

Messaoud AMAIRI

DOCTOR ENG. / ASSISTANT PROFESSOR

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“Volunteering for change...”

Education

National Engineering School of Gabes

PHD ON ELECTRICAL ENGINEERING

Very Honourable

Gabès, Tunisia

March 2011

National Engineering School of Gabes

MASTER ON AUTOMATIC AND INTELLIGENT TECHNIQUES

Very Good

Gabès, Tunisia

Sep. 2006

National Engineering School of Gabes

ELECTRIC-AUTOMATIC ENGINEER

Gabès, Tunisia

July 2004

Lycée 2 Mars 1934

BACHELOR OF MATHEMATICS

Good

Ghomrassen, Tataouine, Tunisia

1999

Academic Career

National Engineering School of Gabes

ASSISTANT PROFESSOR

Tunisia

2011-Present

Higher Institute of Industrial Systems of Gabes (ISSIG)

ASSISTANT

Tunisia

2010-2011

Higher Institute of Industrial Systems of Gabes (ISSIG)

CONTRACTUAL ASSISTANT

Tunisia

2006-2010

Higher Institute of Industrial Systems of Gabes (ISSIG)

RESEARCHER STUDENT

Tunisia

2005-2006

Memberships and Responsibilities

- **Member**, IEEE CSS TC SIAC June 2016 - Present
- **Member**, Evaluation Committee of the National Engineering School of Gabes Apr. 2016 - Present
- **Senior Member**, IEEE Nov. 2015 - Present
- **Secretary**, IEEE TN Section July 2015 - Present
- **Advisor**, IEEE CSS, IAS and RAS SBCs Jan. 2015 - Present
- **Counselor**, IEEE ENIG Student Branch Jan. 2013 - Present
- **Coordinator**, Research Unit Modelling, Analysis and Control of Systems (MACS) Sept. 2012 - Present
- **President**, Hardware purchase committee of the Electric-Automatic Engineering Department 2012 - 2014
- **Member**, Reform Committee of the Electric-Automatic Engineering Department 2012 - Present
- **Member**, Research Unit Modelling, Analysis and Control of Systems (MACS) Sept. 2012 - Present
- **Member**, Executive Board of the Tunisian Association of Automatic and Digitizing May. 2010 - Present
- **Member**, IEEE Feb. 2010 - Present
- **Member**, Research Unit Modelling, Analysis and Control of Systems (MACS) 2005 - Present

SOFT SKILLS AND PEDAGOGICAL TRAININGS

Training of trainers in the Online Training Engineering (I-FeeL)

SCRIPTWRITING OF ONLINE COURSES

Tunisian Virtual University

May, 2015

Training of trainers in the Online Training Engineering (I-FeeL)

TUTORING AND ONLINE ASSESSMENT OF LEARNER ACHIEVEMENTS.

Tunisian Virtual University

April, 2015

Training of trainers in the Online Training Engineering (I-FeeL)

TEACHING WITH MOODLE

Tunisian Virtual University

March, 2015

Tunisian Association for the Development of Automatic (ATUDA)

PEDAGOGY & TECHNOLOGY: AN INSEPARABLE PAIR

Hammamet

April 18-19, 2015

Firme de Formation en Entrepreneuriat Maxime Victor

ENTREPRENEUR IN ACTION

Gabès

April, 2013

National Engineering School of Gabes

MATLAB, L^AT_EX, LABVIEW

Gabes

2012-2016

Training sessions given by me for students and researchers.

TEACHING EXPERIENCES

My teaching experience covers 11 years of pedagogical activities as a Researcher Student (2005-2006), a Contractual Assistant (2006-2010), a Permanent Assistant (2010-2011) and an Assistant Professor (2011 - Present). I taught all levels of higher education. My service was carried out in the Higher Institute of Industrial Systems of Gabes (ISSIG) and the National Engineering School of Gabes (ENIG). The areas taught include: Automatic, electronics and industrial computing. I was able to give theoretical lectures and others more practical.

