

# Shahrazed Elmetennani

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Dedicated and self motivated PhD student in Electrical Engineering, with over 4 years of research experience in systems control applied to solar driven plants. Control engineer with a strong background in systems modeling and analysis and problems formulation. Innovative in designing new strategies for control, optimization and supervision of industrial plants with excellent communication and leadership skills. Experienced in managing research projects from conception to completion with experimental validation.

## Education

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- **King Abdullah University of Science and Technology, Jeddah, KSA**  
○ *Ph.D. Student in Systems Control, Electrical Engineering* 01/2013–04/2017  
Dissertation title: Control of Hyperbolic Heat Transfer Mechanism.  
Application to Concentrated Distributed Solar Collectors.  
Key words: Distributed control, Nonlinear control, Heat transport, Hyperbolic PDE,  
Concentrated solar collectors, Solar energy.
- **Ecole National Polytechnique d'Alger, Algiers, Algeria**  
○ *MSc in Automatic Control with honor* 09/2011-06/2012  
Thesis title: Optimization of a Photovoltaic chain using Hybrid Dynamical Approach,  
Theory and Experiments.  
Key words: MPPT, Hybrid automata, Photovoltaic system, Multicellular converter.
- **Ecole National Polytechnique d'Alger, Algiers, Algeria**  
○ *Control Engineering Diploma with honor* 09/2007-06/2012  
Senior Project title: Control of a Photovoltaic chain based on a Multicellular Converter,  
Hybrid Dynamical Approach.

## Research Interests

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- **Modeling:** Physical systems modeling, Approximation schemes, Simulation softwares development.
- **Control:** Nonlinear control, PDEs control, Robust control, Adaptive control.
- **Estimation:** Soft sensing, Observers design.

## Publications

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### Journals.....

[J4] A. H. Dehwah, **S. Elmetennani**, and C. Claudel, "UD-WCMA: An energy estimation and forecast scheme for solar powered wireless sensor networks", *Journal of Network and Computer Applications*, To be online soon.

[J3] **S. Elmetennani**, T.M. Laleg-Kirati, "Bilinear approximate model based robust Lyapunov control for parabolic distributed collectors", *IEEE Transactions on Control Systems Technology*, To be online soon.

[J2] **S. Elmetennani**, T.M. Laleg-Kirati, "Bilinear reduced order approximate model of parabolic distributed solar collectors", *Solar Energy*, Volume 131, Jun 2016.

[J1] **S. Elmetennani**, T.M. Laleg-Kirati, M. Djemai and M. Tadjine, "New MPPT technique for photovoltaic applications based on hybrid dynamical approach: Theory and experiment", *Process Control Journal*, Volume 48, Dec 2016.

#### Conference proceedings.....

[C6] **S. Elmetennani**, T.M. Laleg-Kirati, "Output feedback control of heat transport mechanisms in parabolic distributed solar collectors", *The 2016 American Control Conference*, Boston, USA, Jul 2016.

[C5] **S. Elmetennani**, T.M. Laleg-Kirati, "Nonlinear observer for the temperature estimation in distributed solar collectors". The 2nd IFAC Workshop on Control of Systems Governed by Partial Differential Equations, Bertinoro, Italy, Jun 2016.

[C4] **S. Elmetennani**, T.M. Laleg-Kirati, K. Benmansour, M.S. Boucherit and M. Tadjine, "New MPPT technique for photovoltaic applications based on hybrid dynamical approach". *The 3rd International Symposium on Environment Friendly Energies and Applications*, Paris, France, Nov 2014.

[C3] **S. Elmetennani** and T.M. Laleg-Kirati, "Fuzzy approximate model for distributed thermal solar collectors control". *Grand Renewable Energy International Conference and Exhibition*, Tokyo, Japan, Aug 2014.

[C2] **S. Elmetennani** and T.M. Laleg-Kirati, "Fuzzy universal model approximator for distributed solar collector field control". *10th International Conference on Control UKACC 2014*, Loughborough, UK, Jul 2014.

[C1] **S. Elmetennani** and T.M. Laleg-Kirati, "New fuzzy model approximate for indirect adaptive control of distributed solar collectors". *2014 IEEE Conference on Evolving and Adaptive Intelligent Systems*, Linz, Austria, Jun 2014.

#### Papers under revision.....

[R1] S. Asiri, **S. Elmetennani**, T.M. Laleg-Kirati, "Moving-Horizon Modulating Functions based algorithm for online source estimation in a first order hyperbolic PDE, under revision in *Journal of Solar Energy Engineering* (Minor revisions).

#### Papers in progress.....

[W2] **S. Elmetennani**, T.M. Laleg-Kirati, "Control of Heat Transport Mechanisms using a Domain-Averaged Temperature Feedback", *To be submitted*.

