

CURRICULUM VITAE (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

Part A. PERSONAL INFORMATION

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|----------------|------------|
| CV date | 24/01/2021 |
|----------------|------------|

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|--|-------------|----------------------------|--|
| First name | Manuel | | |
| Family name | Ruiz Arahal | | |
| Gender (*) | | Birth date (dd/mm/yyyy) | |
| Social Security, Passport, ID number | | | |
| e-mail | | URL Web | |
| Open Researcher and Contributor ID (ORCID) (*) | | | |

(*) Mandatory

A.1. Current position

| | | | |
|-------------------|--|-------------------|--|
| Position | Catedrático de Universidad | | |
| Initial date | 19/12/2009 | | |
| Institution | Universidad de Sevilla | | |
| Department/Center | Dpto. Ing. de Sistemas y Automática / ETS. Ingeniería | | |
| Country | Spain | Teleph. number | |
| Key words | Modelling, simulation, predictive control, optimization. | | |

A.2. Previous positions (research activity interruptions, art. 14.2.b)

| | |
|-----------|---|
| Period | Position/Institution/Country/Interruption cause |
| 1998-2009 | Profesor Titular/U. Sevilla/Spain |

A.3. Education

| PhD, Licensed, Graduate | University/Country | Year |
|-----------------------------|------------------------|------|
| Doctor Ingeniero Industrial | Universidad de Sevilla | 1996 |
| Ingeniero Industrial | Universidad de Sevilla | 1991 |

Part B. CV SUMMARY (max. 5000 characters, including spaces)

B.1. General data:

- 4 research sexenios CNAI (up to 2016)
- over 2600 cites since 2000, more than 200 cites/year (Google citation) with h index 29 (Google citation)
- 5 books, 4 book chapters, over 50 JCR publications mostly in Q1, over 50 contributions in international conferences

B.2. Scientific work

Scientific work spans different but related topics including: identification and control of dynamical systems, modelling, simulation and optimization. I have applied these broad



subjects to several engineering applications including: renewable energy systems, energy-related industry and electric mobility. In particular, in the last decade I have been actively involved in the development of predictive control methods for multiphase induction machines. In this particular field I have accomplished several international firsts:

- First application of predictive control to a multi-phase induction machine (in fact the terminology FSMPC was coined in an early publication of mine).
- Discovery of the trade-offs among figures of merit in FSMPC (later studied by others as Pareto fronts), and description of the trade-offs as a cubic Titeica surface.
- First adaptive cost function for FSMPC.

As a result, I have been awarded by the international scientific community with:

- Best paper award 2010 in IEEE Trans. on Industrial Electronics.
- Best paper award 2011 in IET Electric Power Applications.
- General chairs' recognition award in 2009 for interactive papers at 48th IEEE CDC.

B.3. Contributions to society.

Mainly through industry collaboration, being PI of 8 I+D contracts with more than 400.000 euro managed. Also participation as researcher in 10 contracts as member of research team.

B.4. Contributions in formative and evaluative activities.

- Director for 3 Ph.D. dissertations and collaboration with many young researchers.
- Teaching at several doctorate courses in different universities and of master courses.
- Director of numerous master thesis.
- Reviewer for competitive program CYTED.

B.5 Other relevant merits.

- Guest Editor of IET Electric Power Applications Special Issue in "Advances in Predictive Control of Variable-Speed Electric Drives", 2017.
- Member of program committee for several international conferences and also member of national organizing committees.
- 2008-2013 Member of IEEE-CSS Technical Committee on System Identification and Adaptive Control.
- Reviewer for high impact publications such as IEEE Trans. on Ind. Electronics.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications (see instructions) – Papers in International Journals with JCR

