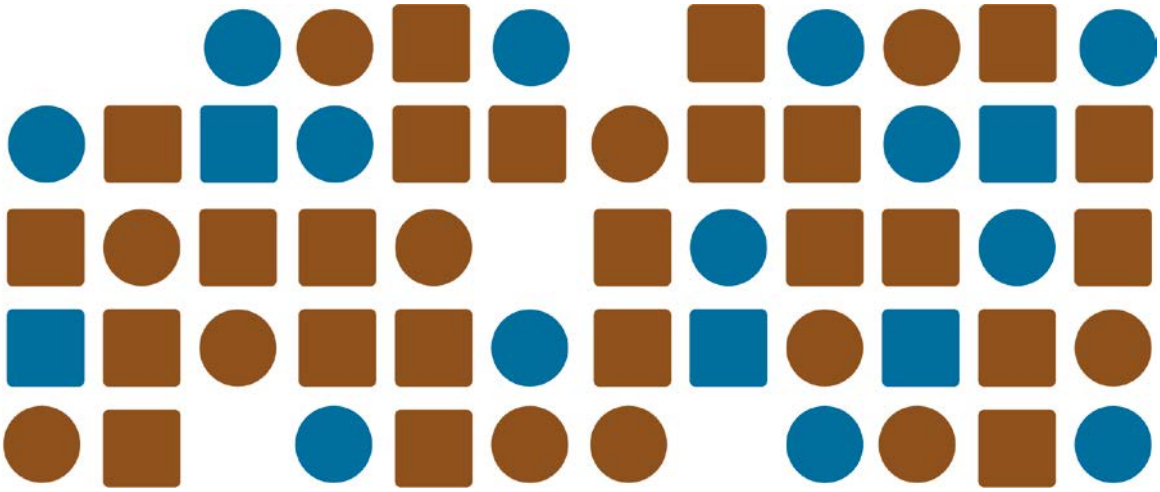


IOC

Institute of Industrial and Control Engineering

Activities Report 2019

UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Institute of Industrial and Control Engineering

Table of contents

1. Organisational structure and governing bodies

Management

Director	ROBERT GRIÑÓ CUBERO
Assistant director	ERNEST BENEDITO BENET
Secretary	JAN ROSELL GRATACÒS
Technical and Management Support Area - UTGAEIB	M. LOURDES DURANY VIDAL

The Board

Management	ROBERT GRIÑÓ CUBERO
Assistant director	ERNEST BENEDITO BENET
Secretary	JAN ROSELL GRATACÒS
Representative of the Control division	DOMINGO BIEL SOLÉ
Representative of the Supply chain and operations management (SCOM) division	AMAIA LUSA GARCÍA
Representative of the Robotics division	RAÚL SUÁREZ FEIJÓO
Technical and Management Support Area - UTGAEIB	M. LOURDES DURANY VIDAL
Representative of teaching and research staff who hold a PhD	LAIA FERRER MARTÍ
Representative of teaching and research staff who do not hold a PhD	Vacancy
Representative of administrative and service staff	LEOPOLD PALOMO AVELLANEDA

The Council

Arias Pujol, Antoni	
Batlle Arnau, Carles	
Basañez Villaluenga, Luís	Fins al 31/08/2019
Bautista Valhondo, Joaquin	
Benedito Benet, Ernest	Assistant director
Biel Solé, Domingo	Representative of the Control division
Calleja Sanz, Gema	
Corominas Subias, Albert	Fins al 31/08/2019
Domenech Lega, Bruno	
Dòria Cerezo, Arnau	
Durany Vidal, Ma Lourdes	Technical and Management Support Area UTGAEIB
Ferrer Llop, Josep	
Ferrer Martí, Laia	
Fossas Colet, Enric	
García Villoria, Alberto	
Griñó Cubero, Robert	Director
Lusa Garcia, Amaia	Representative of the Supply Chain and Operations Management-SCOM division
Martínez Costa, M. Carme	
Mas Casals, Orestes	
Mateo Doll, Manel	
Montaño Sarria, Andrés Felipe	Until 19/03/2019
Olivella Nadal, Jordi	
Olm Miras, Josep Maria	
Palomo Avellaneda, Leopold	Representative of administrative and service staff
Pastor Moreno, Rafael	
Peña Pitarch, Esteban	
Roig Fernández, Vicenç	Representative of administrative and service staff
Rosell Gratacòs, Jan	Secretary
Suárez Feijóo, Raúl	Representative of the Robotics division

2. Staff

NAME		DIVISIONS/ SERVICE	CATEGORIES
Akbari	Aliakbar	ROB	BR
Arias Pujol	Antoni	CTL	TU
Arocas Pérez	José	CTL	BR
Basañez Villaluenga	Luis	ROB	EMERITUS
Batlle Arnau	Carles	CTL	TU
Bautista Valhondo	Joaquin	ROB	CU
Benedito Benet	Ernest	SCOM	AG
Biel Solé	Domingo	CTL	TU
Calleja Sanz	Gema	SCOM	AJ
Cardoner Parpal	Rafel	SSR	LT
Claret Robert	Josep Arnau	ROB	BR
Corominas Subias	Albert	SCOM	EMERITUS
Domènech Lega	Bruno	SCOM	LT
Dòria Cerezo	Arnau	CTL	AG
Ferrer Llop	Josep	CTL	CU
Ferrer Martí	Laia	SCOM	AG
Fossas Colet	Enric	CTL	CU
Galleguillos Pozo	Rosa	SCOM	BR
Garcia Hidalgo	Nèstor	ROB	BR
García Villoria	Alberto	SCOM	AG
Griñó Cubero	Robert	CTL	TU
Lusa García	Amaia	SCOM	TU
López González	Alejandro Esteban	SCOM	LT
Martínez Costa	Carme	SCOM	TU
Mas Casals	Orestes	ROB	TU
Mateo Doll	Manuel	SCOM	TU
Miró Valero	Enric	SSR	LT

NAME		DIVISIONS/ SERVICE	CATEGORIES
Montaño Sarria	Andrés F.	ROB	BR
Olivella Nadal	Jordi	SCOM	TU
Olm Miras	Josep M.	CTL	AG
Palomo Avellaneda	Leopold	SSR	LT
Pastor Moreno	Rafael	SCOM	CU
Peña Pitarch	Esteban	ROB	TU
Repecho Del Corral	Victor	CTL	LT
Rodríguez Pacheco	Carlos	ROB	BR
Rosell Gratacòs	Jan	ROB	TU
Rúa Costa	Carles	SCOM	PAL
Shafieijam	Amir	SCOM	BR
Sharafeldeen	Mohammed	ROB	BR
Suárez Feijóo	Raúl	ROB	DI
Taherimashhadi	Mehrsa	SCOM	BR
Ud Din	Muhayy	ROB	BR
Zaplana Agut	Isiah	ROB	BR

PhD Students

NAME		DIVISIONS/ SERVICE	CATEGORIES
Díaz Pacheco	Raúl Antonio	SCOM	EV
Ferreira Vicente	Jéssica	SCOM	EV
Portilla Rodriguez	Henry	ROB	EV
Rafiezadeh	Roya	CTL	EV
Rodríguez Pacheco	Carlos	ROB	EV
Rojas De Silva González	Fco. Abiud	ROB	EV

GLOSSARY

DIVISIONS/SERVICE	CTL	Division of Automatic Control
	SCOM	Division Supply Chain&Operations Management
	ROB	Division of Robotics
CATEGORY	AG/TU	Associate professor
	AJ/PAL/PL	Assistant professor
	BR	Research grantholder
	CU	Professor
	DI	Research supervisor
	LT	Technical staff

Visiting Staff

NAME		DIVISIONS	UNIVERSITY
Aldana López	Carlos Iván	ROB	Univ. de Guadalajara - Mèxic
De Lellis	Pietro	SCOM	Univ. Federico II - Itàlia
Jeltsema	Dimitri	CTL	Han Univ. Applied Sciences - Holanda
Nuño	Emmanuel	ROB	Univ. de Guadalajara - Mèxic
Ponsich	Antonin	SCOM	Univ. Autón. Metropolitana - Mèxic

