006

Publicações em actas de encontros científicos / Papers in conference proceedings

M. J. Oliveira Ferreira e J. A. Campos Neves, "A wood industrial application for quality control using image processing", The European Symposium on Optics for Productivity in Manufacturing, EUROPTO, 1994, Frankfurt - Germany

J.A.B. Campos Neves e M.J. Oliveira Ferreira, "Segmentation of Wood Defects by Carving the Convex Hull Representing them", RECPAD'96, 1996, Guimarães - Portugal

M.J. Oliveira Ferreira, "Application of Neural Networks to the Quality Control in the Wood Industry", RECPAD'96, 1996, Guimarães - Portugal

J. C. Aparício Fernandes, M.J. Oliveira Ferreira, J.A.B. Campos Neves, Carlos A. C. Couto, "Fast Correction of Lens Distortion for Image Applications", ISEI'97, 1997, Guimarães - Portugal.

Manuel J. Ferreira, Aparício Fernandes, J.A. Campos Neves, João L. Monteiro, "Automatic Visual Inspection on Shoe and Textile Industries", IASTED – CGIM'98, 1998, Halifax - Canada.

Manuel J. Ferreira, Rui Picas de Carvalho, João L. Monteiro, "Texture Classification Based on Fuzzy System Applied to the Cork Industry", SIP'99, 1999, Nassau - Bahamas.

J. Roldão, L.Melo, Manuel J. Ferreira, João L. Monteiro, "Defects Detection in printing fabrics using Computer Vision", M2Vip'00, 2000, Sydney - Austrália.

C. P. Santos, Manuel João Ferreira – Control Of An Industrial Desktop Robot Using Computer Vision And Fuzzy Rules. In IEEE International Symposium on Industrial Electronics, ISIE-2005, D7-02F1, Vol.III, pp. 1297-1302, June 2005, Dubrovnik, Croatia

Oliveira, T, Carvalhal, P., Afonso, J., Ferreira, M.J., Santos, C. P., Distributed Sensing and Actuation over Bluetooth for Unmanned Air-Vehicles. In IEEE International Conference on Robotics and Automation (ICRA-2006) 15-19 May 2006, Orlando, EUA.

Cristina Santos, Manuel Ferreira, "Ball Catching by a Puma Arm: a Nonlinear Dynamical Systems Approach", IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2006, October 2006, Beijing, China.

Tito E. Coelho, Ricardo Macedo, Paulo Carvalhal, José A. Afonso, Luís F. Silva, Heitor Almeida, Manuel J. Ferreira, Cristina Santos, "A FLY-BY-WIRELESS UAV PLATFORM BASED ON A FLEXIBLE AND DISTRIBUTED SYSTEM ARCHITECTURE". In IEEE International Conference on Industrial Technology, ICIT2006, December 2006, Mumbai, India.

Tito E. Coelho, Paulo Carvalhal, Manuel J. Ferreira, Luís F. Silva, Heitor Almeida, Cristina Santos, José A. Afonso, "A Bluetooth-based Wireless Distributed Data Acquisition and Control System". In IEEE International Conference on Robotics and Biomimetics, ROBIO 2006, December 2006, Kunming, China.

Cristina Santos and Manuel Ferreira, "Two Vision-guided vehicles: temporal coordination using nonlinear dynamical systems", . In IEEE International Conference on Robotics and Automation, ICRA-2007, April 2007, Roma, Italy

Manuel J. Ferreira, Cristina Santos, "Tracking system using texture cue based on wavelet transform". In 7th Portuguese Conference on Automatic Control, Controlo 2006, September 2006, Lisboa, Portugal

Ezequiel T. Coelho, José A. Afonso, Paulo Carvalhal, Cristina Santos, Manuel J. Ferreira, Luís F. Silva, Heitor Almeida, "AUTONOMOUS PLATFORM FOR DISTRIBUTED SENSING AND ACTUATION OVER BLUETOOTH". In 7th Portuguese Conference on Automatic Control, Controlo 2006, September 2006, Lisboa, Portugal

Manuel J. Ferreira, Cristina P. Santos, Joao Monteiro, "Texture Cue Based Tracking System Using Wavelet Transform and a Fuzzy Grammar". In 5th International Conference on Industrial Informatics, INDIN 2007, July 2007, Vienna, Austria.

Manuel J. Ferreira, Cristina P. Santos, Joao Monteiro, "Texture Segmentation Based On Fuzzy Grammar for Cork Parquet Quality Control". In IEEE International Symposium on Industrial Electronics, ISIE 2007, June 2007, Vigo, Spain.

