NEW PERFORMANCE IMPROVEMENT TECHNIQUES OF CONTROL SYSTEMS USING EXPERIMENT-BASED TUNING

Goal of the project

- Development of advanced control structures for automotive and mechatronics applications.
- Improvement and development of new Takagi-Sugeno (T-S) fuzzy models and control solutions for a wide range of industrial processes, mechatronics, mobile robots and automotive applications.
- Optimal tuning of fuzzy models for automotive and mechatronics applications.
- Improvement and development of control algorithms for mobile robots.

Short description of the project

Advanced control structures and optimal tuning of fuzzy models for a wide range of industrial processes are offered.

Project implemented by

Department of Automation and Applied Informatics of UPT as the P2 partner, coordinator: University of Craiova, P1 partner: Moara Calafatului, P3 partner: "Lower Danube" University of Galati, director: Prof. Dr. Eng. Dan Selisteanu (University of Craiova).

Implementation period

2014-2017

Main activities

- Development and experimental validation of simple T-S fuzzy models, evolving fuzzy models and advanced controllers (2-DOF, predictive and fuzzy) for processes in automotive and mechatronics: anti-lock braking systems, nonlinear DC drive servo systems, magnetic levitation systems.
- Continuous development of the nRobotic platform for path planning and collision avoidance of mobile robots in missions.
- Modeling, simulation, analysis and development of: T-S PD + I fuzzy controllers, 2-DOF linear and fuzzy controllers, hybrid T-S fuzzy controllers for speed and position control of brushless DC drives with variable parameters and inputs.
- Optimal tuning of parameters of T-S fuzzy models using nature-inspired algorithms: charged system search, grey wolf optimization, gravitational search algorithms.

Results

Results in 2017:
- 2 papers published in Clarivate Analytics Web of Science (WoS) journals with impact factors.
- 2 papers published in conference proceedings indexed in WoS.
- 2 papers published in conference proceedings indexed in international databases.
- More than 50 independent citations in 2017.

Applicability and transferability of the results

- Nature-inspired evolutionary-based optimization algorithms in modeling and control design.
- Cost-effective solutions for control problems in mechatronics, electrical drives, automotive and robotics.
- Tools for the modeling, optimization and design of fuzzy control systems.
- Real-time programming and operating systems for control and robotics.
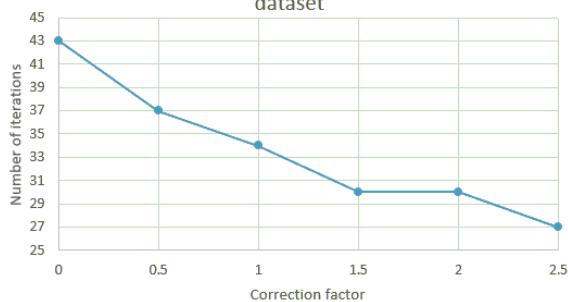
Financed through/by

Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), Bucharest, Romania.
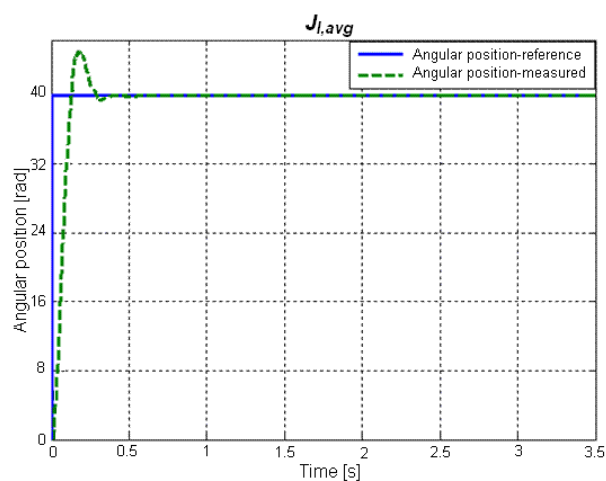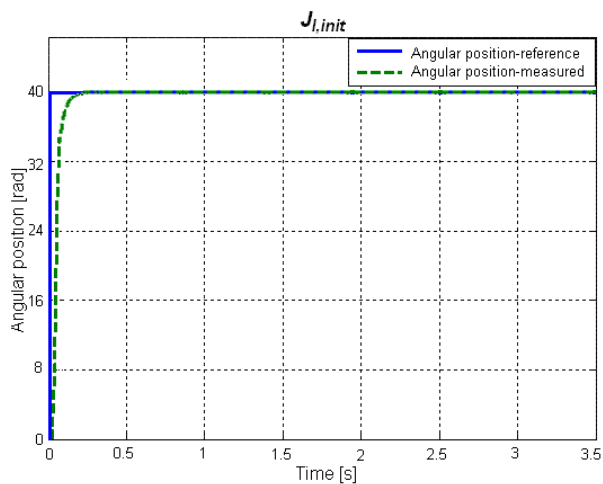
Research Centre
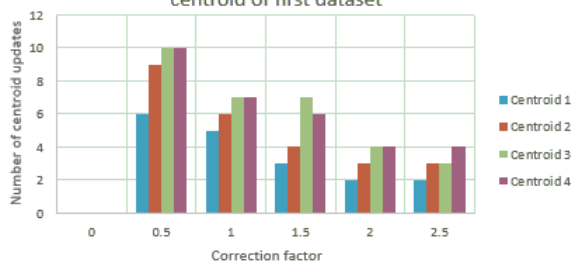
Automatic Systems Engineering Research Centre (CCISA).
http://www.aut.upt.ro/centru-cercetare/index.EN.php

Effect of centroid update approach applied to first dataset

Number of centroid updates applied to every centroid of first dataset

$J_{I,init}$

$J_{I,avg}$

Research team

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