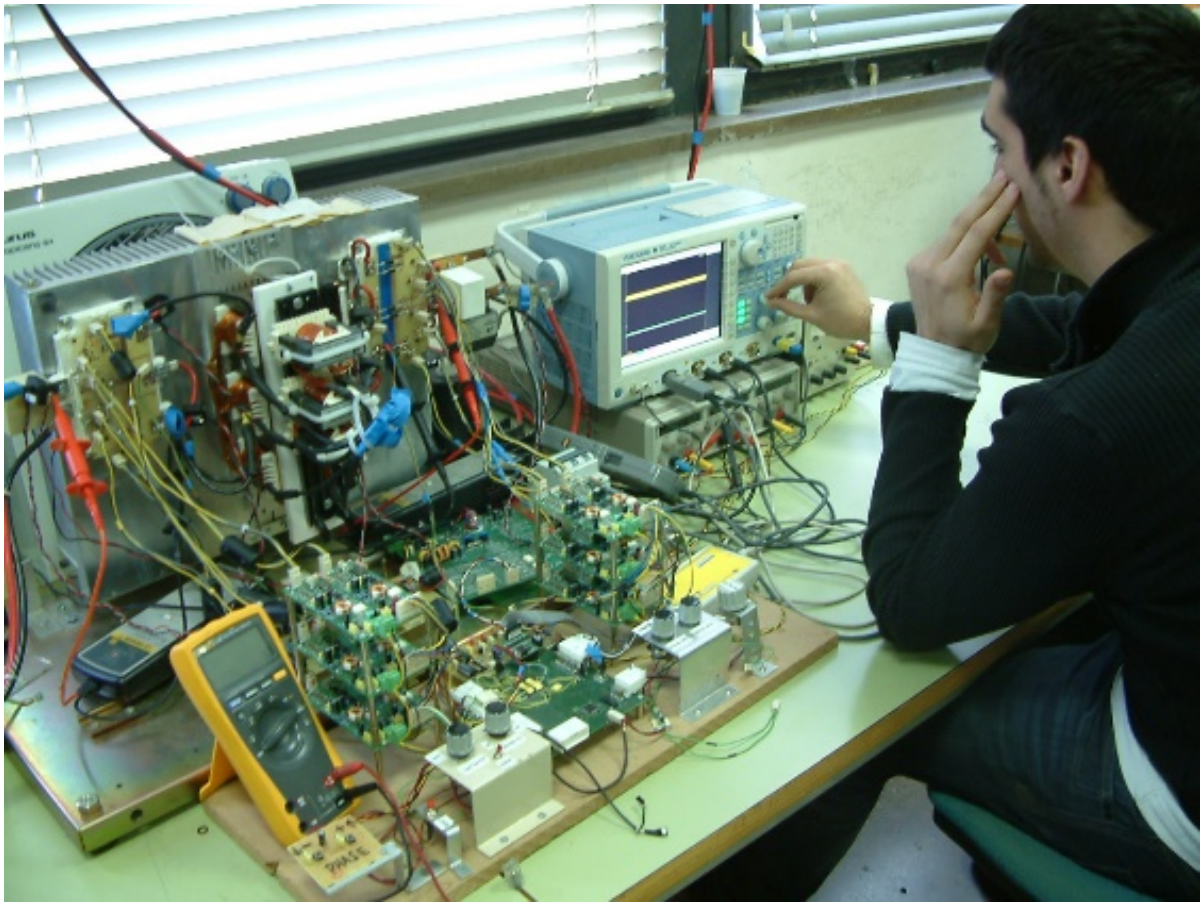
Incoming Students

NAME		DIVISIONS	UNIVERSITY
Chandirasegarr	Vaishnavi	CTL	College of Enfineering - India
Chiala	Francesco	ROB	Polytechnic of Turin - Italia
González Presa	Néstor Guadalupe	ROB	Tecnológico Nacional - México
Lecomte	Alexandre	ROB	École Nat. Sup. d'Elec. - ENSEA
Meziti	Sofiane	ROB	École Nat. Sup. d'Elec. - ENSEA
Ortega Velázquez	Isaac	CTL	Nat. Autonomous Univ. - Mexico
Romero Mato	Alvaro	ROB	Universitat de Barcelona - Espanya
Volkov	Alexey	CTL	Tomsk Polytechnic Univ. - Rússia
Yigit	Alparsian Samil	ROB	Karadeniz Technical Univ. - Turquía

3. Divisions

Research at the IOC is conducted through three divisions:

Division of Automatic Control



The principal projects in this division are set in the following thematic areas: research area of Control Theory, research area of Energy Systems and research area of Automotive Applications.

Head: DOMINGO BIEL SOLÉ

Research fields:

- Advanced linear controllers (Resonant and repetitive control).
- Nonlinear control techniques (Passivity-based control, Adaptive control, Sliding mode control).
- Complex dynamical networks.
- Modelling and control of electronic power systems (generation and conversion).
- Control algorithms for an overall improvement of the vehicle performance.
- Autonomous and cooperative driving applications.

Division of Supply Chain & Operations Management

The Division of Supply Chain and Operations Management covers the design and management of the supply chain, namely production and logistic systems to generate goods and services, as well as the necessary techniques for solving efficiently its derived problems.

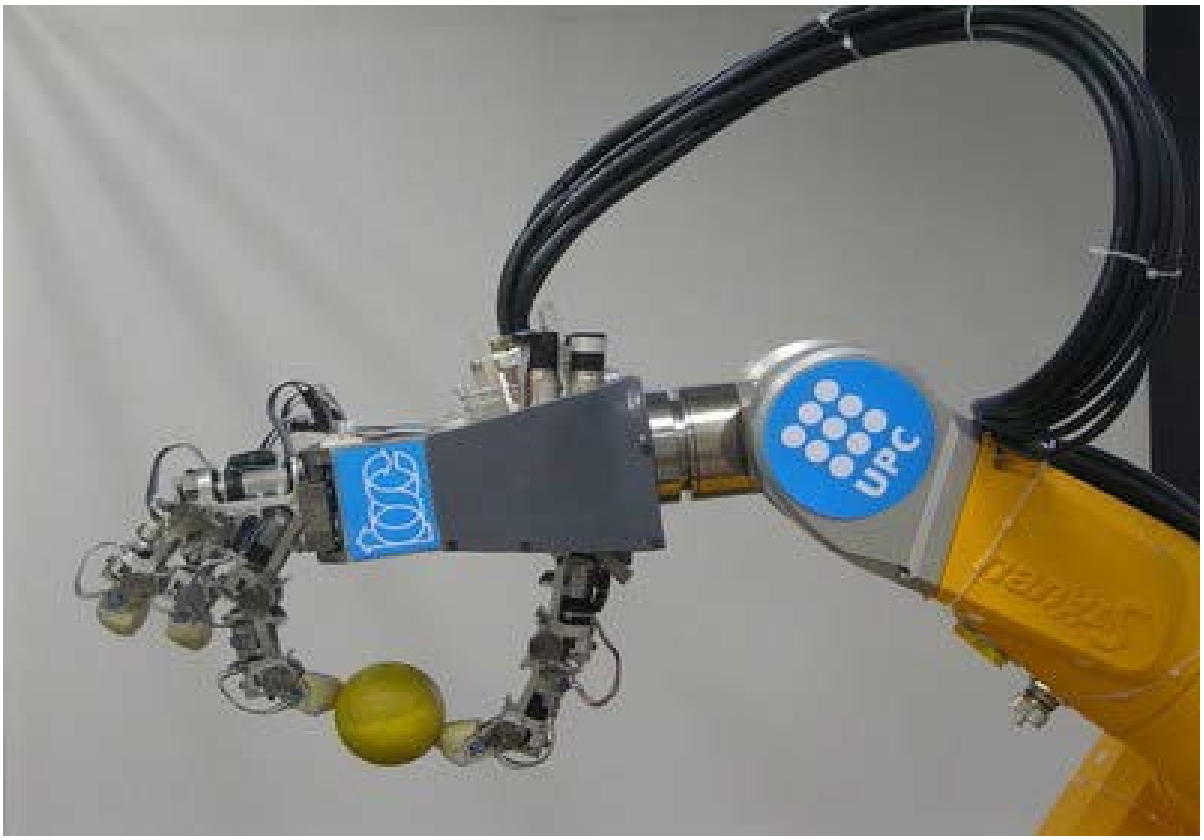
Head: AMAIA LUSA GARCÍA

Research lines:

- Supply Chain management and design
- Operations management
- Scheduling
- Assembly line design and balancing
- Working time planning and scheduling
- LEAN management
- Integrated aggregate planning
- Strategic capacity planning
- Urban logistics
- Sustainability in transportation and distribution
- Rural electrification with renewable energy and sustainable development in isolated areas

Research group linked with the Division: Supply Chain and Operations Management

Division of Robotics



The Division of Robotics of the IOC deals with basic and applied research on different aspects of robotics, either considering the robot as a single machine or integrated with other elements and devices within a robotized system. The research extends to different application fields in both the industrial and service areas.