- 1- CA: Bermúdez, 2/4. Bermúdez Guzmán, Mario, **Ruiz Arahal, Manuel**, Duran Martinez, Mario Javier, González Prieto, Ignacio. 2021. Model Predictive Control of Six-Phase Electric Drives Including ARX Disturbance Estimator. IEEE Trans. Ind. Electronics. 68: 81-91. 9 cites.
- 2- CA: Arahal, 1/4, **Ruiz Arahal, Manuel**, Martín Torres, Cristina, Barrero Garcia, Federico José, Duran Martinez, Mario Javier. 2020. Assessing Variable Sampling Time Controllers for Five-Phase Induction Motor Drives. IEEE Trans. Ind. Electronics. 67: 2523-2531. 6 cites.
- 3- CA: Arahal, 1/5, **Ruiz Arahal, Manuel**, et al. 2019. Model-Based Control for Power Converters with Variable Sampling Time: A Case Example Using Five-Phase Induction Motor Drives. IEEE Trans. Ind. Electronics. 66: 5800-5809. 8 cites.
- 4- CA: Arahal, 1/5, **Ruiz Arahal, Manuel**, et al. 2019. Cost function optimization for predictive control of a five-phase IM drive. Optimal Control Applications & Methods. 41: 84-93. 10 cites.
- 5- CA: Arahal, 1/5, **Ruiz Arahal, Manuel**, et al. 2018. Trade-offs analysis in predictive current control of multi-phase induction machines. Control Eng. Practice. 81: 105-113. 28 cites.



- 6- CA: Rodas, 3/5, Rodas, Jorge, Barrero, Federico, **Ruiz Arahal, Manuel**, et al. 2016. On-line Estimation of Rotor Variables in PCC: A Case Study using Five-phase IM. IEEE Trans. Ind. Electronics. 63: 5348-5356. 64 cites.
- 7- CA: Martín, 2/4, Martín, Cristina, **Ruiz Arahal, Manuel**, et al. 2016. Multiphase Rotor Current Observers for CPC: a 5-Phase Case Study. Control Eng. Practice. 49: 101-111. 21 cites.
- 8- CA: Rodas, 3/5, Rodas, Jorge, Martín, Cristina, **Ruiz Arahal, Manuel**, ET AL. 2017. Influence of Covariance-Based ALS Methods in the Performance of Predictive Controllers with Rotor Current Est. IEEE Trans. Ind. Electronics. 64: 2602-2607. 36 cites.
- 9- CA: Martín, 2/4, Martín, Cristina, **Ruiz Arahal, Manuel**, et al. 2016. 5-Phase IM Rotor Current Observer for FCSMPC of Stator Current. IEEE Trans. Ind. Electronics. 63: 4527-4538. 67 cites.
- 10- CA: Rodas, 3/5, Rodas, Jorge, Barrero, Federico, **Ruiz Arahal, Manuel**, et al. 2016. On-line Estimation of Rotor Variables in Predictive Current Controllers: A Case Study using Five-phase Induction Machines. IEEE Trans. Ind. Electronics. 63: 5348-5356. 64 cites.

C.2. Congress

- 1- Oral presentation, Martín Torres, Cristina, **Ruiz Arahal, Manuel**, et al.: Variable Sampling Time Model Predictive Control of Multiphase IM. 15th IEEE International Workshop on Advanced Motion Control, 2018, Tokyo, Japan
- 2- Oral presentation, Kowal, Agnieszka, **Ruiz Arahal, Manuel**, et al.: Cost Functions in Finite State Model Predictive Control of IM. 7th Int. Conference on Advanced Technologies. 2018, Antalya, Turkey
- 3- Oral presentation, Esteban Roncero, Sergio, **Ruiz Arahal, Manuel**: PBL Methodologies Applied to Large Groups of Students: Airplane Design in a Concurrent Engineering Context. IFAC Workshop on Internet Based Control Education. 2015, Brescia, Italy
- 4- Oral presentation, Perales, Manuel, Barrero, Federico, **Ruiz Arahal, Manuel**, et al.: Problem Based Learning Case in a Control Undergraduate Subject. 3rd IFAC Workshop on Internet Based Control Education. 2015, Brescia, Italy
- 5- Oral presentation, Martín Torres, Cristina, **Ruiz Arahal, Manuel**, et al.: Rotor Current Observer in FSMPC of 5-Phase IM. IECON 41st. 2015, Yokohama, Japan
- 6- Oral presentation, **Ruiz Arahal, Manuel**, Barrero Garcia, et al.: Harmonic Analysis of Direct Digital Control of Voltage Inverters. 11th International Conference on Modeling and Simulation of Electric Machines, Converters and Systems. 2014, Valencia, Spain
- 7- Oral presentation, Bogado Martínez, Blás Juan Andrés, Barrero Garcia, Federico José, **Ruiz Arahal, Manuel**, et al.: Sensitivity to Electrical Parameter Variations of Predictive Current Control in Multiphase Drives. IECON - 39th. 2013, Vienna, Austria
- 8- Oral presentation, **Ruiz Arahal, Manuel**, et al.: Harmonic content in VSI operated with homogeneous pulse width. IECON 2013 - 39th, Vienna, Austria
- 9- Oral presentation, Mena, R., Rodriguez, F., Castilla, M., **Ruiz Arahal, Manuel**: A Neural Network Model for Energy Consumption Prediction of Ciesol Bioclimatic Building. 8th Int. Conf. on Soft Computing Models in Industrial and Environmental Applications. 2013, Salamanca, Spain



