Mohammad MalekZadeh Arasteh — Résumé

No. 22, Soroush, Moalem Blvd – Mashhad, Razavi Khorasan Province, Iran

☐ +98 938 832 4197 • ☏ +98 513 604 0708

✉ malek.mohammad132@gmail.com • Ⓢ Mohammad MalekZadehArasteh

➤ Mohammad MalekZadehArasteh • Date of Birth: October 12, 1995

Research Interests and Objectives

In the long run, I plan to contribute substantially to robotics and control theory. I am interested in Control Theory, Optimization Techniques, Legged Locomotion, Rehabilitation, Health Care Robotics, and Industrial Robotics. My goal is to improve understanding of robotic systems, develop innovative locomotion techniques, and enhance the well-being of people with disabilities. The academic path I have chosen allows me to contribute significantly to society while pursuing academic excellence internationally.

- ○ Control theory
- ○ legged locomotion
- ○ Industrial Robotics
- ○ Optimization Techniques
- ○ Rehabilitation and Health Care Robotics

Education

Ferdowsi University of Mashhad   **Mashhad, Iran**

PHD candidate in Mechanical Engineering field of Dynamics, Control and vibration   *2020-Present*

Title of Thesis: "Online Safe Trajectory Generation for Powered Exoskeleton Rehabilitation in Patients with Spinal Cord Injury"

Supervisor: Dr. Alireza Akbarzadeh Totonchi

I am a PhD candidate at the Ferdowsi University of Mashhad, focusing on creating online safe trajectory generation algorithms for powered exoskeleton rehabilitation in patients with spinal cord injuries. In the Robotics Lab, specialists from mechanical engineering, robotics, and rehabilitation sciences collaborate. Powered exoskeletons can enhance patient care and rehabilitation quality by improving effectiveness and safety. Its interdisciplinary nature offers a unique opportunity to contribute to pioneering research.

University of Tehran   **Tehran, Iran**

Master of Science in Mechanical Engineering field of Dynamics, Control and vibration   *2017-2020*

Title of Thesis: "Reconstruction and modeling of human movement and path generation for robots"

Supervisor: Dr. Aghil Yousefi-Koma

As a Center of Advanced Systems and Technology (CAST) member at the University of Tehran, I contributed significantly to robotics during my master's studies. One of my highlights was the development of the Surena4 humanoid robot, a groundbreaking achievement. Five specialized groups worked on the project: dynamics and control, industrial design, manufacturing and design, electronics, and intelligent intelligence. By contributing to the dynamics and control group, I helped advance the robot's capabilities. I gained a deep understanding of robotic systems and control

mechanisms through this experience. This experience has enriched my academic knowledge and equipped me with practical skills, which I am eager to apply in future endeavours.

Ferdowsi University of Mashhad   **Mashhad, Iran**
B.Sc. Mechanical Engineering   *2012-2016*
Title of Thesis: "Investigation of human hip and knee joint dynamics using motion capture technology"
Supervisor: Dr. Masoud Tahani
My Bachelor's degree in Mechanical Engineering from Ferdowsi University of Mashhad shaped my academic journey in my hometown. It provided me with a robust foundation in fundamental engineering principles and underscored the critical role of engineering in solving real-world challenges.

Experience

Agreen Energy Products

Mashhad, Iran
Robotics Engineer   *January 2022 – April 2022*
As a Robotics Engineer at Agreen Energy Products in Mashhad, Iran, I significantly contributed to optimizing the production methods of THERMO-PLATE Heat Exchangers. I led the introduction of laser welding methods using CAD/CAM software and the Yaskawa MH50 industrial robot to improve manufacturing efficiency and product quality. In order to maintain accuracy and consistency in the manufacturing process, I programmed the Yaskawa robot to perform precise welding tasks.
To improve the safety of the factory environment, I implemented proactive safety measures. Grounding cables were installed in the specified area of the factory and on the robot to reduce electrical risks. I strategically placed barriers around the robot to prevent unintentional contact and maintain a safe working environment for all personnel. These actions emphasized my dedication to placing safety equally important to productivity in our manufacturing activities..
○ Utilized CAD/CAM software for design and manufacturing processes

○ Implemented offline programming techniques to optimize robot operations

○ Using programmed Yaskawa MH50 industrial robot to perform laser welding operations