Head: RAÚL SUÁREZ FEIJÓO

Main fields of activity

- Task and motion planning
- Grasping and dexterous manipulation
- Mobile manipulators
- Robot co-workers
- Human-robot interaction
- Teleoperation and haptic systems
- Control and programming of robots
- Perception systems and sensor integration
- Computer vision
- Simulation of robotized systems
- Industrial applications of robotics
- Service robots

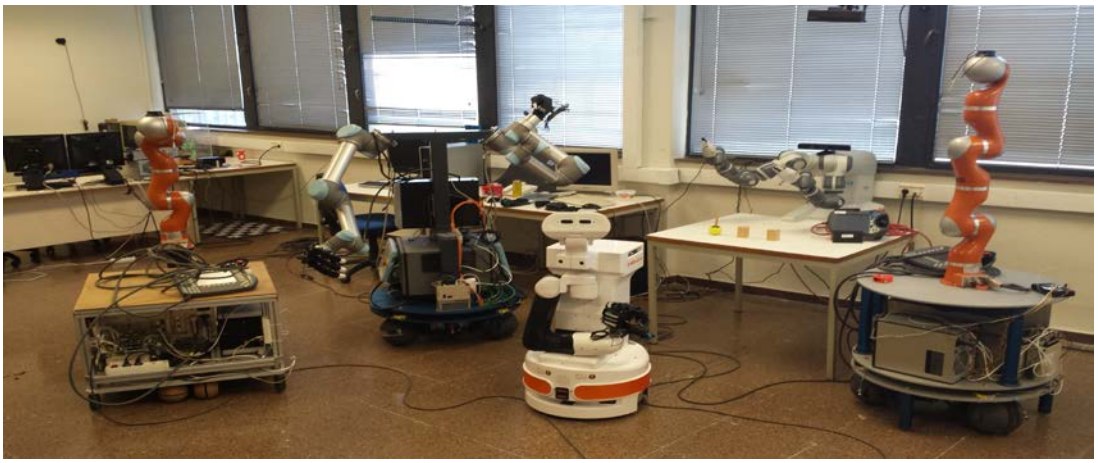
4. Facilities

The IOC is located on the 11th floor of building H of the Barcelona School of Industrial Engineering (ETSEIB).

The Institute has a robotics laboratory; a control and electronics laboratory; a remote control laboratory; a logistics laboratory; a computer network equipped with servers, workstations, PCs and software; a WiFi network; a specialised library with around 6,000 books and numerous journals; a classroom that can hold 25 people; and a meeting room with a digital blackboard and a projector with a capacity for 10 people.

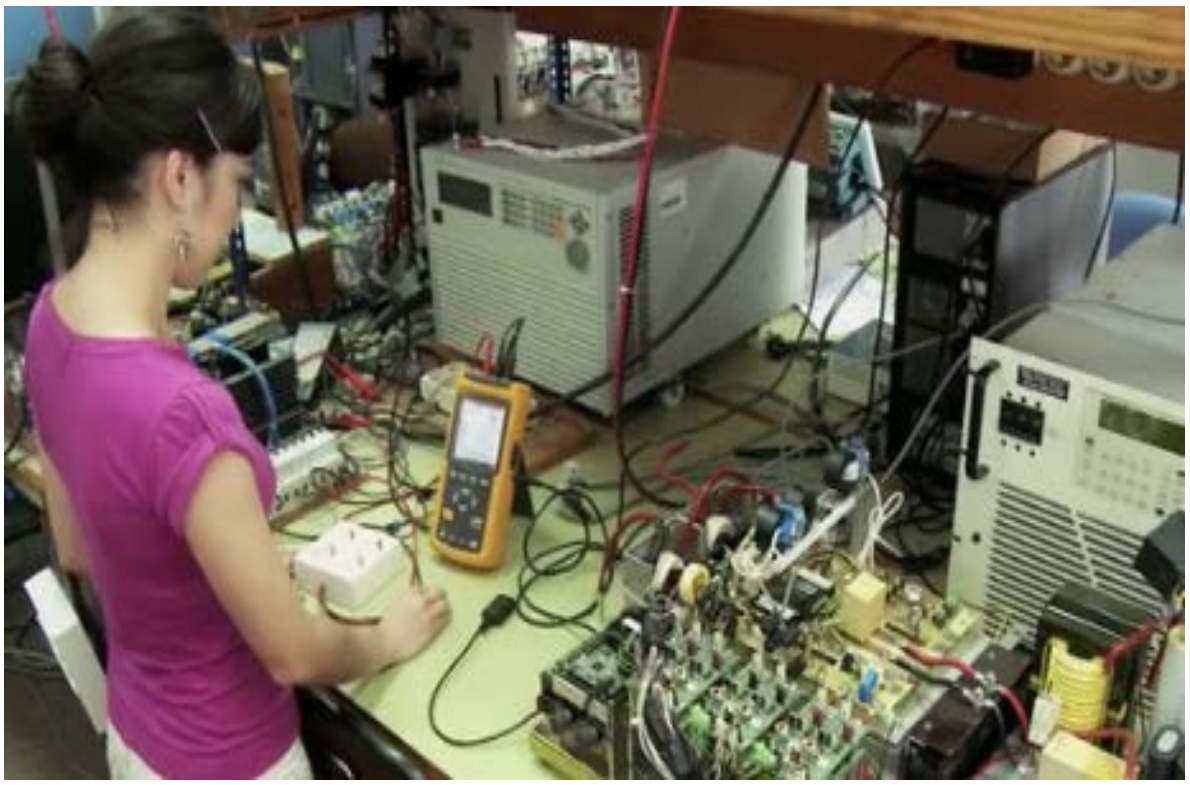
Equipping research laboratories

Robotics Laboratory



- 2 Stäubli TX90 robots, one is mounted on a motorised rail.
- 2 Kuka LWR robots with 7 axes, each one mounted on a mobile platform (BMM1 and BMM2).
- Several grippers and robotic hands: Schunk SAH, Schunk SDH and 3 Allegro hands.
- Haptic devices: Phantom Omni, Phantom Premium 1.5/6DOF and Phantom Premium 1.5/6DOF High force.
- Capture systems such as video cameras, trackers, force sensors, tactile sensors and 3D cameras.
- A 3D projector with the corresponding glasses.
- A bimanual robotic system composed of a two Universal UR5 arms.
- 1 YuMi ABB robot.
- Several servers, PCs, monitors.
- 2 virtual reality glasses Oculus Rift
- 1 Drone DJI Phantom 2 Vision+
- 1 Drone Parrot AR.Drone 2.0
- 1 Pal Robotics TIAGo

Control and Electronic Laboratory



- Oscilloscopes
- Analyzers and signal generators
- Sources and power loads (e.g. sources ac, dc and programmable power load)
- Measuring instrumentation (the multimeter, differential probes, current probes)
- Emulators microprocessors and digital signal processors
- Computers
- The hardware and software for the design and implementation of electronic circuits
- Tools and equipment essential to the realization of small-scale mechanical assemblies
- Thermographic camera

SCOM Calculation Laboratory

- 16 computers: 12 which are designed to make computing experiments; the other 4 are reserved for doctoral, masters and designers
- 1 server for more computationally intensive problems
- 16 SAIs
- 7 screens
- 3 switches for keyboards/screens
- Specialized software: IBM ILOG CPLEX Optimization Studio 12.7

5. University masters

Master’s Degree in Automatic Control and Robotics

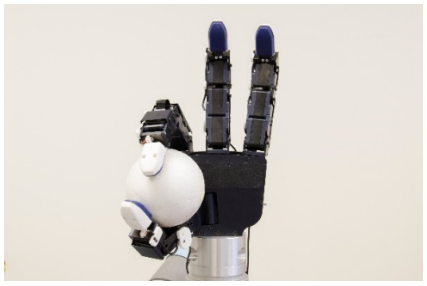
The Master's degree in Automatic Control and Robotics is an official degree adapted to European Higher Education Area (EHEA) offered by the Technical University of Catalonia (UPC) since the academic course 2006-07. The Masters is promoted by the Department of Systems Engineering, Automation and Industrial Informatics (ESAII) and the Institute for Systems and Control Engineering (IOC). It is a research oriented master in the area of Automatic Control and Robotics.