Outras publicações / Other publications

M. J. Oliveira Ferreira e J. A. Campos Neves, "A wood industrial application for quality control using image processing", the INESC Journal of research & development, Vol. 4 Nº 2, 1994, Lisbon - Portugal.

M.J. Oliveira Ferreira, "Reconhecimento do Falante, Survey", Lusíada - Revista de Ciência e Cultura, Série de Engenharia Electrónica e Informática, Junho 1996, Famalicão - Portugal.

Manuel J. Ferreira, João L. Monteiro, "Visão por computador – projectos de I&D para a industria", Workshop RecPad'99, 1999, Vila Real - Portugal.

Ezequiel T. Coelho, José A. Afonso, Paulo Carvalhal, Cristina Santos, Manuel J. Ferreira, Luís F. Silva, "A BLUETOOTH-BASED WIRELESS DISTRIBUTED DATA ACQUISITION AND CONTROL SYSTEM" in GLOBAL BUSINESS FORUM Hannover, April, 2006, Hannover, Alemanha.

Tito Oliveira, Paulo Carvalhal, José Afonso, Manuel João e C. P. Santos, Prémio de Inovação e criatividade promovido pela ANIMEE- Endiel 2005, " 14º Encontro para o desenvolvimento do Sector Eléctrico e Electrónico, "Plataforma Bluetooth para Actuação e Sensorização Distribuída", Relatório técnico, 11-15 de Outubro de 2005, Exponor, Porto.

10. Comunicações 10. Communications

Comunicações orais por convite / Oral communications by invitation

Manuel J. Ferreira, Rui Picas de Carvalho, João L. Monteiro, "Texture Classification Based on Fuzzy System Applied to the Cork Industry", SIP'99, 1999, Nassau - Bahamas.

Outras comunicações orais / Other oral communications

J.A.B. Campos Neves e M.J. Oliveira Ferreira, "Segmentation of Wood Defects by Carving the Convex Hull Representing them", RECPAD '96, 1996, Guimarães – Portugal

M.J. Oliveira Ferreira, "Application of Neural Networks to the Quality Control in the Wood Industry", RECPAD '96, 1996, Guimarães – Portugal

11. Línguas 11. Language

Língua Language	Leitura Reading	Escrita Writing	Conversação Conversation
Inglês	Excelente	Bom	Bom

Curriculum Vitae

Personal Data

Name: Jaime dos Santos Cardoso

Birthplace: Argivai, Póvoa de Varzim, Portugal

Date of Birth: 28 May 1976

Nationality: Portuguese

Current Professional Address:

INESC Porto
Campus da FEUP,
Rua Dr. Roberto Frias, n 378
4200-465 Porto
Portugal

Telephone office: +351 222094000

Email: jaime.cardoso@inescporto.pt

Web page: <http://www.inescporto.pt/~jsc/>

Current Professional Status

Researcher at INESC Porto, Porto, Portugal.
Invited Assistant Professor at Faculdade de Engenharia da
Universidade do Porto, Portugal.

Education

His academic record is outstanding, achieving both BSc in Electrical and Computing Engineering at FEUP and Engineering Mathematics at FCUP with a final classification of 19 – out of 20 – both course and faculty all time record. He has been distinguished with three consecutive Faculty Merit Distinctions and with the award Eng. António de Almeida.

Doctoral Degree in Electrical and Computers Engineering

Institution: Faculdade de Engenharia da Universidade do Porto
End date: May 2006
Supervisor: Luis Corte-Real
Title of the Dissertation: Metadata Assisted Image Segmentation

Master in Mathematical Engineering

Institution: Faculdade de Ciências da Universidade do Porto
End date: November 2005
Supervisor: Joaquim F. Pinto da Costa
Title of the Dissertation: Classification of Ordinal Data

Diploma (Licenciatura) in Electrical and Computers Engineering

Institution: Faculdade de Engenharia da Universidade do Porto
End date: July 1999
Graduation grade: 19 (out of 20)
Specialization: Telecommunications

Industry

Co-founder of **ClusterMedia Labs**, an IT company developing automatic solutions for semantic audio-visual analysis.

Research

Since 1999 he has been a Researcher at INESC Porto, Portugal, an R&D institute affiliated with Universidade do Porto. He has participated in several European research projects and has been the Principal Investigator of some Portuguese research projects. One of the current projects is "Advanced Objective Method for the Evaluation of the Aesthetical Result of Breast Interventions", in collaboration with the Medical School of University of Porto.

