Hamed **Damirchi**

Research Assistant at ARAS Labs

hamed-d.github.io hamed-damirchi
hamdamirchi@gmail.com +98 914 867 8775

Education

Mechatronics Engineering

M. Sc, K. N. Toosi University of Technology, Tehran, Iran
- GPA : **18.17/20**
- Thesis : Data-Driven Multimodal Fusion Based Localization Subsystem implemented on the ARAS Cable Driven Robot End Effector
- Supervisor : Prof. Hamid D. Taghirad

Fusing information from various modalities available from a large-scale parallel cable robot though a novel multimodal fusion architecture in order to derive the end-effector's position in 6D

Mechanical Engineering

B. Sc, Tabriz Univeristy, Tabriz, Iran
- GPA : 14.59/20
- Thesis : Design and Implementation of an Attitude Stabilizer for a Mini Quad-Copter
- Supervisor : Prof. Jafar Keygobadi

Designing a lightweight quadcopter and developing a flight controller. Various filters such as KF, EKF and UKF were compared and a cascaded PID controller was used as the controller.

Publications

Papers

- **H. Damirchi**, R. Khorrambakht, H. D. Taghirad, "Exploring Self-Attention for Visual Odometry", Submitted to CVPR21, 2020, arxiv.org/abs/2011.08634
- R. Khorrambakht, **H. Damirchi**, Muhamad Risqi U. Saputra, Chris Xiaoxuan Lu, "Deep Inertial Odometry Using Preintegrated and STFT IMU Features", Submitted to ICRA21, 2020
- **H. Damirchi**, R. Khorrambakht, H. D. Taghirad, "ARC-Net : Activity Recognition through Capsules", Accepted at International Conference on Machine Learning and Applications (ICMLA20), 2020, arxiv.org/abs/2007.03063
- R. Khorrambakht, **H. Damirchi**, H. D. Taghirad, "Preintegrated IMU Features For Efficient Deep Inertial Odometry", 2020, arxiv.org/abs/2007.02929
- **H. Damirchi**, R. Khorrambakht, H. D. Taghirad, "ARAS-IREF : An Open-Source Low-Cost Framework for Pose Estimation", International Conference on Robotics and Mechatronics (Best poster paper award), 2019
- R. Khorrambakht, **H. Damirchi**, H. D. Taghirad, "A Calibration Framework for Deployable Cable Driven Parallel Robots with Flexible Cables", International Conference on Robotics and Mechatronics, 2019
- MRJ. Harandi, **H. Damirchi**, S. A. Khalilpour, H. D. Taghirad, "A Point-to-Point Motion Control of An Underactuated Planar Cable Driven Robot", Iranian Conference on Electrical Engineering, 2019
- MRJ. Harandi, S. A. Khalilpour, **H. Damirchi**, H. D. Taghirad, "Stabilization of Cable Driven Robots Using Interconnection Matrix : Ensuring Positive Tension", 2019, International Conference on Robotics and Mechatronics
- R. Khorrambakht, **H. Damirchi**, H. D. Taghirad, "Online Factor Graph Based Forward Kinematic and Initial Length Resolution For Parallel Cable Driven Manipulators", 2019

Books

- M. Delrobaei, A. Riasi, **H. Damirchi**, A. Hassani, H. D. Yaghoubi, "A Biomechatronics Handbook",

Research Interests

- Visual Perception
- Intelligent and autonomous systems
- Multimodal fusion
- Machine Intelligence

Projets

Robust Visual-Inertial Pipelines — Graduate, 2019-2020

An investigation of different gating mechanisms to achieve a more robust odometry pipeline. Gating modules that closely resemble attention mechanisms can be used to fuse various modalities together and achieve a more robust pipeline by training VO and IO pipelines alongside each other.

Visual-Inertial Odometry | Optical Flow | Localization

Cryptocurrency Price Direction Forecasting — Graduate, 2019

Various recurrent networks were used in order to predict the direction of the movement of Ethereum price with the aid of social media sentiment analysis pipelines. The results were compared against classical time series forecasting methods. This was a part of my system identification course project.