Subject

Robust Control
Digital Systems
Advanced Control Techniques
Microprocessor-based Systems

Type

Lecture and Tutorial
Lecture, Tutorial and Practical work
Lecture, Tutorial and Practical work
Lecture, Tutorial and Practical work

Type

- Lectures
- Tutorials
- Practical Works

Number of hours

682
775
930

PROJECTS SUPERVISION

During last years, I supervised many final year projects (more than 35). Several of them deal with: system control, automation and Scada programming, printed circuit board realization, etc. Among these projects, I can cite :

- Installation and Automation of a new Pet Coke machine.
- CNC three axes machine for plasma cutting and milling.
- Study and implementation of a control system for a CNC machine.
- Calibration and three-dimensional measurements of the flight parameters of a Drone.
- Design and implementation of a microcontroller based system for controlling Remotely Operated vehicle (ROV)

RESEARCH INTERESTS

My research interests focus on the use of fractional order differentiation in identification and robust control and the development of set-membership methods for the control of uncertain systems. In this context, my research work deals with:

- Modeling, simulation, identification and control systems for the fractional order differentiation.
- Set-membership methods for modelling, identification, control, diagnosis and prognosis.

PHD THESIS

NON-INTEGGER ORDER SYSTEMS AND IDENTIFICATION BY SET-MEMBERSHIP METHODS

The thesis is dedicated to the development and the application of set-membership methods for parameter estimation for fractional order systems. First, a comparison between different approximations of the fractional differentiation operators is given. A new simulation method based on the numerical approximation of Diethelm is presented. Next, a new numerical method for solving a Fractional Differential Equation (FDE) based on generalized Taylor's formula and validated methods for FDEs are developed. Finally, the parameter estimation of models described by fractional order transfer functions is presented using global optimization techniques and set inversion by interval analysis.

SUPERVISION OF THESES AND MASTERS

THESES DEFENDED

Name	Title	Date
Bchira SAIDI	On the design and implementation of fractional PID controllers for control of uncertain systems	December 24, 2015
Zeineb YAAKOUB	Identification of linear fractional closed-loop systems: Application to Control	December 24, 2015

THESES IN PROGRESS

Name	Title	Progression
Amina BEN HMED	Time and frequency analyzes of elementary fractional order systems , application to control	100%
Besma YOUSFI	On observation and diagnosis of uncertain systems	100%
Rihab LAMOUCHE	Fault-tolerant control for uncertain systems: set-membership approach	75%
Saifeddine HAMD	Contributions to the set-membership identification of fractional systems	50%
M. Lazhar WARDI	Contributions to the design and implementation of robust fractional controller	50%
Haifa ETHABET	Diagnosis of Switching Systems : set-membership approach	25%

MASTERS DEFENDED

Name	Title	Date
Warda SALEM	Design and implementation of robust fractional order controller	November 17, 2015
Naziha ARAARI	Design of robust fractional PID controllers based on multi-objective optimization	October 17, 2014
Amina BEN HMED	Design and comparative study of fractional PI controller and CRONE	December 04, 2012
Bchira SAIDI	Robust design of fractional PID controller for delay systems	December 04, 2012

SCIENTIFIC REPUTATION

PARTICIPATION IN DEFENSE JURIES OF MASTER.

Name	Title	Date
Besma YOUSFI	Contribution to the design of a polynomial control strategy to path following of nonlinear systems	2012
Marwa SAIHI	Fault detection in wireless sensor networks	2012
Ghazi BEL HAJ FREJ	Diagnosability of discrete event systems	2012
Nizar RAFAA	Development of a polynomial approach of a stabilizing control based on the method of Zubov	2012

CHAIR OR CO-CHAIR AT INTERNATIONAL CONFERENCES

Co-chair of the session 'Robust Control', IEEE Multi-Conference on Systems and Control (MSC 2014).

RESEARCH STAY

High Level Scientific Stay (SSHN), France , May 2015.

REVIEWING

- International Journals : Applied Mathematical Modelling (1) ; Nonlinear Dynamics (3) ; Circuits, Systems & Signal Processing (5) ; Asian Journal of Control (3), International Journal Of Modelling, Identification And Control (1).
- International Conferences: ACC'16; CDC'15; SafeProcess'15; MSC'14 ; STA'14.