The UPC is considered the first Spanish university in the discipline of Automatic Control and Robotics in the 5th edition (2014) of I-UGR Ranquing over the period 2009-2013. Selected by the Catalunya-La Pedrera Foundation for it's scholarships programme for Masters of Excellence

6. Doctoral degrees

The Institute of Industrial and Control Engineering (IOC) was set up for the purposes of conducting research and training researchers to a high level of specialisation. It is actively involved in teaching master and doctoral degrees.

Doctoral programme in Automatic Control, Robotics and Computer Vision (ARV)



The Doctoral programme in Automatic Control, Robotics and Computer Vision (ARV) emerged in 2006 from the fusion of the Doctoral programme in Advanced Automation and Robotics of the Institute of Industrial and Control Engineering (IOC) and of the Doctoral programme in Control, Vision and Robotics of the Automatic Control Department (ESAII), both with Quality Mention of the Spanish Ministry of Education (MEC). The fusion was fruit of an increasing thematic affinity and convergence between both programmes, and was carried out taking advantage of the opportunity to adapt the programme to the new syllabus of the Official Postgraduate Programmes in the framework of the European Higher Education Area.

The ARV Doctoral programme achieved from the beginning the Quality Mention, from the academic year 2007-2008 until 2010-2011. Then this award was replaced by the Excellence Mention by the Spanish Ministery of Education, with code MEE2011-0453. This mention was awarded from the academic years 2011-2012 until 2013-2014, and the programme ARV always obtained it.

The units responsible for the program are:

- Automatic Control Department (ESAII)
- Institute of Industrial and Control Engineering (IOC)

Doctoral Committee for the doctoral degree in Automatic Control, Robotics and Computer Vision (ARV)

- Dr. Suárez Feijóo, Raúl (Coordinator PhD ARV)
- Dra. Alícia Casals Gelpí (before course 2017-18 Dr. Antonio Benito Martínez Velasco)
- Dr. Andreu Català Mallofré (before course 2017-18 Dr. Cecilio Angulo Bahon)
- Dr. Robert Griñó Cubero
- Dr. Rafael Pastor Moreno
- Dr. Vicenç Puig Cayuela
- Dr. Jan Rosell Gratacòs
- Dr. Alberto Sanfeliu Cortés

Doctoral data 2019

A.	**Program Coordinator**	**RAÚL SUÁREZ FEIJÓO**
B.	**Number of students**	**89** (registration 2019/2020)

Date	06/02/2019
Title	**Advanced Digital Resonant Control Techniques for Grid-Connected Voltage Source Converters**
Author	ORELLANA BARCELÓ, MARCOS
Thesis Director	GRIÑÓ CUBERO, ROBERT
Qualification	Excel.lent Cum Laude

Date	27/02/2019
Title	**Information Metrics for Localization and Mapping**
Author	VALLVÉ NAVARRO, JOAN
Thesis Director	ANDRADE CETTO, JUAN SOLÀ
Qualification	Excel.lent Cum Laude

Date	04/04/2019
Title	**Combining task and motion planning for mobile manipulators**
Author	AKBARI, ALIAKBAR
Thesis Director	ROSELL GRATACÓS, JOAN
Qualification	Excel.lent Cum Laude

Date	12/04/2019
Title	**On the fault diagnosis of dynamic systems using set-based approaches**
Author	POURASGHARLAFMEJANI, MASOUD
Thesis Director	PUIG CAYUELA, VICENÇ
Thesis Codirector	OCAMPO MARTÍNEZ, CARLOS AUGUSTO
Qualification	Excel.lent Cum Laude

Date	03/05/2019
Title	**Designing a robot to evaluate group formations**
Author	PAILLACHO CHILUIZA, DENNYS FABIÁN
Thesis Director	ANGULO BAHON, CECILIO
Thesis Codirector	DÍAZ BOLADERAS, MARTA
Qualification	Excel.lent

Date	07/06/2019
Title	**UAV perception for safe flight under physical interaction**
Author	CAYERO BECERRA, JULIÁN FRANCISCO
Thesis Director	MORCEGO SEIX, BERNARDO
Thesis Codirector	CUGUERÓ ESCOFET, JOSEP
Qualification	Excel.lent Cum Laude

Date	11/06/2019
Title	**Model-Based Control And Diagnosis Of Inland Navigation Networks**
Author	SEGOVIA CASTILLO, PABLO
Thesis Director	DUVIELLA, ERIC
Thesis Codirector	PUIG CAYUELA, VICENÇ
Qualification	Excel.lent Cum Laude

Date	15/07/2019
Title	**Gestión Energética de Vehículos Híbridos usando Control Predictivo Económico**
Author	SAMPIETRO SAQUICELA, JOSÉ LUIS
Thesis Director	PUIG CAYUELA, VICENÇ
Thesis Codirector	COSTA CASTELLO, RAMON
Qualification	Aprovat

Date	02/10/2019
Title	**The Robot Null Space: New Uses For New Robotic Systems**
Author	CLARET ROBERT, JOSEP ARNAU
Thesis Director	BASAÑEZ VILLALUENGA, LUIS
Qualification	Excel.lent Cum Laude

Date	08/10/2019
Title	**Motion Planning Using Synergies Application to Anthropomorphic Dual-Arm Robots**
Author	GARCÍA HIDALGO, NÉSTOR
Thesis Director	SUÁREZ FEIJOO, RAÚL
Thesis Codirector	ROSELL GRATACÓS, JOAN
Qualification	Excel.lent Cum Laude

Doctoral programme Supply chain and operations management (SCOM)

The aim of the doctoral program SCOM (Supply Chain & Operations Management) is to promote and develop research into the supply chain and thus contribute to improve the economic and environmental efficiency of all kind of organizations.

Currently, the concept of supply chain, which includes and exceeds operations management and logistics, articulates the research on supply, production, distribution and recovery. Although, strictly speaking, the concept of supply chain management includes operations management, the fact of joining them in the name of the PhD program indicates which is the aspect of the SC management in which the program focuses most.

SCOM begins in 2016 with the participation of the academic staff of the Department of Management (OE) and the Institute of Industrial Engineering of Control (IOC) has recognized extensive teaching, research and thesis experience in the monitoring program. Moreover, the participation of these personnel in conferences and research projects and publications in high impact journals, show their own experience of research on the item of SCOM.

Doctoral Committee for the doctoral degree:

- Dr Joaquin Bautista Valhondo
- Dr Ernest Benedito Benet
- Dr Laia Ferrer Martí
- Dr Amaia Lusa Garcia
- Dr Rafael Pastor Moreno
- Dr Imma Ribas Vila

Doctoral data 2019

A.	**Program Coordinator**	**AMAIA LUSA GARCIA**
B.	**Number of students**	**7** (registration 2019/2020)

7. Projects and agreements

Public funding projects

Head researcher	BAUTISTA VALHONDO, JOAQUÍN
Title	Organització de la Producció en Tallers Híbrids.
Funding institution	Agència de Gestió d'Ajuts Universitaris i de Recerca (AGAUR)
Reference	2017 SGR 314. OPE-PROTHIUS
Start-up date	01/01/2017
Completion date	31/12/2019

Head researcher	BAUTISTA VALHONDO, JOAQUÍN
Title	Optimización de la Producción de talleres híbridos enlazados por unidades en secuencia.
Funding institution	Agencia Estatal de Investigación
Reference	PGC2018-095080-B-I00
Start-up date	01/01/2019
Completion date	31/12/2021

Head researcher	BENEDITO BENET, ERNEST
Title	Customer Quality 4.0
Funding institution	Agència de Gestió d'Ajuts Universitaris i de Recerca (AGAUR)
Reference	2019 DI 033
Start-up date	16/09/2019
Completion date	04/12/2022

Head researcher	DOMENECH LEGA, BRUNO
Title	Metodologies i aplicatius per a l'elaboració de plans d'electrificació rural i l'avaluació de projectes energètics a l'Amèrica Llatina II.
Funding institution	Centre de Cooperació per al Desenvolupament , UPC
Reference	
Start-up date	01/06/2018
Completion date	31/03/2019

Summary

Up to now, we have worked on the development of a methodology to optimize the design of rural electrification projects in developing countries, through decision support models and tools. The methodology minimizes project costs, combining wind and photovoltaic technologies, as well as microgrids and individual supplies, while considering social aspects. This project extends research aiming to consider, not only projects, but also regional-scale electrification plans, defining the order in which proceed with communities and the best electrification option. Moreover, we work on the evaluation of case studies identifying key issues and strengths to define good practices that favour sustainability of future projects.