Time series Forecasting | Recurrent Networks | Dynamic Modelling

ARAS-IREF — Graduate, 2019

aras-cdrpm-projects/IR-Referencing-System IEEE

Developement of an IR Localization Subsystem with ROS Support. This pipeline was a robust pose estimation pipeline that used a monocular camera which is attached to the robot to estimate the pose of the joint by looking at a few IR markers. We developed this system in order to collect highly accurate pose data from a surgeon robot and develop data-driven pose estimation algorithms for the same robot.

Time series Forecasting | Recurrent Networks | Dynamic Modelling

Universal cable robot end-effector — Graduate, 2019

aras-cdrpm-projects/VIO_Camera_module

Design and implementation of a universal end-effector. An end-effector was designed in order to house a sensor array and allow for data collection. The collected data was used for all of the data-driven projects that used the ARAS-CAM cable robot as a case study.

Data Collection | CAD/CAM

Sensor fusion on a surgeon robot — Graduate, 2019

The data from the encoders of the Diamond surgeon robot alongside the data from an IMU were fused in order to detect slippage in the cable powered mechanisms. The ARAS-IREF platform was also used in order to provide information regarding the pose of the end-effector of this robot.

Data Collection | CAD/CAM

ARAS-CAM DAQ — Graduate, 2019

aras-cdrpm-projects/ARAS_CDRPM_DAQ_SYSTEM

Design and Implementation of ARAS-CAM Central Data Acquisition System. This system allows for collection of data from various sensors such as force sensors, encoders, IMU, etc. in a synchronized manner.

Data Collection | DAQ

Cryptocurrency Next-day price prediction — Undergraduate, 2018

Ethereum's next-day price prediction using recurrent networks. This project lead me to realize that the direct estimation of the price is not feasible and would be risky and direction estimation is much more stable.

Time Series Forecasting | Recurrent Networks

Quadcopter Attitude Estimation — Undergraduate, 2017

Design, implementation and control of a mini quad copter with cascaded PID controller. The goal of this project was to evaluate the efficiency of different filter-based methods such as KF, EKF, UKF and low pass filters in estimation of a quad-copter's attitude.

Attitude Estimation | UAV | Control

Custom Robot Arm — Undergraduate, 2016

Design and implementation of a robotic arm. An Arduino based system was developed in order to implement a miniature robotic arm. Nonlinear regression methods were also used to estimate the inverse kinematics of the arm.

Robotics | CAD/CAM | Arduino

Skills

Language	**English(TOEFL : 114/120, Reading : 29, Listening : 30, Speaking : 27, Writing : 28)** , Azeri, Persian
Programming	**Python**, C, C++, Matlab
Frameworks	**PyTorch**, **TensorFlow**, Keras, MySQL, ROS, Qt, Git
Embedded Platforms	Custom Embedded Linux Development, STM32Fx ARM Microcontrollers, Arduino
CAD/CAM	**CATIA**, SolidWorks, **Altium Designer**

Teaching Experiences

2015, Tabriz, Iran	Teaching Assistant, Robotics, Mechanical Engineering Dep
2016, Tabriz, Iran	Tutor, Introduction to Robotics, Mechanical Engineering Dep
2017, Tabriz, Iran	Teaching Assistant, Robotics, Mechanical Engineering Dep
2017, Tabriz, Iran	Tutor, Programming with C++, Mechanical Engineering Dep
2019, Tehran, Iran	Teaching Assistant, Introduction to Arduino, Electrical Engineering Dep

Notable Graduate Courses

- Machine learning
- System Identification
- Control in Robotics
- Advanced Control
- Data Fusion
- Mechatronics
- Biomechatronics

Online Courses

- Intro to Deep Learning Course Instructed by Prof. Hinton on Coursera
- Deep Learning Specialization Course Instructed by Prof. Ng on Coursera
- Introduction to Self-Driving Cars Course Instructed by Prof. Waslander on Coursera

References

Prof. Hamid D. Taghirad
Professor, Faculty of Electrical Engineering
VC for Global Strategies and International Affairs
K. N. Toosi University of Technology
@ taghirad@kntu.ac.ir