Research Interests

Machine learning
Image and Video analysis and processing
Medical Image Analysis

Collaborations

Strong collaboration with the Medical School and the Department of Mathematics of the Sciences School of University of Porto, co-supervising numerous PhD and MSc Students and working together in several research projects.

Projects

1. ORBIT (1999-2002) - Object Reconfigurable Broadcast Infrastructure Trial. A direct contract with BBC. Role: Investigator
2. Metavision (2000-2003) - European Project; Funding: 4.5M€; Role: Investigator
3. VISNET (2003-2005) - European Network of Excellence; ; Funding: 2.2M€; Role: Investigator
4. VISNET II (2006-2009) - European Network of Excellence; ; Funding: 6.2M€; Role: Investigator
5. BCCT (Advanced Objective Method for the Evaluation of the Aesthetical Result of Breast Interventions) - 2007-2010-Funding Organization: FCT; Role: Principal Investigator; Funding: 95k€
6. OMR (Optical Recognition System for Handwritten Music Scores) - 2007-2010-Funding Organization: FCT; Role: Principal Investigator; Funding: 50k€

Teaching Experience

September 2006 – Present

Assistant Professor at Faculdade de Engenharia da Universidade do Porto.

Courses: Computer Networks; Programming

March 2006 – July 2006

Invited Assistant at Faculdade de Engenharia da Universidade do Porto.

Courses: Computer Networks; Programming

Student Supervision

Running Doctoral Thesis Works

Title: Prediction of the aesthetic result in breast cancer conservative treatment

Student: Susy Cabral da Costa

Role: Co-supervisor

Title: Video analysis and representation based on 3D models

Student: Pedro M. Carvalho

Role: Co-supervisor

Running Master Thesis works

Title: Objective assessment of the aesthetic result of breast cancer conservative treatment

Student: Luis Daniel Torres Rebelo

Role: Supervisor

Title: System for the automatic processing of handwritten forms

Student: Luis Miguel Marques Soeiro Batista

Role: Supervisor

Title: QuidPyx mobile - Music recommendation system on mobile platforms

Student: Luis Jorge Trindade Certo

Role: Supervisor

Title: A Smarter YouTube - automatic video annotation system based on semantic content

Student: João Carlos Loureiro de Jesus Oliveira

Role: Supervisor

Title: Gamera Plugin for the optical recognition of handwritten music symbols

Student: Guilherme Artur Conceição Capela

Role: Supervisor

Title: System for the automatic processing of cheques
Aluno: Filipe Emanuel Amaro Coelho
Role: Supervisor

Title: Towards an intelligent medical system for the aesthetic evaluation of breast cancer conservative treatment
Student: Ricardo Jorge Gamelas de Sousa
Role: Co-supervisor

Title: Automatic analysis of handwritten music scores
Student: Ana Maria Silva Rebelo
Role: Co-supervisor

Publications

Thesis

"Metadata Assisted Image Segmentation", PhD thesis, Faculdade de Engenharia da Universidade do Porto, 2006.

"Classification of Ordinal Data", MSc thesis, Faculdade de Ciências da Universidade do Porto, 2005.

Papers on Refereed Journals

2008

Joaquim F. Pinto da Costa, Hugo Alonso, **Jaime S. Cardoso**, "The unimodal model for the classification of ordinal data", (Elsevier) Neural Networks, vol. 21, issue 1, pp. 78-91.

Maria João Cardoso, André Magalhães, Teresa Almeida, Susy Costa, Conny Vrieling, David Christie, Jørgen Johansen, **Jaime S. Cardoso**, "Is Face-Only Photographic View Enough for the Aesthetic Evaluation of Breast Cancer Conservative Treatment?", Breast Cancer Research and Treatment.

2007

Emanuele Berti, **Jaime S. Cardoso**, Vitor Cardoso, Marco Cavaglia, "Matched-filtering and parameter estimation of ringdown waveforms", Physical Review D.

Luis F. Teixeira, **Jaime S. Cardoso**, Luis Corte-Real, "Object segmentation using background modelling and cascaded change detection", Journal of Multimedia, vol. 2, issue 5, pp. 55-65.

M. J. Cardoso, **Jaime S. Cardoso**, and Natália Amaral et al., "Turning subjective into objective: The BCCT.core software for evaluation of cosmetic results in breast cancer conservative treatment", (Elsevier) The Breast, vol. 16, issue 5, pp. 456-461.