Head researcher	FERRER MARTÍ, LAIA
Title	Planificació de l'electrificació rural amb microxarxes i energies renovables.
Funding institution	Agència de Gestió d'Ajuts Universitaris i de Recerca (AGAUR)
Reference	2017 INTCO00002
Start-up date	01/01/2018
Completion date	05/02/2019

Head researcher	FERRER MARTÍ, LAIA
Title	Optimización de Microredes con Energías Renovables bajo Incertidumbre y Futura Integración a la Red.
Funding institution	Agencia Estatal de Investigación
Reference	RTI2018-097962-B-I00
Start-up date	01/01/2019
Completion date	31/12/2021

Head researcher	OLIVELLA NADAL, JORDI
Title	La modularitat dels conjunts de muntatge com a sistema de millora de la productivitat.
Funding institution	Agència de Gestió d'Ajuts Universitaris i de Recerca (AGAUR)
Reference	2015 DI 045
Start-up date	16/02/2016
Completion date	15/02/2019

Head researcher	FERRER MARTÍ, LAIA
Title	Optimización de sistemas de electrificación con energías renovables y microrredes.
Funding institution	Ministerio de Economía, Industria y Competitividad.
Reference	ENE2015-67253-R
Start-up date	01/01/2016
Completion date	30/06/2019

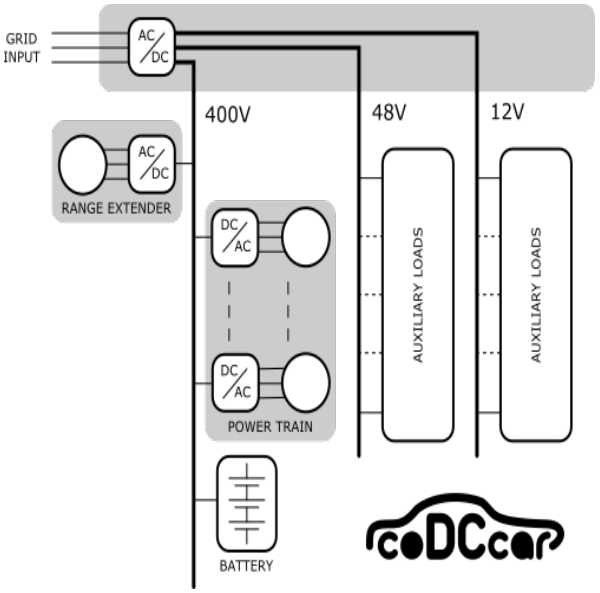
Summary

Electrification systems based on the use of renewable energy sources have proved adequate to provide electricity to isolated communities autonomously and also produce electricity in a sustainable and respectful way with the environment. Nowadays, models and design tools in the literature to design these systems do not consider some of its features and/or key constraints. In the previous project ENE2010 - 15509 (Rural Electrification with Solar and Wind Energy) some of these issues were addressed, and models to design wind and/or solar systems were developed, considering local microgrids. As a continuation and expansion of this project, and to increase its applicability, the overall objective of this proposal, OSEERyM, is to optimize the design of rural electrification systems based on the use of wind, solar and also microhydro energy and bioenergy, with inter-community distribution grids at a regional scale. In addition, a management system will be design to be in charge of the operation, maintenance and technical and economical sustainability of the project.

Head researcher	DÒRIA-CEREZO, ARNAU / GRIÑÓ CUBERO, ROBERT
Title	Advanced control of on-board DC multibus systems in vehicles.
Funding institution	AGENCIA ESTATAL DE INVESTIGACION
Reference	DPI2017-85404-P
Start-up date	01/01/2018
Completion date	31/12/2021

Summary

In the last years two main challenges raised up in the automotive sector: for one hand, the CO2 reduction that implies a weight reduction and increasing the efficiency of the vehicle components and, for another hand, the customer's requirements, mainly, in terms of performance and security. Consequently, the use of electrified systems emerged as an alternative to be considered by the OEMs (Original Equipment Manufacturers). This new tendency does not only consider the electrification of the power train (i.e. electrical and hybrid vehicles) but is also evident in many auxiliary devices that are increasingly being electrified.
However, the major electrification of vehicles could imply problems related to on-board DC micro-grids. This implies the necessity of designing: controllers that ensure grid stability in front of the connection of constant power loads (CPLs), but also offer good robustness and efficiency properties, and optimization algorithms for the dc micro grid.



This project considers a DC multi-bus, with the most, used automotive voltages (400V, for power the train, and 48 V and 12 V, for auxiliary devices), composed by only one storage element (batteries). The dc buses will be connected by one multiport converter (400/48/12 V DC) that will also offer charger functionalities thanks to a single-phase 230 V, or tree-phase 400 V, controlled unitary power factor rectifier. The main advantage of using only one battery and one power converter is the size and weight reduction.
The aim of this project is to study and develop control strategies for a DC multi-bus and a multi-port power converter that provides energy management among the dc buses and AC/DC charging functionalities. During the project several control techniques will be used; resonant digital control, sliding-mode control, adaptive control, control based on systems with complex coefficients, control of complex networks and continuous optimization methods. The obtained control algorithms will be tested in the experimental plants and, the obtained results are expected to be of interest of the industrial and automotive sectors.

Keywords: Control of power electronic converters, stability and regulation, constant power loads, on-board dc networks.

Head researcher	LUSA GARCIA, AMAIA
Title	Gender Equality in Engineering through Communication and Commitment.
Funding institution	European Commission
Reference	H2020-741128-GEECCO
Start-up date	01/05/2017
Completion date	30/04

Summary

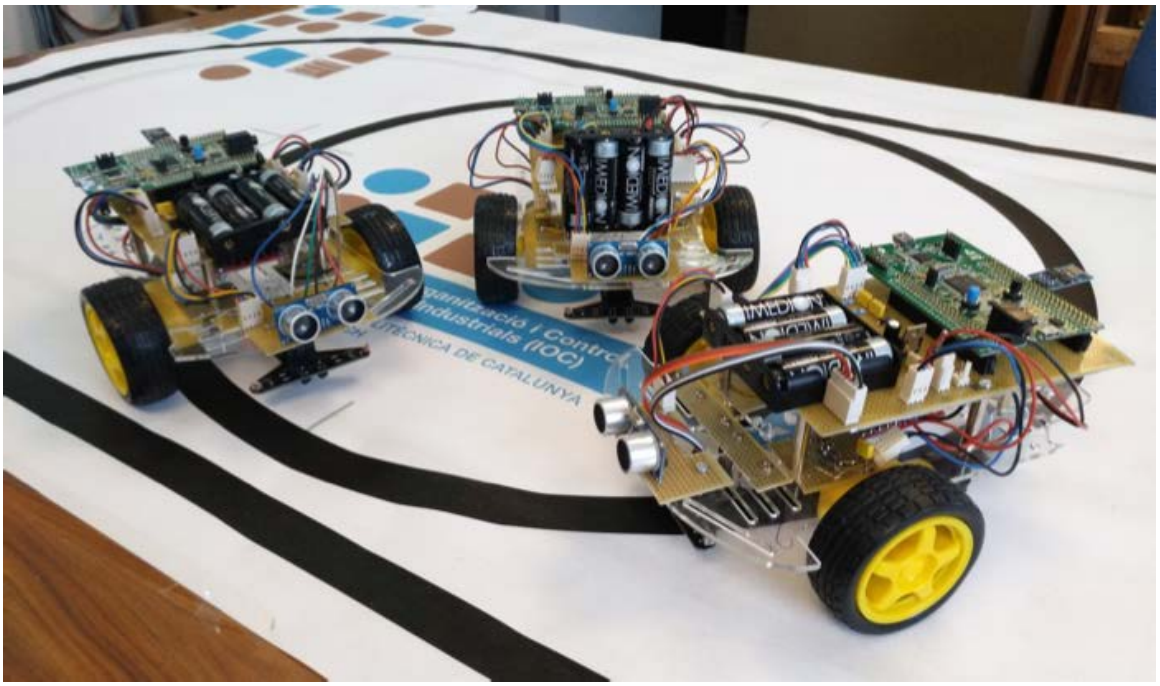
The underrepresentation of women continues to characterise the STEM field (Science, Technology, Engineering, and Mathematics). Whereas in Europe approximately half of the PhD students are female, only 21% of PhD graduates in computing and 25% of PhD graduates in engineering are women. Given the relevance of technologies in our societies an adequate participation of all genders in the STEM field is of outstanding importance. With technologies, we shape structures that have long-term impacts on how people live, work, communicate, travel, and consume. Therefore, the gender dimension in research and innovation, their contexts and their outcomes, is significant. GEECCO is an EU funded project, which brings together a consortium that is characterised by the focus on the STEM field. GEECCO will increase the number of Research Performing Organizations (RPOs) and Research Funding Organizations (RFOs) that start to implement gender equality plans (GEP) pursuing the 3 objectives mentioned in the challenge, namely: (1) Removing barriers to the recruitment, retention and career progression of female researchers; (2) Addressing gender imbalances in decision making processes; (3) Strengthening the gender dimension in research programmes. GEECCO will be a step forward to a new way of establishing tailor-made GEPs in RPOs and implementing the gender dimension in research funding programmes. An effective and efficient dissemination and exploitation strategy has the aim of making the GEECCO approach accessible to other actors.