10- Oral presentation, **Ruiz Arahall, Manuel**, et al.: Subharmonic content in FSMPC strategy for thermal comfort and indoor-air quality. IECON 39th, 2013, Vienna, Austria

C.3. Research projects

- RTI2018-101897-B-I00, Gestión Óptima de la Demanda de Frío en Grandes Instalaciones, Ministerio de Ciencia, Innovación y Universidades, Plan Estatal 2017-2020 Retos, PI= M.G. Ortega, co-PI= **Manuel Ruiz Arahall**, from 01-01-2019 to 31-12-2021, budget: 73.800€.
- DPI2015-70973-R, Optimización de la Producción de Frío Mediante Sistemas de Almacenamiento de Energía, MEC Plan Estatal 2013-2016 Retos, PI= M.G. Ortega, from 01-01-2016 to 31-12-2018, budget: 203.000€.
- DPI2016-76144-R, Extensión de la Zona de Operación Segura de los Variadores Eléctricos de Inducción de 5 Fases, MEC Plan Estatal 2013-2016, Retos, PI= F. Barrero, from 30-12-2016 to 29-12-2018, budget: 93.800€.
- DPI2013-44135-R, Estimación y Predicción Distribuida de la Radiación para Control de Campos Solares, MEC Plan Estatal 2013-2016 Retos, PI= F.R. Rubio, from 01-01-2014 to 31-07-2017, budget: 147.000€.
- P11-TEP-7555, Movilidad Eléctrica en Entornos Urbanos, Junta de Andalucía (Consejería de Innovación, Ciencia y Empresas), Proyectos de Excelencia de la Junta de Andalucía, PI= F. Barrero, from 26-03-2013 to 25-07-2016, budget: 143.470€.
- DPI2012-37580-C02-02, Optimización y Control Robusto Multivariable de Sistemas de Refrigeración, MEC Plan Nacional del 2012, PI= M.G. Ortega, from 01-01-2013 to 31-12-2015, budget: 152.000€.
- P10-TEP-5791, Aplicación de Sistemas de Propulsión Basados en Motores Multifásicos al Desarrollo de Vehículos Eléctricos, Junta de Andalucía (Consejería de Innovación, Ciencia y Empresas), Proyectos de Excelencia de la Junta de Andalucía. PI= F. Barrero, from 15-03-2011 to 15-03-2014, budget: 126.929€.

C.4. Contracts, technological or transfer merits

- ECASYS: Sistema Europeo de Cambio de Ancho, PI= **Manuel Ruiz Arahall**, Ref: PI-1345/2014, from 03-07-2013 to 31-03-2015, financed by Azvi, S.A., budget: 20.000 €.
- eFleet - Inteligencia y eficiencia energética en la gestión integral de flotas de vehículos eléctricos, PI= **Manuel Ruiz Arahall**, Ref: PI-1157/2013, from 01-09-2013 to 31-01-2015, financed by Azvi, SA, budget: 98.000€.
- Medida Coherente de Caudal, PI= **Manuel Ruiz Arahall**, Refs: PI-1071A/2013 and PI-1081/2013, from 01-01-2013 to 31-12-2013, financed by EMASESA, budget: 16.800 €.
- Planta de almacenamiento térmico TES PS10, PI= **Manuel Ruiz Arahall**, Ref: 0345/0105, from 13-04-2009 to 13-04-2013, financed by Abengoa Solar New Technologies, budget: 191.400 €.
- Impactos - Detección de impactos de aves en líneas eléctricas, PI= **Manuel Ruiz Arahall**, Ref: 0166/0105 from 01-10-2008 to 30-12-2012, financed by Fundación Migres, budget: 139.250 €.

