PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	School of Robotics
Supervisors	Principal supervisor: Dr. Ibrahim M Mehedi (XJTLU) Co-supervisor: Sze Hong (XJTLU) Co-supervisor: Dr. Heba Lakany (UoL)
Application Deadline	Open until the position is filled
Funding Availability	Funded PhD project (world-wide students) – 50% tuition fee discount Scholarship: TW5A2506004
Project Title	Study on Robust Fractional Order Dynamic Inverse (RFODI) Control System for Industrial Automation
Contact	Please email Ibrahim.mehedi@xjtlu.edu.cn (XJTLU principal supervisor's email address) with a subject line of the PhD project title. The principal supervisor's profile is linked here: https://scholar.xjtlu.edu.cn/en/persons/IbrahimMehedi

Requirements:

A Master's degree with Merit and a Bachelor's degree with first-class or upper second-class honors are required for PhD admissions. Exceptional candidates holding only a Bachelor's degree may be considered on an individual basis in certain disciplines.

Evidence of good spoken and written English is essential. The candidate should have an IELTS (or equivalent) score of 6.5 or above, if the first language is not English. This position is open to all qualified candidates irrespective of nationality.

Degree:

The student will be awarded a PhD degree from the University of Liverpool (UK) upon successful completion of the program.

Funding:

The PhD studentship is available for three years subject to satisfactory progress by the student. The award covers 50% tuition fee reduction for three years (RMB 148,500 total value). It also provides up to RMB 16,500 to allow participation at international conferences during the period of the award. The scholarship holders are expected to conduct the majority of their research at XJTLU in Suzhou, China. However, they may apply for a short-term research visit to the University of Liverpool if the project requires it.

Project Description:

The primary objective of this project is to design, develop, and validate a Robust Fractional Order Dynamic Inverse (RFODI) Control System for industrial automation. The project aims to combine the strengths of fractional-order controllers (FOCs) and dynamic inverse (DI) control techniques into a unified, robust control framework. By addressing existing gaps in research and application, the intended outcomes are both theoretical and practical, as outlined below:

General Objectives

1. Integration of Techniques: Develop a theoretical framework that successfully integrates fractional-order calculus and dynamic inversion techniques into a robust control system.

2. Robustness: Enhance system performance in uncertain and nonlinear environments by incorporating advanced robustness features.

3. Industrial Applicability: Ensure the developed RFODI controller meets the requirements of diverse industrial automation scenarios, such as robotics, manufacturing, and process control.

Specific Objectives

1. Mathematical Modeling and Design: Formulate the mathematical model and control laws for the RFODI system, addressing stability, convergence, and robustness in fractional-order dynamics.

2. Algorithm Development: Develop computationally efficient algorithms for implementing the RFODI controller, considering real-time applications and hardware constraints.

3. Simulation Studies: Conduct extensive simulation studies to evaluate the controller's performance under varying conditions, including system uncertainties, noise, and disturbances.

4. Experimental Validation: Implement the RFODI system on industrial-scale hardware platforms to validate its effectiveness in real-world scenarios.

5. Comparative Analysis: Compare the RFODI controller with existing FOC, DI, and other conventional control systems to demonstrate its advantages in terms of performance metrics such as stability, response time, robustness, and adaptability.

6. Scalability and Adaptability: Design the controller to be scalable across different industrial systems and adaptable to various operational conditions.

Intended Outcomes

1. A Novel Control Framework: Establish a new paradigm in control system design that

integrates fractional-order and dynamic inverse techniques with robustness features.

2. Improved System Performance: Achieve faster response times, reduced overshoot, enhanced stability, and superior disturbance rejection capabilities in industrial systems.

3. Industrial Impact: Provide a practical solution

For more information about doctoral scholarship and PhD programme at Xi'an Jiaotong-Liverpool University (XJTLU), please visit

https://www.xjtlu.edu.cn/en/admissions/global/entry-requirements/

https://www.xjtlu.edu.cn/en/admissions/global/fees-and-scholarship

How to Apply:

Interested applicants are advised to email Ibrahim.mehedi@xjtlu.edu.cn (XJTLU principal supervisor's email address) the following documents for initial review and assessment (please put the project title in the subject line).

- CV
- Two formal reference letters
- Personal statement outlining your interest in the position
- Certificates of English language qualifications (IELTS or equivalent)
- Full academic transcripts in both Chinese and English (for international students, only the English version is required)
- Verified certificates of education qualifications in both Chinese and English (for international students, only the English version is required)
- PDF copy of Master Degree dissertation (or an equivalent writing sample) and examiners reports available