

Amir Yazdani

 <https://amir-yazdani.github.io/>  [amir-yazdani-robotics](#)  amir.yazdani@utah.edu

EDUCATION

University of Utah, Salt Lake City, UT

JAN 2016 - Present

PhD in Mechanical Engineering (Robotics Track), Thesis: "*Haptic Posture Estimation and Guidance to Improve Ergonomics in Telemanipulation*", GPA: 3.8/4

Amirkabir University of Technology, Tehran, Iran

FEB 2013 - JUN 2015

MSc in Mechanical Engineering, Thesis: "*Optimal Trajectory Planning and Fault-Tolerant Control of Redundant Planar Serial Manipulators*", GPA: 17.18/20

K. N. Toosi University of Technology, Tehran, Iran

SEP 2005 - SEP 2010

BSc in Mechanical Engineering, Thesis: "*Design and Development of VirSense: A Novel Haptic Device With Fixed-Base Actuators and Gravity Compensation*", GPA: 15.03/20

SKILLS

Human-Robot Interaction

Ergonomics and safety in physical HRI, Human-aware planning, Biomechanics

AI

Pose estimation & SLAM, POMDP, HMM, Bayes filters, Smoothing, Prediction

Planning

Optimal & search-based motion planning, MPC, A*, RRT, PRM, MIQP & convex opt.

Software

ROS(Rviz, Gazebo, MoveIt, OpenCV, OpenNI, OpenPose, Gmapping, Rtabmap

KDL, traclK, GTSAM), Tensorflow, MATLAB Simulink, Gurobi Optimization, Motive

Hardware

Baxter, Quanser HD², Phantom Omni, Phantom Premium, Novint Falcon, Kinect V2

Teamwork/Documentation

Office, L^AT_EX, Slack, Git, Wrike

EXPERIENCES

Trajectory Planning for Fixed Robots

Omron Reserach Center of America, San Ramon, CA

Robotics Research Intern, Supervisors: John Drinkard

Summer 2019

- Working on trajectory planning for high-speed industrial robot.

Human-Robot Interaction/Robot Perception

LL4MA Lab & Ergonomics and Safety Lab, University of Utah

Research Assistant, Supervisors: Tucker Hermans, Andrew Merryweather, Jake Abbott

Jan. 2016 - present

- Developed a new algorithm for human posture estimation in physical HRI solely from the robot's trajectory without any extra sensor. I have modeled the system as a partially-observable dynamic system and use probabilistic inference and incremental smoothing techniques to estimate the posture. I've done human subject tests using a Quanser HD² robot and compared the results with motion capture and markerless posture estimation approaches.
- Developing a ROS package for online ergonomics analysis and finding the ergonomically-optimal posture correction in physical HRI using RULA risk assessment tool and graph-based MIQP optimization.
- Explored different approaches to provide guidance from the robot to the user in physical HRI to guide the user toward a more ergonomics posture and reduce the risk of musculoskeletal disorders.
- Investigating human redundancy resolution and joint coordination to improve the posture estimation in physical HRI.
- Implemented safety parameters into an optimal motion planning algorithm using MPC for serial robots to improve safety and productivity of the task in a shared autonomy.
- Developed a haptic guidance algorithm including virtual fixtures and synthetic fixtures to guide the user through a maze using a Quanser HD² haptic robot.
- Collaborated in a project to control an under-actuated wearable arm-swing rehabilitator for gait training.
- Collaborating in exploring probabilistic risk-aware decision making that leverages the predictive models and manipulation planning to minimize the risk of patient fall in hospital room by providing supporting objects during ambulation.

- Collaborated in developing a mobile manipulation planning algorithm based on MPC/convex optimization to push/pull legged objects.
- Developed an algorithm for push planning of objects with mobile robots using a mixture of A* and RRT-connect.
- Collaborated in a project developing a ROS package for visual SLAM using RGB-D and monocular cameras on an iRobot Create2 robot.
- Collaborated in designing and developing an under-actuated robotic hand for grasping legged objects with various leg diameters.