Jaime S. Cardoso, Joaquim F. Pinto da Costa, "Learning to classify ordinal data: the data replication method", Journal of Machine Learning Research, vol. 8, pp. 1393-1429.

Jaime S. Cardoso, M. J. Cardoso, "Towards an intelligent medical system for the aesthetic evaluation of breast cancer conservative treatment", Artificial Intelligence in Medicine, vol. 40, issue 2, pp. 115-126.

M. J. Cardoso, **Jaime S. Cardoso**, A. C. Santos, C. Vrieling, D. Christie, G. Liljegren, I. Azevedo, J. Johansen, J. Rosa, N. Amaral, R. Saaristo, V. Sacchini, H. Barros, M. C. Oliveira, "Factors determining aesthetic outcome after breast cancer conservative treatment", (Blackwell) *The Breast Journal*, vol. 13, issue 2, pp. 140-146.

2006

Jaime S. Cardoso, Luís Corte-Real, "A measure for mutual refinements of image segmentations", *IEEE Transactions on Image Processing*, vol. 15, issue 8, August 2006, pp. 2358-2363.

M. J. Cardoso, **Jaime S. Cardoso**, A. C. Santos, H. Barros, M. C. Oliveira, "Interobserver agreement and consensus over the esthetic evaluation of conservative treatment for breast cancer", (Elsevier) *The Breast*, vol. 15, issue 1, February 2006, pp. 52-57.

2005

Jaime S. Cardoso, Luís Corte-Real, "Accumulator size minimization for a fast cumulant-based motion estimation", *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 15, issue 12, December 2005, pp. 1660-1664.

Jaime S. Cardoso, Luís Corte-Real, "Toward a Generic Evaluation of Image Segmentation", *IEEE Transactions on Image Processing*, vol. 14, issue 11, November 2005, pp. 1773-1782.

Jaime S. Cardoso, Joaquim F. Pinto da Costa, M. J. Cardoso, "Modelling ordinal relations with SVMs: an application to Objective Aesthetic Evaluation of Breast Cancer Conservative Treatment", (Elsevier) *Neural Networks*, vol. 18, issues 5-6, June-July 2005, pp. 808-817.

M. J. Cardoso, A. C. Santos, **Jaime S. Cardoso**, H. Barros, M. C. Oliveira, "Choosing observers for the evaluation of aesthetic results in breast cancer conservation treatment", (Elsevier) *International Journal of Radiation Oncology, Biology and Physics*, vol. 61, pp. 879-881, 2005.

Papers on Refereed Conferences

2008

Jaime S. Cardoso, Luis F. Teixeira, M. J. Cardoso, "Automatic Breast Contour Detection in Digital Photographs", *HEALTHINF 2008*, vol. 2, pp. 91-98.

2007

Ana Rebelo, Artur Capela, Joaquim F. Pinto da Costa, Carlos Guedes, Eurico Carrapatoso, **Jaime S. Cardoso**, "A Shortest Path Approach for Staff Line Detection", *Third International Conference on Automated Production of Cross Media Content for Multi-channel Distribution (AXMEDIS 2007)*, Barcelona, November 2007.

Jaime S. Cardoso, M. J. Cardoso, "Breast Contour Detection for the Aesthetic Evaluation of Breast Cancer Conservative Treatment", *International Conference on Computer Recognition Systems (CORES 2007)*, Wroclaw, October 2007.

Maria João Cardoso, **Jaime S. Cardoso**, Conny Vrieling, David Christie, Jorgen Joahensen, Susy Costa, Teresa Almeida, "Is face-view only enough for the aesthetic evaluation of breast cancer

conservative treatment (BCCT)?", 10th Nottingham International Breast Cancer Conference (NIBCC 2007), Nottingham, September 2007.

Jaime S. Cardoso, "Bandwidth-efficient byte stuffing", IEEE International Conference on Communications (ICC 2007), Glasgow, June 2007.

Jaime S. Cardoso, Jorge C. Cardoso, Luís Corte-Real, "Object-based spatial segmentation of video guided by depth and motion information", IEEE Workshop on Motion and Video Computing 2007 (WMVC 2007), Austin, Texas, USA, February 2007.

2006

M. J. Cardoso and **Jaime S. Cardoso**, "Towards a computer-aided medical system for the aesthetic evaluation of breast cancer conservative treatment", San Antonio Breast Cancer Symposium 2006.

