Mohammadreza Dindarloo

(+98) 938 808 6348 | mohammadrezadindarlou@gmail.com | mohammadrezadindarloo.github.io | Github | Google Scholar | Linkedin

Education

K. N. Toosi University of Technology (KNTU) *Tehran, Iran*

M.Sc. in Electrical Engineering *2021 - 2024*

- **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 (18.82/20.0)

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 (16.74/20.0)

Research Interests

- **Sensor Fusion:** Design and implementation of sensor fusion systems and algorithms for SLAM, localization, and calibration problems
- **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
- **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

Research Experience

Advanced Robotics and Automated Systems (ARAS) *Tehran, Iran*

■ Parallel and Cable-Driven Robots Lab (PACR Lab) *2021 - Present*

- **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] [Paper]
  - 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

■ Surgical Robots Lab (SR Lab) *2020 - 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]

Publications

Published Papers:

- **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]
- **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]
- **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]
- **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. Khorambakht, A. Bataleblu, H. Sadeghi, R. Heidari, A. Iranfar, P. Hasani, N. S. Hojati, A. Khorasani, N. KhajeAhmadi, M. Motaharifar, H. Riazi-Esfahani, A. Lashay, S. F. Mohammadi, H. D. Taghirad. "2021 9th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM)." [PDF File] [DOI]

Accepted Papers:

- **Graph-Based Kinetostatic State Estimation in Cable-Driven Parallel Robots**
  - **M. R. Dindarloo**, A. Hassani, A. Sharifi, S. A. Khalilpour, P. Cardou and H. D. Taghirad. "2025 7th International Conference on Cable-Driven Parallel Robots (CableCon)." [PDF File]
- **Arastronaut: An Open Source UWB/IMU Hardware and Software for Indoor Positioning**
  - M. Vakili, A. S. Mirjalili, **M. R. Dindarloo**, Ali. Sharifi, and H. D. Taghirad. "2024 12th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM)." [PDF File]
- **Control of Cable Driven Parallel Robots Through Deep Reinforcement Learning**
  - D. A. Nejad, A. Sharifi, **M. R. Dindarloo**, A. S. Mirjalili, S. A. Khalilpour, and H. D. Taghirad. "2024 12th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM)." [PDF File]
- **Graph-Based Simultaneous Localization and Calibration for Planar Cable-Driven Parallel Robots**
  - A. Sharifi, M. Vakili, **M. R. Dindarloo**, A. S. Mirjalili, S. A. Khalilpour, B. Tavassoli, and H. D. Taghirad. "2024 12th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM)." [PDF File]

Skills

Programming Languages	Python, C/C++, MATLAB, Maple
Embedded Systems / Software	ROS, STM32CubeMX, Raspberry Pi, Arduino / Altium Designer, Simulink, RecurDyn, MuJoCo
Languages	English (TOEFL iBT: 91/120 - R: 23, L: 24, S: 21, W: 23) , Persian (Native)

Teaching Experiences

- **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]

References

Prof. Hamid D. Taghirad [Scholar] [Webpage] *Tehran,Iran*

Professor and the Director of Advanced Robotics and Automated Systems, K. N. Toosi University of Technology

Email: taghirad@kntu.ac.ir

Prof. Philippe Cardou [Scholar] [Webpage] *Québec, Canada*

Professor, Robotics Laboratory, Department of Mechanical Engineering, Laval University

Email: pcardou@gmc.ulaval.ca