Motion Planning/Parallel Robots

TaarLab, The University of Tehran, Tehran, Iran

Research Associate, Supervisor: Mehdi Tale Masouleh, Mohammad Bagher Menhaj

Dec. 2011 - Dec. 2015

- Developed a fault-tolerant optimal collision-free motion planning algorithm based on convex optimization and MPC for robot arms and implemented on a developed 4-DOF planar & redundant serial robot.
- Collaborated in developing an optimal collision-free motion generation algorithm based on convex optimization and MPC and implementing it on various mobile, serial and parallel robots.
- Collaborated in developing PGNGN, a neural gas network algorithm for finding the singularity-free workspace of planar parallel robots.
- Designed and developed a 4-DOF Quattro-based parallel robot with optimal singularity-free workspace.
- Designed and developed a 3-DOF and a 2-DOF spherical, and a 3-DOF Cartesian parallel robot and collaborated in dynamic modeling and computed torque control.
- Designed and developed a pneumatic 6-DOF Gough-Stewart robot and collaborated in dynamic modeling.

Haptic Robots, Driving Simulators

Virtual Reality Lab, K. N. Toosi University of Technology, Tehran, Iran

Research Assistant & Lab manager, Supervisor: Ali Nahvi

July 2008 - Sep. 2011

- Designed and developed VirSense, a 6-DOF haptic device with fixed-base actuators and 95% passive gravity compensation using linear springs.
- Designed a novel 4-DOF serial-parallel robot for real-size urban bus driving simulators and collaborated in development and kinematic analysis of the mechanism.

SELECTED COURSES

Artificial Intelligence	Machine Learning	Motion Planning	3D Computer-Vision
Neural Networks	Haptics and Physical HRI	Intro to Robot Control	Advanced Mechatronics

PEER-REVIEWED PUBLICATIONS

1. **A. Yazdani**, R. SabbaghNovin, A. Merryweather, T. Hermans, "Estimating human teleoperator posture using only a haptic-input device", Submitted to *RSS 2019*.
2. R. SabbaghNovin, **A. Yazdani**, T. Hermans, and A. Merryweather, "Dynamics model learning and manipulation planning for objects in hospitals using a patient assistant mobile (PAM) robot." *IROS 2018*, Madrid, Spain.
3. R. SabbaghNovin, M. Tale Masouleh, and **M. Yazdani**. "A new neural gas network approach for obtaining the singularity-free workspace of 3-DOF planar parallel manipulators.", *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science* (2016).
4. R. SabbaghNovin, A. Karimi, **M. Yazdani**, and M. Tale Masouleh. "Optimal motion planning for parallel robots via convex optimization and receding horizon." *Advanced Robotics*, 30, no. 17-18 (2016): 1145-1163.
5. R. SabbaghNovin, M. Tale Masouleh, and **M. Yazdani**. "Optimal motion planning of redundant planar serial robots using a synergy-based approach of convex optimization, disjunctive programming and receding horizon." *Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering* 230, no. 3 (2016): 211-221.
6. M. ZamaniFekri, M. Zareei, M. Tale Masouleh, and **M. Yazdani**. "Optimal design and fabrication of a 4-DOF quattrotaar parallel robot with singularity-free workspace by ABC and PSO algorithms.", *Modares Mechanical Engineering*, (2016): Vol 16 No 6, 149-158.

7. **M.Yazdani**, M.Tale Masouleh, M. Hasanvand, I.Yahyapour, and M. Ghafouri Tabrizi. "Inverse dynamic problem of two parallel manipulators with identical limbs structures.", *Modares Mechanical Engineering*, Vol 15 No 13, 281-290 (2015).
8. A. Jaber, A. Nahvi, M. Hasanvand, M.Tale-Masouleh, M.Arbabtafti, and **M.Yazdani**. "Design and kinematic analysis of a 4-DOF serial-parallel manipulator for a driving simulator." *International Journal of Robotics (Theory and Applications)* Vol.4, No. 3, 29-37 (2015).
9. R. SabbaghNovin, M.Tale Masouleh, **M.Yazdani** and B. Danaei. "Optimal motion planning of a 3-DOF decoupled parallel robot using convex optimization and receding horizon concept." *Modares Mechanical Engineering* Vol.15, No. 8, (2015).
10. **M.Yazdani**, R. SabbaghNovin, M. Tale Masouleh, M. Menhaj, and H. Abdi. "An experimental study on the failure tolerant control of a redundant planar serial manipulator via pseudo-inverse approach." *ICRoM 2015*, Tehran, Iran.
11. A. Mashayekhi, A. Nahvi, **M.Yazdani**, M. Mohammadi Moghadam, M. Arbabtafti, and M. Norouzi. "VirSense: a novel haptic device with fixed-base motors and a gravity compensation system." *Industrial Robot: An International Journal* 41, no. 1 (2014): 37-49.
12. E. Rostami Jame Bozorgi, I.Yahyapour, A. Karimi, M. Tale Masouleh, and **M.Yazdani**. "Design, development, dynamic analysis and control of a 2-DOF spherical parallel mechanism." *ICRoM 2014*, Tehran, Iran.
13. I.Yahyapour, **M.Yazdani**, M.Tale Masouleh, and M. Ghafouri Tabrizi. "Dynamic modeling and computed torque control of a 3-DOF spherical parallel manipulator." *ICRoM 2014*, Tehran, Iran.
14. R. SabbaghNovin, **M.Yazdani**, M.Tale Masouleh, and M. Menhaj. "Workspace determination of planar parallel robots via progressive growing neural gas network." *ICRoM 2014*, Tehran, Iran.
15. A. Jaber, A. Nahvi, M. Hasanvand, M. Tale Masouleh, M. Arbabtafti, **M.Yazdani**, M. Lagha, M. Hemmatabadi, and S. Samiezadeh. "Design and kinematic analysis of a 4-DOF serial-parallel manipulator for urban bus driving simulator." *ICRoM 2013*, Tehran, Iran.
16. I.Yahyapour, M. Hasanvand, M. Tale Masouleh, **M.Yazdani**, and S. Tavakoli. "On the inverse dynamic problem of a 3-PRRR parallel manipulator, the Tripteron." *ICRoM 2013*, Tehran, Iran.