Margarita Kotti, Emmanouil Benetos, Constantine Kotropoulos, Luís Gustavo P. M. Martins and **Jaime S. Cardoso**, "Automatic Speaker Segmentation Using Multiple Features and Distance Measures: A Comparison of Three Approaches", Proceedings of International Conference on Multimedia & Expo (ICME) 2006.

2005

Joaquim F. Pinto da Costa, **Jaime S. Cardoso**, "Classification of Ordinal Data Using Neural Networks", Proceedings of 16th European Conference on Machine Learning (ECML) 2005, pp. 690-697.

Jaime S. Cardoso, Joaquim F. Pinto da Costa, M. J. Cardoso, "SVMs Applied to Objective Aesthetic Evaluation of Conservative Breast Cancer Treatment", Proceedings of International Joint Conference on Neural Networks, (IJCNN05), pp. 2481- 2486, 2005.

2004

M. J. Cardoso, I. Leitão, A. J. Moura, A. C. Santos, **Jaime S. Cardoso**, H. Barros, M. C. Oliveira., "Aesthetic evaluation of conservative breast cancer treatment: new scales of agreement or disagreement?", Proceedings of 4th European Breast Cancer Conference, 2004.

M. J. Cardoso, I. Leitão, A. J. Moura, A. C. Santos, **Jaime S. Cardoso**, H. Barros, M. C. Oliveira., "Aesthetic evaluation of conservative breast cancer treatment: can measuring help?", Proceedings of 4th European Breast Cancer Conference, 2004.

2003

M. J. Cardoso, I. Leitão, A. J. Moura, F. Valente, L. M. Lima, **Jaime S. Cardoso**, M. C. Oliveira, "Aesthetic evaluation of conservative breast cancer treatment: development of a new evaluating tool", Proceedings of 2nd Congress of the World Society of Breast Health, Budapest, 2003.

2002

P. W. Walland, G. Thomas, M. Koppetz, **Jaime S. Cardoso**, T. Erseghe, F. Hericourt, "The Application of Intimate Metadata in Post Production", Proceedings of Int. Broadcasting Convention (IBC 2002), Amsterdam, 2002.

M. J. Cardoso, J. Preto, H. Queirós, V. Garrido, A. J. Moura, J. Pinto-de-Sousa, D. Ayres-de-Campos, **Jaime S. Cardoso**, "Aesthetic evaluation of conservative breast cancer treatment: Trying to optimize results", 3rd European Breast Cancer Conference, Barcelona, 2002.

2000

Jaime S. Cardoso, J. C. Alves, Luís Corte-Real, "FPGAs based hardware applied to block-based motion estimation for real-time video processing", Proceedings of 11th Portuguese Conference on Pattern Recognition (RECPAD2000), 2000, pp. 455-458.

1999

Telmo Cunha, Phillip Tomé, Sérgio Cunha, **Jaime S. Cardoso**, Luisa Bastos, "Utilização de DGPS para a Monitorização de Frotas em Ambiente Urbano", Actas da 2^a Conferência Nacional de Cartografia e Geodésia, Luso, 1999.

Reviewer Activities

Journals

EURASIP Journal on Image and Video Processing

Elsevier Artificial Intelligence in Medicine

IEEE Transactions on Biomedical Engineering

Conferences

IJCNN 2008

IJCNN 2007

ISIT 2007

ibPRIA 2007

ICIAR 2007

ICIAR 2006

ECML 2005

Honours and Awards

In May 2000 was received the award *Eng. António de Almeida*, assigned to the best graduate in Electrical and Computing Engineering of the Faculty of Engineering.

In 2000 was also received a scholarship, *Bolsa de Mérito*, along with other nine students of the Faculty of Engineering with best averages in the year of 1998/99.

The same scholarship, *Bolsa de Mérito*, had been received in 1999 relating to 1996/97 and 1997/98.

In 1994 received the award *Prémio Santos Graça*, assigned to the best student of the school *Escola Secundária de Rocha Peixoto* by the Rotary Club of Póvoa de Varzim.

In the same year was distinguished by the school *Escola Secundária de Rocha Peixoto* for the same reasons. And that same distinction had been assigned in 1992.

In 1991 and 1993 received the award *Prémio Lyons Clube da Póvoa de Varzim*, assigned to the best student of school *Escola Secundária de Rocha Peixoto*.

Patents

Portuguese patent pending "Computer System for the Aesthetic Evaluation of Breast for Medical Application". The invention applies computer technology to cancer care by the design and testing of an automated method for the measurement of the cosmetic results of treatment to the breast. The method will enable entirely objective assessment to be carried out, recorded and scored very quickly.