

Mohammadreza Dindarloo

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Education

K. N. Toosi University of Technology (KNTU)

Tehran, Iran

M.Sc. IN ELECTRICAL ENGINEERING

2021 - Present

- **Thesis:** Development of a Graph-Based Unified Optimization framework for Robot Calibration and State Estimation
- **Advisor:** Prof. Hamid D. Taghirad [[Scholar](#)]
- **Co-Advisor:** Prof. Philippe Cardou [[Scholar](#)]
- **GPA:** 3.88/4.0

K. N. Toosi University of Technology (KNTU)

Tehran, Iran

B.Sc. IN ELECTRICAL ENGINEERING

2017 - 2021

- **Final Project:** Design and Implementation of a Comprehensive Data Acquisition System(DAQ) for Real-Time Applications in ARASH:ASiST Eye Surgery Training Robot
- **Advisor:** Prof. Hamid D. Taghirad [[Scholar](#)]
- **GPA:** 3.52/4.0

Research Interests

- **Sensor Fusion:** Design and implementation of sensor fusion systems and algorithms for SLAM, localization, and calibration problems
- **Multi Agent Perception and Localization:** Communication, positioning, and fusion tasks utilizing optimization-based algorithms
- **Medical Robotic:** Calibration and control surgical robots for minimally invasive surgery, haptics, and teleoperation
- **Machine Learning for Hybrid Statistical Learning and Control in Robotic Systems:** Enhancing robotic applications utilizing machine learning methods for more adaptive and efficient control strategies

Research Experience

Advanced Robotics and Automated Systems (ARAS)

Tehran, Iran

■ SURGICAL ROBOTS LAB (SR LAB)

2021 - Present

- **A Unified Graph-Based Kinematic Calibration Algorithm for Surgical Robots** [[Github](#)] [[Paper](#)]
 - Developed a kinematic calibration method using SE(3) manifold formulations for DIAMOND and ARASH:ASiST eye surgery robots.
 - Implemented a ROS node for real-time communication and synchronized systems with an Network Time Protocol (NTP) server. [[Github](#)].
 - Collected visual-inertial-kinematic data using TagSLAM [[Github](#)].
- **Design and Implementation of a Real-Time DAQ System with Multi-Robot Testing (B.Sc. Final Project)** [[Paper](#)]
 - Designed an efficient real-time DAQ system based on the ARM Cortex-M4 STM32F7 comprising isolated multi analog/digital inputs/outputs, digital encoder channels, serial protocols, and an Ethernet communication pipeline.
 - Set up multi DAQ for real-time communication through UDP protocol with RTOS Matlab for dual-core ARASH:ASiST haptic robots.
 - Implemented an IDC controller using Matlab Real-Time Simulink utilizing this DAQ on ARASH:ASiST robot and DIAMOND robot, and a PID controller on the ARASCam robot.
- **CT-Based Navigation System for Elbow Surgery: Integrating Tracking Technology and 3D Simulation for Precise Guidance** [[Github](#)]
 - Collaborated on the implementation of an efficient custom IR tracker strew camera-based system for real-time surgical registration and navigation. [[Github](#)]

■ PARALLEL AND CABLE-DRIVEN ROBOTS LAB (PACR LAB)

- **A Graph-Based Self-Calibration Technique for Cable-Driven Robots with Sagging Cable (M.Sc. Final Project)** [[Github](#)] [[Paper](#)]
 - Developed a graph-based simultaneous localization and self-calibration technique for deployable CDPRs considering sagging cable.
 - Verified the proposed method using a Finite Element approach in RecurDyn software.
 - Developed a C++ and Python-based framework for implementation utilizing GTSAM and SymForce libraries.
- **Graph-Based Visual-Kinematic Fusion and Monte Carlo Initialization for Fast-Deployable Cable-Driven Robots** [[Github](#)] [[Paper](#)]
 - Collaborated in the development of a graph-based visual-kinematic fusion for deployable CDPRs utilizing SVO and factor graph.
 - Collected an open-source visual-inertial and kinematic dataset for state estimation and calibration research in cable robotics.
- **A Novel Cable-Driven Robot Kineto-Static State Estimation** [[Github](#)]
 - Introduced a graph-based module for solving inverse and forward kinematics of CDPRs for accurate kineto-static state estimation considering cable sag without using force sensors.
- **Embedded System Implementation for Kamal-OL-Molk Painter Robot** [[Github](#)]
 - Designed and implemented an isolation embedded module using ESP32 with wireless connectivity in Altium Designer for the Kamal-OL-Molk 3DoF cable planer robot.
- **Arastronaut Indoor/Outdoor Positioning System** [[Github](#)]
 - Designed a real-time embedded ESP32-based module with IMU, ultra-wideband, pressure, and compass sensors for robot positioning.
 - Set up a user-friendly GUI based on UDP web server for automated programming, sensor calibration, data visualization and collection