PRESENTATION & ABSTRACTS

1. **A.Yazdani**, R. SabbaghNovin, A. Merryweather, and T. Hermans. "Human posture estimation and ergonomics analysis solely from the robot in physical human-robot interaction." *17th Annual Regional National Occupational Research Agenda (NORA) Young/New Investigators Symposium*. April 2019, Salt Lake City, UT.
2. **A.Yazdani**, and A. Merryweather. "Changing perceptions of robotics in industry: recent accomplishment in safety and injury risk reduction." *National Occupational Research Symposium (NOIRS)*, October 2018, Morgantown, WV.
3. **A.Yazdani**, R. SabbaghNovin, and A. Merryweather. "Improvement of human safety in fault-tolerant human and robot collaboration using convex optimization and receding horizon control." *Expanding Research Partnership: State of The Science Conference*, June 2017, Aurora, CO.
4. A. Merryweather, R. SabbaghNovin, **A.Yazdani**, "Optimal motion and mobility aid manipulation planning to enable personal activity monitoring and facilitate safer sit-to-walk transitions", *5th International Conference on Ambulatory Monitoring of Physical Activity and Movement (ICAMPAM)*, June 2017, Bethesda, MD.

PATENTS

- 4-degree of freedom industrial-researching parallel robot with free singularity workspace, No.146720 issued by Iranian Organization of Patents Registration. 2016
- Pneumatically Actuated 6-DoF Gough-Stewart Parallel Robot, No.446327 issued by Iranian Organization of Patents Registration. 2015
- VirSense, a novel haptic device with fixed-base actuators and gravity compensation, No.036421 issued by Iranian Organization of Patents Registration. 2013

- Two degrees of freedom parallel mechanism for the purpose of rapid object tracking, No.78963 issued by Iranian Organization of Patents Registration. 2013

TEACHING ASSISTANTSHIP

- Probability and Statistics, Computer-based Problem Solving for Eng. Sys.,
Intro to Design for Eng. Sys., Engineering Design I, CAD Lab *University of Utah, 2016-2019*
- Advanced Robotics, Parallel Robots, Statics and Strength of Materials *University of Tehran, 2012-2013*

AWARDS & HONORS

- Dr. Paul Richard's Safe Workplace Scholarship by WCF Insurance 2017, 2018 & 2019
- American Society of Safety Engineering Foundation Scholarship 2018, 2019
- Graduate Student Travel Assistance award, Graduate School, The University of Utah 2018
- Pilot Project Research Training (PPRT) Award from National Institute of Occupational Safety and Health (NIOSH), Award number: T420H008414-10 2016
- 1st place in Senior Demo league in Robocup IranOpen 2014

PEER REVIEW ACTIVITIES

- SAGE: Journal of Systems and Control Engineering
- IEEE: Robotics: Science and Systems Conference (RSS), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE-RAS International Conference on Humanoid Robots, International Conference on Robotics and Mechatronics (ICROM)
- ELSEVIER: Medicina
- MDPI: Sensors, Robotics, Applied Science, Technologies

MEMBERSHIPS

- Student member of IEEE
- Student member of Robotic & Automation Society (RAS)
- Student member of American Society of Safety Engineering (ASSE)