PARTICIPATION IN ORGANIZING COMMITTEES

- General chair of IEEE Tunisian forum for Academia-Industry partnership (IEEE TFIAP'16) tfiap.ieee.tn, Sousse, April 01-03, 2016
- Special session 'Fractional Calculus and its Applications', in the 3rd IEEE Conference on Control, Decision and Information Technologies CoDIT'16.
- Spring School of Automatic Control, "On the identification, observation and diagnosis of nonlinear , hybrid and delays systems", Djerba, March 20-22, 2015
- Conference on "Emerging Sensors and Applications", National Engineering School of Gabes, University of Gabes (Tunisia), Nov. 12, 2014
- Automation & Industry Seminar SAI'06, Matmata, Feb. 10-12, 2006.

AWARDS

- Volunteer Award, National Engineering School of Gabes, 2015
- IEEE Volunteer Leadership Training (VOLT) graduate Award, 2015
- IEEEExtreme Programming Competition, Certificate of Appreciation, 2013-2015

Publications

JOURNALS PAPERS

1. B. Yousfi, T. Raissi, **M. Amairi**, D. Gucik-Derigny and M. Aoun, *Robust state estimation for singularly perturbed systems*, International Journal of Control, 2016. (**I.F 1.88**)
2. A. Ben Hmed, **M. Amairi**, and M. Aoun, *Robust stabilization and control using fractional order integrator*, Transactions of the Institute of Measurement and Control, 2016 (**I.F 0.82**)
3. Z. Yakoub , M. Chetoui, **M. Amairi** and M. Aoun, *A bias correction method for fractional closed-loop system identification.* , Journal of Process Control, Volume 33, Pages 25–36, 2015 (**I.F 2.216**)
4. **M. Amairi**, *Recursive set-membership parameter estimation using fractional model.* , Circuits, Systems & Signal Processing, Volume 34, Issue 12, pp 3757-3788, 2015 (**I.F 1.178**)
5. Z. Yakoub, **M. Amairi**, M. Chetoui and M. Aoun, *On the closed-loop system identification with fractional models.* , Circuits, Systems & Signal Processing. Volume 34, Issue 12, pp 3833-3860, 2015 (**I.F 1.178**)
6. B. Saidi, **M. Amairi**, S. Najjar and M. Aoun, *Bode shaping-based design methods of a fractional order PID controller for uncertain systems.*, Nonlinear Dynamics. Volume 80, Issue 4, pp 1817-1838 , 2015 (**I.F 3.0**)
7. A. Ben Hmed, **M. Amairi**, and M. Aoun, *Stability and resonance conditions of the non-commensurate elementary fractional transfer functions of the second kind*, Communications in Nonlinear Science and Numerical Simulation. Volume 22, Issues 1-3, Pages 842-865, 2015. (**I.F 2.834**)
8. **M. Amairi**, S. Najjar, M. Aoun, Z. Lassoued and M.N. Abdelkrim, *OBE-based set-membership parameter estimation of fractional models*, Transactions on Systems, Signals & Devices, Issues on Systems, Analysis & Automatic Control, Vol. 9, No. 1, pp.39-58, 2014 (**indexed INSPEC**)
9. M. Aoun, **M. Amairi**, S. Najjar, and M.N. Abdelkrim, *New simulation method for fractional systems based on the Caputo fractional differentiation*, Transactions on Systems, Signals & Devices, Issues on Systems, Analysis & Automatic Control, Vol. 8, No. 1, pp.41-62, 2013 (**indexed INSPEC**)
10. **M. Amairi**, M. Aoun, S. Najjar, and M.N. Abdelkrim, *Guaranteed frequency-domain identification of fractional order systems: application to a real system*, Int. J. Modelling, Identification and Control, Vol. 17, No. 1, pp.32-42, 2012 (**indexed Scopus**)
11. **M. Amairi**, M. Aoun, S. Najjar, M. N. Abdelkrim , *A constant enclosure method for validating existence and uniqueness of the solution of an initial value problem for a fractional differential equation*, Applied Mathematics and Computation, vol.217 n° 5, pp.2162–2168, 2010 (**I.F 1.536**)
12. **M. Amairi**, M. Aoun, S. Najjar, M. N. Abdelkrim, *New method for the resolution of fractional orders differential equations: application to the simulation of fractional systems*, International Review on Modeling and Simulation , vol.3 n° 3 June 2010, 2010 (**indexed Scopus**)