○ Collaborated with the team to improve efficiency and quality in product manufacturing

http://www.agensanat.com

FUM Robotics Research

Mashhad, Iran
FUM 6R-20 Industrial Robot Operator   *September 2020 – Present*
At FUM Robotics Research in Mashhad, Iran, I worked as an industrial robot operator, assisting in research and development projects aimed at enhancing robotics solutions for healthcare and industry. Using the FUM 6R-20 industrial robot for experiments and data collection in projects such as calibration of IMU sensors, lab researchers and I collaborated.
○ Operated and maintained FUM 6R-20 industrial robot for research and development purposes

○ Collaborated with researchers to conduct experiments and collect data for various projects

www.fumcare.ir

Center of Advanced Systems and Technologies (CAST)

Tehran, Iran
FUM 6R-20 Industrial Robot Operator   *April 2018 – August 2020*

During my time at CAST, I performed both operational and managerial duties. My responsibilities included managing the Surena-mini robot and leading multiple research projects at the same time. Overseeing the robot's daily activities, carrying out experiments, and collecting data were my responsibilities. CAST's goal of innovation and excellence in robotics research was enhanced by active participation in the Surena-mini project.

○ Oversaw the Surena-mini robot project.

○ Contributed to the success of the Surena-mini project, demonstrating CAST's commitment to robotics research.
```
www.castech.ir
https://www.youtube.com/watch?v=U71STMsbwo8
https://www.youtube.com/watch?v=PO3Hi4ytxuQ
```

Skills and Techniques

I have gained a wide range of skills through my experience in robotics and control systems.

Trajectory Generation

I am proficient in trajectory generation techniques, especially jerk-limited trajectories, which I can plan and implement.

Kinematics

Familiar with quaternion kinematics and how to manipulate orientations with it.

Control Systems

As an Optimal Controller designer and developer, I am good at enhancing system performance through the use of Optimal Controllers. To maintain system stability and robustness, I am skilled in Robust Control methods, specifically sliding mode controllers. Using Differential Dynamic Programming, I solve optimal control issues in nonlinear systems.

Computer-Aided Design and Manufacturing (CAD/CAM)

To design products and enhance manufacturing procedures, I use Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) software.

Simulation

Modeling and simulating complex systems using simulation tools like MATLAB, Simulink, and Simscape allows for comprehensive analysis and optimization before implementation.

Projects and Robot Manipulations

I have gained valuable experience in robot manipulation and system testing through participation in multiple projects, enhancing my ability to implement and test different control techniques and hardware setups.

Inertial Measurement Unit (IMU)

Implemented Inertial Measurement Units (IMUs) to combine sensor data and determine orientation, aiding in the creation of reliable navigation and motion tracking systems.

6R Robot Manipulator

Utilized a 6R robot manipulator to conduct tasks focused on testing and assessing IMU performance in various manipulation scenarios, such as trajectory tracking, object manipulation, and sensor

calibration.

SCARA Robot (RRPR)

To acquire practical knowledge of advanced control techniques in robotics, I applied control algorithms such as Computed Torque Control (CTC) to a SCARA robot with RRPR configuration.

Dynamixel Motor Setup (Surena-mini)

Managed Dynamixel motors in the Surena-mini robot platform to improve humanoid robot functions and behavior by performing tasks such as motor calibration, PID tuning, and trajectory control.

System Identification of Motor Harmonic Drive

Performed system identification experiments on motor harmonic drives to analyze their dynamics and performance traits, guiding the development and enhancement of control strategies for systems incorporating harmonic drive mechanisms.

Papers

M. M. Arasteh, A. Yousefi-Koma and H. Alai, "Analytical Closed-Form Joint Solution of Quaternion-Based Inverse Kinematics for Humanoid Robots," 2020 28th Iranian Conference on Electrical Engineering (ICEE), Tabriz, Iran, 2020, pp. 1-6, doi: 10.1109/ICEE50131.2020.9260636.
keywords: Quaternions;Kinematics;Mathematical model;Humanoid robots;Legged locomotion;Robots;Jacobian matrices;Inverse Kinematics;Humanoid Robots;Singularity;Quaternions;Human-Like;Analytical Closed-Form Inverse Kinematics

Language Proficiency

○ **Persian** Native
○ **English** Advanced

Interests

- Piano
- GYM

- Swimming
- Video Games