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Nicola A. Piga

I am a Post Doctoral researcher working in the Humanoid Sensing and Perception (HSP) research line within the Istituto Italiano di Tecnologia.
My research deals with the development of *6D object pose tracking* algorithms for humanoid robots that combine neural networks, Bayesian filtering, vision and tactile sensing.

Facts about me

- Researcher in humanoid robotics with a passion for state estimation applied to 6D object pose tracking.
- Enthusiast Linux and C++ user.
- Hardware experience with several humanoid and industrial robotic platforms.
- Main interests: Bayesian filtering, 6D object pose tracking, Machine learning-aided object pose tracking, Tactile sensing.

Current Position

May, 2022 - current **Post Doctoral Researcher @ Humanoid Sensing and Perception (IIT)**, *Istituto Italiano di Tecnologia*, Genoa, Italy.

Publications

2022 **ROFT: Real-Time Optical Flow-Aided 6D Object Pose and Velocity Tracking** , ***Piga, N.***, *Onyshchuk Y., Pasquale G., Pattacini, U. and Natale, L.*, IEEE Robotics and Automation Letters, vol. 7, no. 1, pp. 159-166, Jan. 2022

2021 **A Differentiable Extended Kalman Filter for Object Tracking Under Sliding Regime**, ***Piga, N.***, *Pattacini, U. and Natale, L.*, Frontiers in Robotics and AI, Humanoid Robotics, Vol. 8, Pg. 251, 2021.

2021 **Active Perception for Ambiguous Objects Classification**, *Safronov, E.*, ***Piga, N.***, *Colledanchise, M. and Natale, L.*, Accepted at 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021).

2021 **MaskUKF: An Instance Segmentation Aided Unscented Kalman Filter for 6D Object Pose and Velocity Tracking**, ***Piga, N.***, *Bottarel, F., Fantacci, C., Vezzani, G., Pattacini, U. and Natale, L.*, Frontiers in Robotics and AI, Humanoid Robotics, Vol. 8, Pg. 38, 2021.

2019 **Magnetic 3-axis Soft and Sensitive Fingertip Sensors Integration for the iCub Humanoid Robot**, *Holgado, A. C.*, ***Piga, N.***, *Pradhono Tomo, T., Vezzani, G., Schmitz, A., Natale, L. and Sugano, S.*, Proc. IEEE-RAS International Conference on Humanoid Robotics, Toronto, Canada, 2019.

Skills

Software
Programming languages, C++, Python.
Libraries, Eigen, OpenCV, VTK, YARP, ROS.
Simulators, Gazebo.
OS, Linux, Windows.
Build systems, CMake.
Version control systems, Git.

Hardware
Robots, iCub humanoid robot, Franka Emika Panda, RGB-D sensors, Tactile sensors (capacitive, magnetic-based, vision-based).

Soft skills
Work-related, Problem solving, Teamwork, Leadership, Motivation.
Languages, English (independent user), Italian (mother-tongue).

Past Experience

November, 2021 - April 2022
Ph.D. Candidate @ Humanoid Sensing and Perception (IIT),
Istituto Italiano di Tecnologia, Genoa, Italy.

Ph.D. Thesis "Hybrid Architectures for Object Pose and Velocity Tracking at the Intersection of Kalman Filtering and Machine Learning" (Link)

November, 2018 - November, 2021
Ph.D. Student @ Humanoid Sensing and Perception (IIT),
Istituto Italiano di Tecnologia, Genoa, Italy.

I carried out my Ph.D. in Advanced and Humanoid Robotics at the Humanoid Sensing and Perception research line at Istituto Italiano di Tecnologia in Genoa. During the Ph.D. project, I developed hybrid architectures for 6D object pose tracking by fusing Deep Learning with Kalman filtering techniques. Part of my work was dedicated to the development of these algorithms in C++ and their testing on the iCub humanoid platform using vision and tactile sensing.

December 2017 - September 2018
Research Fellow @ Humanoid Sensing and Perception (IIT),
Object localization using vision and touch: experiments on the iCub humanoid robot,
Istituto Italiano di Tecnologia & Università di Pisa, Genoa, Italy.

During my M. Sc. thesis in collaboration with Istituto Italiano di Tecnologia (IIT), I designed a Bayesian object localization algorithm for the robot iCub exploiting visual and tactile measurements.

Education

December, 2014 - September, 2018
M. Sc. with full honours in Robotics and Automation Engineering,
Università di Pisa, Pisa, Italy.

M. Sc. Thesis "Object localization using vision and touch: experiments on the iCub humanoid robot"

September, 2011 - December, 2014
B. Sc. with full honours in Computer Engineering,
Università di Pisa, Pisa, Italy.

B. Sc. Thesis "Analysis of the reconstruction error in environmental monitoring via Compressive Sensing"