Head researcher	OLM MIRAS, JOSEP M.
Title	Control Avançat de Sistemes d'Energia.
Funding institution	Agència de Gestió d'Ajuts Universitaris i de Recerca (AGAUR)
Reference	2017 SGR 872
Start-up date	01/01/2017
Completion date	30/09/2021

Summary

This project is aimed at recognizing and funding the research activities of the group Advanced Control of Energy Systems (ACES) by the Generalitat de Catalunya. Already funded in the calls SGR 2005-2008, SGR 2009-2013, and SGR 2014-2016, ACES is a multidisciplinary constituted by engineers, physicists and mathematicians belonging to Electrical Engineering, Electronics Engineering, Automatic Control, and Mathematics Departments of UPC.

The research interests of ACES are mainly focused on the modelling and control of complex systems, as well as on its application to problems related to the electrical grid (generation, conditioning, storing, and managing of electrical energy) and automotive systems. On the one side, the theoretical working lines encompass: internal model principle-based linear control; nonlinear control, including adaptive, sliding, energy-based, and complex networks control; order reduction in large-scale models; nonsmooth systems, and differentially flat systems. On the other side, the applied works deal with power electronics converters, electrical machines, power networks, control of automotive electrical components, vehicle dynamics, traffic flow analysis, cooperative driving, and fuel cells.



Head researcher	ROSELL GRATACÒS, JAN / SUÁREZ FEIJÓO, RAÚL
Title	Robots autónomos diestros como co-trabajadores con operadores humanos.
Funding institution	Ministerio de Economía, Industria y Competitividad.
Reference	DPI2016-80077-R
Start-up date	30/12/2016
Completion date	30/06/2021

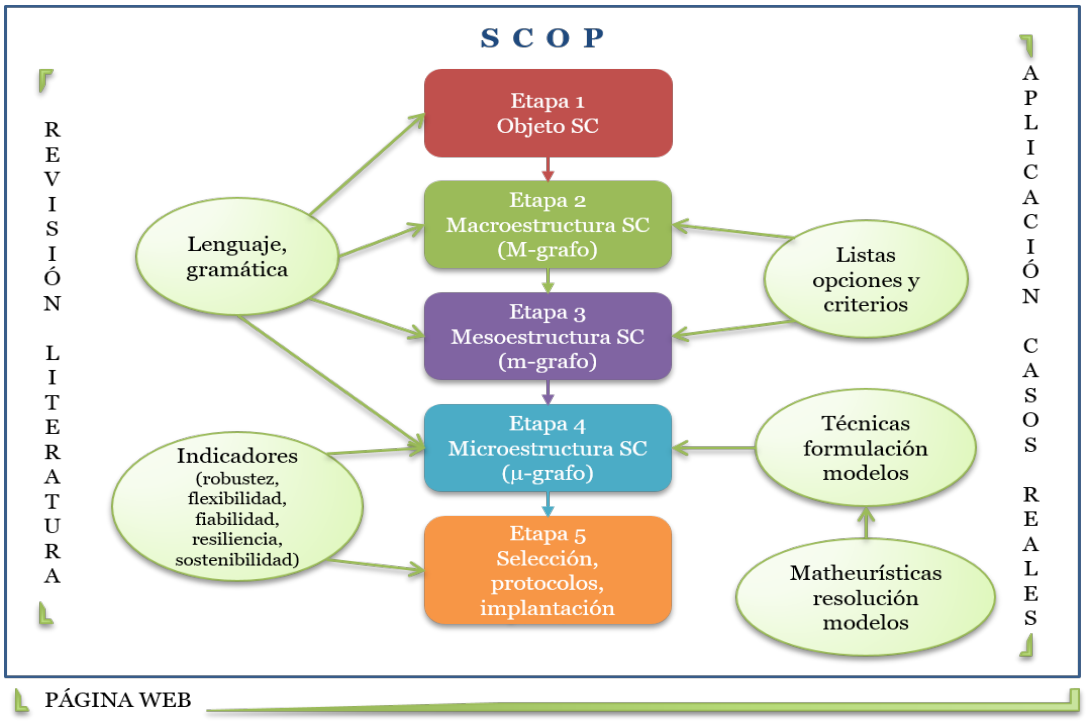
Summary

The robotics field-of-application is constantly growing as the technological advances allow new capabilities and an increment and strength of the already existing ones. Among the new applications, it is worth mentioning, due to their potential significance from the productive and social point of view, those in which the robots work jointly with the humans, originating the concept of "coworker robots". In this type of applications, the robots require some special features. On the one hand, they must have certain level of autonomy and capacity of decision, as their role is no longer doing repetitive tasks in the classical way but on the contrary, they must adapt themselves with swiftness to changing conditions, especially to those produced by the humans in the same workspace. This adaptation implies an interaction with the human operators that constraint the robot movements and actions with the aim of avoiding potential injuries to humans, but without affecting the robot efficiency. In order for the coworker robots to be useful for the human operators, it is necessary that they have an important level of dexterity so that they can perform a number of different actions usually required in the human activities. In this context, the project aims for solutions that increment the performance of the coworker robots to allow their permanent establishment in our society, and, at the same time, facilitate their acceptance by the humans. With this aim, the project will deal with the topics mentioned above, developing algorithms and procedures that make easy the efficient cooperation between coworker robots and humans. Specifically, contributions are expected in relevant topics, as: the increment of the robot capability to autonomously manage the required tasks and the movements to execute them, using ontologies to represent the knowledge; the increment of the dexterous and bimanual manipulation capabilities, monitoring the movements to prevent potential failures; and the improvement of the interaction with the human operators regarding reactive, cooperative and exchange-objects movements, considering approaches based on demonstrations or on teleoperation. All the theoretical developments will be checked and validated experimentally using the systems specifically prepared for it in the project. Besides, as usual in the developments of the group, the mentioned problems will be addressed with the intention of providing general solutions, valid for both industrial and service robotics, taking care of the productive and social components.

Head researcher	LUSA GARCIA, AMAIA
Title	Conceptos, instrumentos, modelos y algoritmos para el diseño de la supply chain.
Funding institution	Ministerio de Economía, Industria y Competitividad.
Reference	DPI2015-67740-P
Start-up date	01/01/2016
Completion date	31/12/2020

Summary

The purpose of this project is to develop tools and concepts for an efficient and correct design of supply chains (SC), under the SCOP method (Supply Chain Outline Process). The design of the SC consists of determining what elements are to be present in the SC and the relationships between them and includes decisions that are highly irreversible once implemented, and with associated significant costs and long-term implications. SCOP comprises five stages: the first one involves the definition of the object of the SC, the analysis of the environment and the formalization of objectives (the decisions made at this stage –such as a lean or an agile SC- determine the subsequent stages); the second, third and fourth respectively correspond to the definitions of the structure of the SC at a macro level (large blocks that comprise it), meso level (product structure and activities taking place in the SC; for each activity an option must be chosen from those available) and micro (includes defining and optimizing, by means of mathematical programming, the relations between the facilities in which the activities can potentially be carried out) level; in the fifth stage the configuration of the SC is selected, the protocols to apply in case of incidents are defined and the implementation of the SC is done. The proposed elements to be developed in this project are closely related, and are inserted into the framework defined in SCOP and help developing and strengthening the method.