[W1] **S. Elmetennani**, T.M. Laleg-Kirati, "Adaptive control of distributed concentrated solar collectors: Source stabilization of a first order hyperbolic PDE", *In progress*.

#### Patent in progress.....

[P1] Taous Meriem Laleg-Kirati; **Shahrazad Elmetennani** - "patent pending" - US provisional application, 62/205, 631.

## Research Experience

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- **PhD dissertation project** **CEMSE division, KAUST, Jeddah, KSA**  
*Jan 2013–Present*  
Control of Concentrated Distributed Solar Collectors:
  - Flow control of hyperbolic heat transfer mechanism to cope with the unpredictable varying external disturbances.
  - Control design for distributed systems with time varying parameters.
  - Robust and adaptive control strategies for nonlinear systems with unmeasured parameters and disturbances.
  - Design of observers for soft sensing of the system dynamics.
  - Design of efficient control algorithms with reduced complexity for real time implementation.  
Matlab/Python based programs with experimental validation.
  
- **Master thesis project** **Processes Control Laboratory, ENP, Algiers, Algeria**  
*Jan-Jui 2012*  
Control of a Photovoltaic System based on a Multicellular Converter using a Hybrid Dynamical Approach:
  - Design of a new MPPT algorithm for the optimization of the solar production using hybrid dynamical systems theory.
  - Experimental validation of the proposed algorithm on a lab scale photovoltaic chain.
  
- **Final project** **Processes Control Laboratory, ENP, Algiers, Algeria**  
*Jan-Jui 2011*  
Control and Optimization of a Hybrid System based on Photovoltaic and Wind energy: Review of the different control techniques designed for the hybrid chains involving wind and solar photovoltaic energy.

## Teaching Experience

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- **Lecturer in a reading group** **KAUST, Jeddah, KSA**  
*Nonlinear Control*  
Supervisor: Prof. Jeff Shamma  
*Spring 2015*
  
- **Lecturer in a reading group** **KAUST, Jeddah, KSA**  
*Control of PDEs*  
Supervisor: Dr. T. M. Laleg-Kirati  
*Fall 2014–Spring 2015*
  
- **Teacher assistant** **KAUST, Jeddah, KSA**  
*Applied Numerical Methods*  
Instructor: Dr. T. M. Laleg-Kirati  
*Fall 2014*
  
- **Teacher assistant** **KAUST, Jeddah, KSA**  
*Applied Mathematics II*  
Instructor: Dr. Sahraoui Chaieb  
*Spring 2014*

## Advanced Control Courses

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- **An introduction to modelling and control of systems governed by PDEs** Bertinoro, Italy  
*Instructor: Prof. Hans Zwart* Jun 2016
- **Advances in feedback design for MIMO nonlinear systems** Yildiz TU, Istanbul, Turkey  
*Instructor: Prof. Alberto Isidori* Apr 2015
- **Model Predictive Control** Paris-Saclay, Paris, France  
*Instructor: Prof. Eduardo Camacho* Mar 2015
- **Boundary control of PDEs** KAUST, Jeddah, KSA  
*Instructor: Prof. Miroslav Krstic* Mar 2014

## Professional Experience

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- **Control lab assistant** KAUST, Jeddah, KSA  
*Fall 2015-Present*
- **Reading group coordinator** KAUST, Jeddah, KSA  
*Spring and Fall 2015*
- **Control engineer** Internship, RATP ELDJAZAIR, Algeria  
*Apr 2012*  
Carry out of diagnosis of the automata controlling the metro station escalators; by identification of malfunctioning devices and program bugs within the electrical engineering maintenance team.
- **Control engineer** Internship, Mediterranean Float Glass (MFG), Algeria  
*Jul-Aug 2011*  
Assisted a control engineer in order to be initiated to the Scada supervision interface/software and to learn the basic steps to follow for the maintenance of an automated industrial process.
- **Researcher** Internship, l'Unite de Developpement des Equipements Solaires, Algeria  
*Mar 2011*  
Learned the different technologies used for solar conversion to both thermal and electrical energy.

## Miscellaneous Activities

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- Member in KAUST team in the Saudi Science and Creativity Festival, Riyadh, KSA, Feb 2015.
- Student ambassador in KAUST career fair, KAUST, Mar 2014.
- KAUST student ambassador in IEEE Smart Grid Conference, Jeddah, KSA, Nov 2013.
- Vice president of Polytechnic Leaders club, ENP, Algiers, Algeria, 2010-2012.
- Representative of an association for needy children "Sourrire a l'innocence", ENP, Algiers, Algeria, 2010-2012.