Data-Driven Based Navigation

Itzik Klein
The Hatter Department of Marine Technologies, University of Haifa, Israel
Email: kitzik@univ.haifa.ac.il

The purpose of navigation is to determine the position, velocity, and orientation of manned and autonomous platforms, humans, and animals. Obtaining accurate navigation commonly requires fusion between several sensors, such as inertial sensors and global navigation satellite systems, in a model-based nonlinear estimation framework. Recently, data-driven approaches applied in various fields show state-of-the-art performance, compared to rule- or model-based methods. This talk will address data-driven based navigation algorithms, derived at the autonomous navigation and sensor fusion lab, that enhance common navigation and estimation tasks. The algorithms include: 1) autonomous underwater vehicle navigation with partial measurements 2) indoor positioning using the smartphone's inertial sensors 3) adaptive nonlinear filtering with model uncertainty for autonomous vehicles 4) quadrotor dead reckoning 5) stationary coarse alignment 6) smartphone location recognition.

References

[1] Klein I., Smartphone Location Recognition: A Deep Learning-Based Approach, Sensors, 20(1), 214, 2020.

[2] Klein I. and Asraf O., StepNet—Deep Learning Approaches for Step Length Estimation, IEEE Access, 8, pp. 85706 - 85713, 2020.

[3] Shurin A. and Klein I., QDR: A Quadrotor Dead Reckoning Framework, IEEE Access, Vol. 8, pp. 204433-204440, 2020.

[4] Zak I., Katz R., and Klein I., MLCA – A Machine Learning Framework for INS Coarse Alignment, Sensors, Vol. 20, pp. 6959, 2020.

[5] Asarf O., Shama F., and Klein I., PDRNet: A Deep Learning Pedestrian Dead Reckoning Framework, accepted to –IEEE Sensors, 2021.

[6] Daniel N., Goldberg F., and Klein I., Smartphone Location Recognition with Unknown Modes, Sensors, vol. 21(14), pp. 4807, 2021.

[7] Daniel N, Klein I. INIM: Inertial Images Construction with Applications to Activity Recognition, Sensors, vol. 21(14), pp. 4787, 2021. https://doi.org/10.3390/s21144787

[8] Yona M. and Klein I., Compensating for Partial Doppler Velocity Log Outages by using Deep-Learning Approaches, accepted to IEEE International Symposium on Robotic and Sensors Environments (ROSE 2021), October 28-29, 2021