Agreements with companies

Head researcher	LUSA GARCÍA, AMAIA
Title	Creació d'algoritme d'optimització de procés de fabricació d'una planta de producció.
Funding institution	ITHINKUPC, S.L.
Reference	
Start-up date	04/11/2019
Completion date	20/04/2020

Summary

The project consists in designing an optimization algorithm for scheduling production orders in a set of production lines. There are setup times that depend on the production sequence and there are some resources that are shared by two production lines. The algorithm consists of an heuristic to build an initial solution and a local search algorithm to improve it. Different drivers are included in the objective function.

Head researcher	LUSA GARCÍA, AMAIA
Title	Formació en logística per estudiants del Tecnológico de Monterrey.
Funding institution	Instituto Tecnológico y de Estudios Superiores de Monterrey
Reference	
Start-up date	30/04/2019
Completion date	29/04/2024

Summary

The project consists in organizing and developing a summer school for students coming from the Instituto Tecnológico y de Estudios Superiores de Monterrey. All courses are focused on logistics and transportation and visits to different companies are also organized. Some trainers belong to IOC and others to other departments or organizations.

Head researcher	ARIAS PUJOL, ANTONI
Title	Assessorament pel disseny i posterior implementació en microprocessadors d'algorismes digitals pel control d'altres prestacions per a fonts d'alimentació.
Funding institution	POWER INNOTECH
Reference	
Start-up date	01/01/2019
Completion date	31/12/2020

Summary

The main objective it to provide consultancy and advice for the theoretical design of digital algorithms to obtain high performance control for power supplies.
The feasibility analysis for implementation on digital platforms, preferably in high-performance microprocessors, is an asset.
It is also planned to participate actively in the dissemination of results at the level of scientific articles and/or participation in prestigious international congresses.

Head researcher	GRIÑÓ CUBERO, ROBERT
Title	Diseño y control de un convertidor cc-ca trifásico, aislado galvánicamente, paralelable y de potencia nominal 6 Kva.
Funding institution	PREMIUM, S.A.
Reference	C10599
Start-up date	06/05/2016
Completion date	30/09/2019

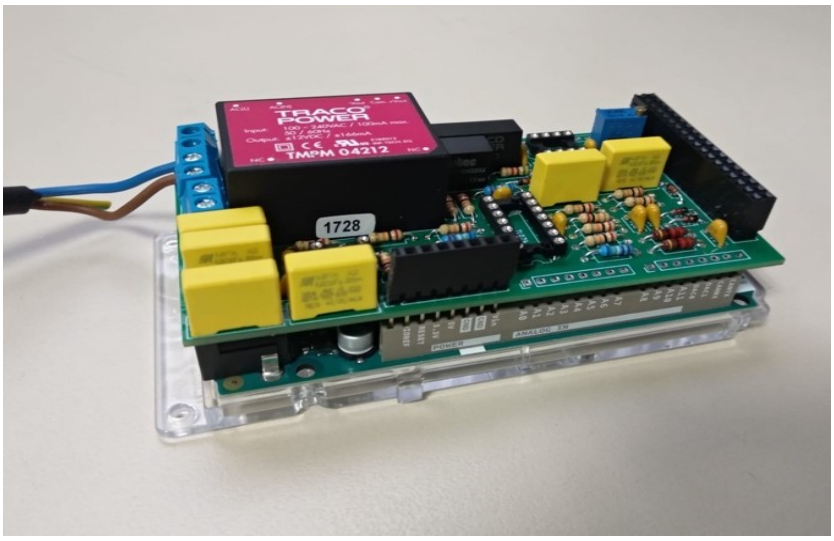
Summary

The objective of the project was the design and control of a three-phase, galvanically isolated, parallelable, three-phase dc-ac converter with a rated power of 6 kVA. The tasks included: the topological design of the dc-ac power converter and the design, tuning and programming of its control algorithms. The converter is supplied with a dc voltage in the range 72 V - 110 V and generates a three-phase three-wire system of rated voltage 400 Vrms, 50 Hz and rated power 6 kVA. The converter is galvanically isolated and it is ac parallelable up to 4 devices (total power 24 kVA).

Head researcher	GRIÑÓ CUBERO, ROBERT
Title	Donació /'Dynamic Systems/'
Funding institution	THE MATHWORKS, S.L.
Reference	
Start-up date	01/01/2018
Completion date	31/07/2019

Summary

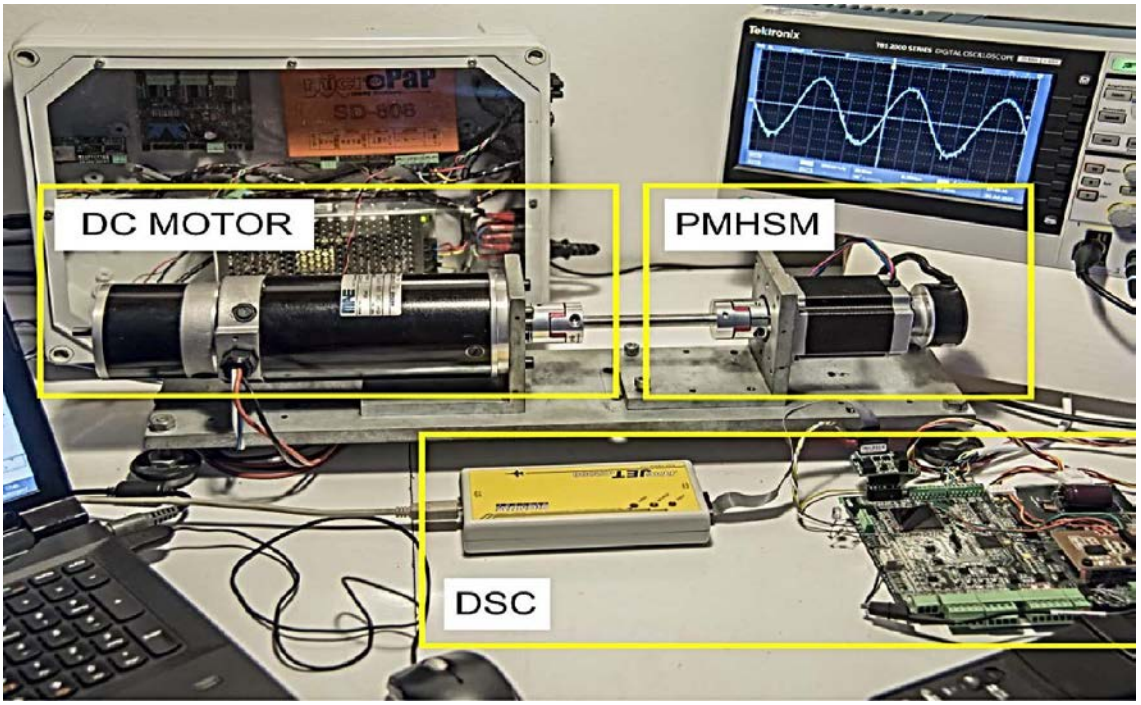
The aim of the project was the design and construction of a platform, based on Matlab/Simulink and Arduino, for digital control practices within the framework of the teaching of automatic at the ETSEIB (UPC).



Head researcher	ARIAS PUJOL, ANTONI
Title	Assessorament pel disseny i posterior implementació en microprocessadors d'algorismes digitals pel control d'altres prestacions de motors pas a pas.
Funding institution	MICROPAP ENGINEERING SL
Reference	C10722
Start-up date	31/10/2016
Completion date	30/07/2020

Summary

The main goal is the design and further implementation in digital microprocessors of state-of-the-art algorithms to improve the overall performance of the well-known stepper motors. On a second step, the use of a position transducer (typically and encoder) will be considered in order to develop field oriented control and therefore industrially compete with their counterparts (permanent magnet synchronous machines) in order to gain market.
It is also expected to publish the scientific results in prestigious international conferences and high impact factor journals.