Publications

- **A Graph-Based Self-Calibration Technique for Cable-Driven Robots with Sagging Cable**
 - M. R. Dindarloo, A. S. Mirjalili, S. A. Khalilpour, R. Khorrambakht, Stephan Weiss, and H. D. Taghirad. “2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).” [\[PDF File\]](#) [\[Presented in 2024 IROS\]](#)
- **Kinematic Calibration of a Spherical Parallel Robot**
 - M. R. Dindarloo, A. S. Mirjalili, R. Khorrambakht, S. A. Khalilpour, P. Cardou and H. D. Taghirad. “2023 11th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM).” [\[PDF File\]](#) [\[DOI\]](#)
- **Graph-Based Visual-Kinematic Fusion and Monte Carlo Initialization for Fast-Deployable Cable-Driven Robots**
 - R. Khorrambakht, H. Damirchi, M. R. Dindarloo, A. Saki, S. A. Khalilpour, H. D. Taghirad, and Stephan Weiss. “2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).” [\[PDF File\]](#) [\[DOI\]](#)
- **An observer-based responsive variable impedance control for dual-user haptic training system**
 - A. Rashvand, R. Heidari, M. Motaharifar, A. Hassani, M. R. Dindarloo, M. J. Ahmadi, K. Hashtrudi-Zaad, M. Tavakoli, H. D. Taghirad. “2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).” [\[PDF File\]](#) [\[DOI\]](#)
- **Marker Correspondence Initialization in an IR Motion Capturing System**
 - M. M. Kalantari, R. Khorrambakht, M. R. Dindarloo, S. A. Khalilpour, H. D. Taghirad, P. Cardou. “2022 10th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM).” [\[PDF File\]](#) [\[DOI\]](#)
- **On The Dynamic Calibration and Trajectory Control of ARASH: ASiST** *[Best Paper Award]*
 - A. Hassani, M. R. Dindarloo, R. Khorrambakht, A. Bataleblu, R. Heidari, M. Motaharifar, S. F. Mohammadi, H. D. Taghirad. “2022 8th IEEE International Conference on Control, Instrumentation and Automation (ICCIA).” [\[PDF File\]](#) [\[DOI\]](#)
- **Kinematic and dynamic analysis of arash asist: Toward micro positioning** *[Best Paper Award]*
 - A. Hassani, M. R. Dindarloo, R. Khorrambakht, A. Bataleblu, H. Sadeghi, R. Heidari, A. Iranfar, P. Hasani, N. S. Hojati, A. Khorasani, N. KhajeAhmadi, M. Motaharifar, H. Riaz-Esfahani, A. Lashay, S. F. Mohammadi, H. D. Taghirad. “2021 9th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM).” [\[PDF File\]](#) [\[DOI\]](#)

Skills

Programming Languages	Python, C/C++, MATLAB, Maple, \LaTeX
Embedded Systems	ROS, STM32CubeMX, Raspberry Pi, Arduino
Engineering Software	Altium Designer, Simulink, RecurDyn, MuJoCo
Languages	English , Farsi

Teaching Experiences

Teaching Assistant at K.N. Toosi University of Technology (KNTU)

Tehran, Iran

- **Nonlinear Control System, Linear Control System, Industrial Control System** - Instructor: Prof. Hamid D. Taghirad [\[Scholar\]](#)
- **Robotics** - Instructor: Dr. S. Ahmad khalilpour [\[Scholar\]](#)
- **Signals and Systems** - Instructor: Dr. Lotfollah Beygi [\[Webpage\]](#)
- **Engineering Economics** - Instructor: Dr. Amirhossein Nikoofard [\[Scholar\]](#)

Courses

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| <ul style="list-style-type: none">• Robotic: Mechanics and Control• Linear/Nonlinear Control System• Multivariable Control• Optimal/Robust Control | <ul style="list-style-type: none">• Biomechatronic Systems• System Identification• Neural Networks• Reinforcement Learning |
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References

Prof. Hamid D. Taghirad [\[Scholar\]](#) [\[Webpage\]](#)

Tehran, Iran

PROFESSOR AND THE DIRECTOR OF ADVANCED ROBOTICS AND AUTOMATED SYSTEMS (ARAS), DEPARTMENT OF SYSTEMS AND CONTROL, FACULTY OF ELECTRICAL ENGINEERING, K. N. TOOSI UNIVERSITY OF TECHNOLOGY
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Prof. Philippe Cardou [\[Scholar\]](#) [\[Webpage\]](#)

Québec, Canada

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Dr. Amirhossein Nikoofard [\[Scholar\]](#) [\[Webpage\]](#)

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