CONFERENCES PAPERS

1. M. L. Wardi, **M. Amairi** and M. N. Abdelkrim, *Robust fractional order PI Controller design for Nonlinear Systems via Singular Perturbations Technique*, International Conference on Fractional Differentiation and its Applications, Novi Sad, Serbia, July 18 - 20, 2016.
2. S. Hamdi, **M. Amairi** and M. Aoun, *Orthotopic Set-Membership Parameter Estimation of Fractional Order Model*, 24th Mediterranean Conference on Control and Automation, Athens, Greece, June 21-24, 2016.
3. R. Lamouchi, **M. Amairi**, T. Raissi and M. Aoun, *Interval Observer Design for Linear Parameter-Varying Systems Subject to Component Faults*, 24th Mediterranean Conference on Control and Automation, Athens, Greece, June 21-24, 2016.
4. R. Lamouchi, T. Raissi, **M. Amairi** and M. Aoun, *Fault Tolerant Control in a Set-Membership Framework*, 15th European Control Conference (ECC), 2016.
5. M. L. Wardi, **M. Amairi** and M. N. Abdelkrim, *Robust fractional control of a two time scale system*, 16th International conference on Sciences and Techniques of Automatic control & computer engineering, 2015.
6. B. Yousfi, T. Raissi, **M. Amairi** and M. Aoun, *Set Membership Methodology for model-based systems prognosis*, 9th IFAC Symposium on Fault Detection, Supervision and Safety for Technical Processes, Safeprocess'15, 48 (21), 302-307, 2015.
7. B. Saidi, **M. Amairi**, S. Najar and M. Aoun, *Multi-objective optimization based design of fractional PID controller*, The 12th International Multi-Conference on Systems, Signals & Devices, SSD'2015, 2015.
8. Z. Yakoub, M. Chetoui, **M. Amairi** and M. Aoun, *A direct fractional order bias eliminated least squares method for the fractional closed-loop system identification*, The 12th International Multi-Conference on Systems, Signals & Devices, SSD'2015, 2015.
9. A. Ben Hmed, **M. Amairi** and M. Aoun, *Stabilizing fractional order controller design for first and second order systems*, The 12th International Multi-Conference on Systems, Signals & Devices, SSD'2015, 2015.
10. A. Ben Hmed, **M. Amairi**, S. Najar, and M. Aoun, *Fractional order controller design using time-domain specifications*, 15th International conference on Sciences and Techniques of Automatic control & computer engineering - STA'2014, pp. 462-467, Hammamet, Tunisia, 2014
11. B. Saidi, **M. Amairi**, S. Najar, and M. Aoun, *Fractional PI design for time delay systems based on min-max optimization*, 15th International conference on Sciences and Techniques of Automatic control & computer engineering - STA'2014, pp. 468-473, Hammamet, Tunisia, 2014
12. B. Yousfi, T. Raissi, **M. Amairi** and M. Aoun, *Interval Observers Design for Singularly Perturbed Systems*, in the 53rd IEEE Conference on Decision and Control (CDC-14), 2014
13. **M. Amairi**, M. Aoun and B. Saidi, *Design of robust fractional order PI for FOPDT systems via set inversion*, IEEE Conference on Control Applications (CCA), 8-10 Oct. 2014, pp. 1166 - 1171, <http://dx.doi.org/10.1109/CCA.2014.6981486>, 2014
14. Z. Yakoub, **M. Amairi**, M. Chetoui, and M. Aoun, *A bias-eliminated least squares method for continuous-time fractional closed-loop system identification*, IEEE Conference on Control Applications (CCA), 8-10 Oct. 2014, pp. 128-133, <http://dx.doi.org/10.1109/CCA.2014.6981340>, 2014
15. B. Saidi, **M. Amairi**, S. Najar, and M. Aoun, *Fractional PI design for time delay systems based on min-max optimization*, IEEE Conference on Fractional Differentiation and Its Applications (ICFDA), 23-25 June. 2014, pp. 1-6, <http://dx.doi.org/10.1109/ICFDA.2014.6967440>, 2014