Head researcher	PEÑA PITARCH, ESTEBAN
Title	Copropietat patent/Aparell per mesurar la força del sol pelvic.
Funding institution	FUNDACIÓ ALTHAIA.
Reference	P201130449
Start-up date	25/03/2011
Completion date	25/03/2031

8. Publications

Journals articles

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Conference publications

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Books

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Book chapters

1. Calleja, G.; Olivella, J.; Vila, M.. Operations research and emergent technologies. Management science foundations and innovations. Editorial: Springer. Any: 2019. Pàgs: 183 ~ 197. ISBN: 978-3-030-13229-3.
2. Mateo, M.; Bautista, J.; De La Torre, R.. Managing volunteer assignment in a sport event. Engineering digital transformation. Lecture notes in management and industrial engineering. Editorial: Springer. Any: 2019. Pàgs: 247 ~ 255. ISBN: 978-3-319-96005-0.
3. Olivella, J.. Los rankings internacionales ARWU, THE y QS. La posición de las universidades españolas. Informe de la Fundación Conocimiento y Desarrollo 2018. Any: 2019. Pàgs: 253 ~ 258. ISBN: 978-84-17934-19-4.
4. Peña-Pitarch, E.; A. Al Omar; Alcelay, J. I.; Vives, J.. Virtual human hand: grasps and fingertip deformation. Advances in Additive Manufacturing, Modeling Systems and 3D Prototyping: proceedings of the AHFE 2019 International Conference on Additive Manufacturing, Modeling Systems and 3D Prototyping, July 24-28, 2019, Washington D.C., USA. Editorial: Springer. Any: 2019. Pàgs: 484 ~ 492. ISBN: 978-3-030-20216-3.

5. Ud Din, M.; Akbari, A.; Rosell, J.; Qazi, W.. A tool for knowledge-oriented physics-based motion planning and simulation. Recent trends and advances in wireless and IoT-enabled networks. Any: 2019. Pàgs: 329 ~ 340. ISBN: 978-3-319-99966-1.

9. International stays and visits

1. Participant: Mateo, M.. Tipus de participació: Convidat. Nom del centre: Ghent University. Finalitat de l'estada: Recerca. Tasques contrastables: Problemas de gestión (programación y rutas). Gestión del riesgo en el diseño de la cadena de suministro. Planificación de la capacidad en servicios. Data d'inici: 17/06/2019. Data de fi: 18/09/2019.

2. Participant: Suárez, R.. Tipus de participació: Convidat. Nom del centre: Universidad de Guadalajara. Finalitat de l'estada: Recerca. Tasques contrastables: Desarrollo de un nuevo algoritmo de control para la prensión/manipulación colaborativa de objetos con manos robóticas teleoperadas. Conferencia "Planificación de movimientos con apariencia humana para robots bi-brazo" a docentes y alumnos de postgrado (28/11/2019).. Data d'inici: 17/11/2019. Data de fi: 01/12/2019.

3. Participant: Suárez, R.. Tipus de participació: Convidat. Nom del centre; Universidad Nacional San Luis (campus Villa Mercedes), Argentina. Finalitat de l'estada: Recerca. Conferencia "Planificación de movimientos con apariencia humana para robots bi-brazo". Data d'inici: 06/05/2019. Data de fi: 06/05/2019.

4. Participant: Suárez, R.. Tipus de participació: Convidat. Nom del centre; Universidad Nacional San Luis (campus Villa Mercedes), Argentina. Finalitat de l'estada: Recerca. Conferencia "Prensión y manipulación en robótica". Data d'inici: 07/05/2019. Data de fi: 07/05/2019.

10. Seminars from external researches

1. Professor Dimitri Jeltsema
   HAN University of Applied Sciences. The Netherlands
   Title: "What the VAr?"
   July 17, 2019

11. Prizes and awards

1. Rewarded: Bautista, J.. Nom del premi (edició): Reconeixement UPC guardonats 2018/Inauguració del curs acadèmic de la UPC 2019-2020. Any: 2019. Motiu/treball reconegut: Premi al millor treball presentat en el XIII Congrés Espanyol en Metaheurístiques i Algoritmes Evolutius i Bioinspirats: Metaheurísticas constructivas para Car Sequencing Problem con Flotas de vehículos especiales. Data de resolució: 04/10/2019. Resultat: Primer premi. Entitat que ho concedeix: Consell Social de la UPC.

2. Rewarded: Bautista, J.; Mateo, M.. Nom del premi (edició): Reconeixement UPC guardonats 2018/Inauguració del curs acadèmic de la UPC 2019-2020. Any: 2019. Motiu/treball reconegut: Best Paper Awards in the area of Operations Research, Modelling and Simulation en el XXII CIO 2018 - 12th ICIEIM pel seu treball Assignment of Volunteers in a sport event. Case Restricted Fitness by Cut-off mark.. Data de resolució: 04/10/2019. Resultat: Primer premi. Entitat que ho concedeix: Consell Social de la UPC.

3. Rewarded: Lerma, E.; Griño, R.; Costa-Castelló, R.; Sanchis, C.. Nom del premi (edició): PREMIO PRODEL AL MEJOR TRABAJO EN EDUCACIÓN EN AUTOMÁTICA. Any: 2019. Motiu/treball reconegut: PREMIO PRODEL AL MEJOR TRABAJO EN EDUCACIÓN EN AUTOMÁTICA Concedido a ENEKO LERMA,ROBERT GRIÑO, RAMÓN COSTA-CASTELLÓ Y CARLOS SANCHÍS Por el Trabajo en Educación enAutomática presentado a las XL Jornadas de Automática 2019 titulado DUINO-BASED LEARNING (DBL): UN PROYECTO PARA FACILITAR EL USO DE ARDUINO Y MATLAB. Data de resolució: 05/09/2019. Resultat: Primer premi. Entitat que ho concedeix: COMITÉ ESPAÑOL DE AUTOMÁTICA.

12. Extracurricular activities

Executive en Lean Supply Chain Management. Direcció d'Operacions I Logística - Master's degree. Face-to-face.

Academic management: Rúa Costa, Carles

Presentation

16th year

Traditional functions in companies such as production, distribution, planning or logistics have evolved with the change in economic cycles. The productive function has adapted to the new needs of markets, incorporating new trends such as Lean Manufacturing¿ and embracing quality control, training or staff motivation as part of its tasks. Likewise, logistics have also changed, and the concept Integrated Logistics has come to comprise all the value chain between the customer and the supplier, as well as the flow of information and materials.

Integrated management of the distribution chain, production and supplies is now known as Supply Chain Management. The emergence of logistics has forced governments to work on improving and updating infrastructures roads, railway, ports and airports and this, together with staff training and research and innovation as key aspects to increase the level of competitiveness in the business fabric.

This Master's Degree aims to be unique and exclusive, a reference point for all professionals aiming to develop their career in the areas of logistics, distribution, supplies and, in general, Year aspect relating to the supply chain management and design. To make this possible, the course has included prestigious professionals from the main European universities (CRANFIELD) and leading schools in specific areas (European Short Sea Shipping School). For this Masters we also have the collaboration of managers from the leading logistics companies in Spain, who will transmit their experiences to the students.

AIMS

- TO PUT INTO QUESTION, THE CURRENT ORGANISATIONAL AND MANAGEMENT SYSTEMS IN THE LOGISTICS CHAIN.
- TO STRATEGICALLY ANALYSE, ORIENT AND DEFINE THE ENTIRE LOGISTICS CHAIN AND ALL OF ITS DIFFERENT SECTORS, IMPLEMENTING AND ADAPTING NEW TECHNOLOGIES TO BOOST COMPANIES LOGISTICS SERVICES.
- TO DESIGN AND IMPLEMENT NEW SYSTEMS AND METHODOLOGIES TO IMPROVE THE MANAGEMENT OF THE RELATIONSHIPS AMONG PROVIDERS, BUSINESSES, OPERATORS AND END CLIENTS.
- TO EFFECTIVELY MANAGE PERSONNEL TEAMS THAT NEED TO COLLABORATE WITH THE CULTURAL CHANGE IMPLIED IN IMPLANTING AN INTEGRATED STRATEGY OF SUPPLY CHAIN MANAGEMENT

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http://www.talent.upc.edu/cat/professionals/presentacio/codi/203200/executive-lean-supply-chain-management-direccio-operacions-logistica/