Adaptive Attitude and Heading Estimation Using Deep Learning Approaches

Eran Vertzberger
The Hatter Department of Marine Technologies, University of Haifa, Israel
Email: vertzeran@gmail.com

Accurate attitude and heading is required for many applications. For pedestrian navigation, the major challenge is to cope with linear accelerations and magnetic disturbances. To that end, a hybrid deep learning and classical solution for attitude and heading estimation is proposed. Classical equations are adopted to form an adaptive complementary filter structure. The accelerometers and magnetometers weights in each axis are adjusted by a neural network, trained on experimental data for optimal performance. The proposed approach is compared to commonly used algorithms using experimental data representing frequently used smartphone dynamics. Results show the contribution of the proposed approach to the attitude accuracy.
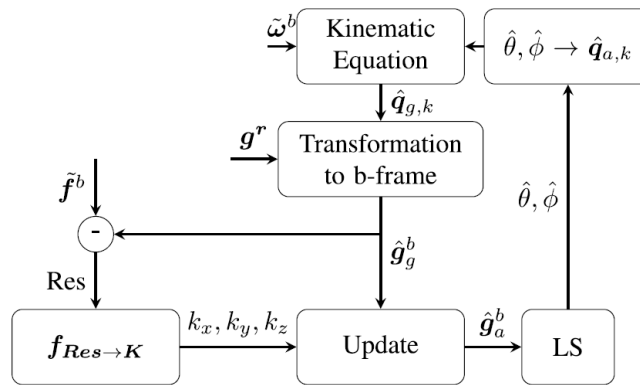
Figure 1: Structure of the proposed approach

[1] E. Vertzberger and I. Klein, "Attitude adaptive estimation with smartphone classification for pedestrian navigation," IEEE Sensors Journal, vol. 21, no. 7, pp. 9341–9348, 2021.
[2] E. Vertzberger and I. Klein, "Attitude and Heading Adaptive Estimation Using a Data Driven Approach," accepted to the International Conference on Indoor Positioning and Indoor Navigation (IPIN), 2021.