16. A. Ben Hmed, **M. Amairi**, S. Najar, and M. Aoun, *Resonance study of an elementary fractional transfer function of the third kind*, IEEE Conference on Fractional Differentiation and Its Applications (ICFDA), 23-25 June. 2014, pp. 1-6, <http://dx.doi.org/10.1109/ICFDA.2014.6967437>, 2014
17. Z. Yakoub, M. Chetoui, **M. Amairi** and M. Aoun, *Indirect approach for closed-loop system identification with fractional models*, IEEE Conference on Fractional Differentiation and Its Applications (ICFDA), 23-25 June. 2014, pp. 1-6, <http://dx.doi.org/10.1109/ICFDA.2014.6967441>, 2014
18. B. Saidi, S. Najar, **M. Amairi**, M. N. Abdelkrim, *Design of a robust fractional PID controller for a second order plus dead time system*, 10th International Multi-Conference on Systems, Signals and Devices (SSD'13), Tunis, Tunisia, 2013
19. A. Ben Hmed, **M. Amairi**, S. Najar, M. N. Abdelkrim, *Design of fractional PI controller with guaranteed time and frequency-domain performances*, 10th International Multi-Conference on Systems, Signals and Devices (SSD'13), Tunis, Tunisia, 2013
20. S. E. Hamdi, **M. Amairi**, M. Aoun, M. N. Abdelkrim, *Interval state observer design for fractional systems*, 10th International Multi-Conference on Systems, Signals and Devices (SSD'13), Tunis, Tunisia, 2013
21. A. Guefrachi, S. Najar, **M. Amairi**, M. Aoun, M. N. Abdelkrim, *Frequency response of a fractional complex order transfer function*, 13th International conference on Sciences and Techniques of Automatic control & computer engineering, pp. 765-773, Academic Publication Center of Tunis, Tunisia, 2012
22. B. Saidi, S. Najar, **M. Amairi**, M. N. Abdelkrim, *Design and digital implementation of a fractional PID controller*, 4ème Colloque de Recherche Appliquée et de Transfert de Technologie, CRATT'2012, Tunis, Tunisia, 2012
23. A. Ben Hmed, **M. Amairi**, S. Najar, M. N. Abdelkrim, *Analog and pseudo-analog implementation of fractional PID controller*, 4ème Colloque de Recherche Appliquée et de Transfert de Technologie, CRATT'2012, Tunis, Tunisia, 2012
24. **M. Amairi**, M. Aoun, S. Najar, M. N. Abdelkrim, *Set membership parameter estimation of linear fractional systems using parallelotopes*, The Ninth International Multi-Conference on Systems, Signals & Devices (SSD), 2012
25. M. Aoun, **M. Amairi**, S. Najar, M. N. Abdelkrim, *Simulation method of fractional systems based on the discrete-time approximation of the Caputo fractional derivative*, The Eighth International Multi-Conference on Systems, Signals & Devices (SSD), 2011
26. M. Aoun, **M. Amairi**, Z. Lassoued, S. Najar, M. N. Abdelkrim, *An ellipsoidal set-membership parameter estimation of fractional order systems*, The Eighth International Multi-Conference on Systems, Signals & Devices (SSD), 2011
27. **M. Amairi**, S. Najar, M. Aoun, M. N. Abdelkrim, *Guaranteed output-error identification of fractional order model*, The 2nd IEEE International Conference on Advanced Computer Control (ICACC 2010), pp. 246-250, IEEE Press, 2010

28. **M. Amairi**, M. Aoun, S. Najjar, M. N. Abdelkrim , *Interval analysis approach for frequency domain identification of a non integer order electronic system*, 10th International conference on Sciences and Techniques of Automatic control & computer engineering, pp. 1122-1133 Academic Publication Center of Tunis, Tunisia, 2009
29. **M. Amairi**, M. Aoun, S. Najjar, M. N. Abdelkrim , *Bounded error parameter estimation using fractionnel models*, Cinquième Conférence internationale JTEA, 2008
30. **M. Amairi**, M. Aoun, S. Najjar, M. N. Abdelkrim , *Estimation paramétrique d'un système fractionnaire par une approche ensembliste*, Huitièmes journées scientifiques des jeunes chercheurs en génie électrique et informatique GEI'2008, 2008