Title:

Two-stage Particle Filter for Simultaneous Pose and Posture Estimation with Visuo-inertial Fusion

Abstract:

We address the problem of human pose and posture estimation without any high precision marker-based motion capture systems, by merging inertial data from wearable sensors and a single RGB camera.

Our proposition is based on a biomechanical model of the human body and two coupled filters:

the first filter takes advantage of the accurate posture observations provided by wearable sensors and a factorization of joints to estimate the human posture with a reduced number of particles while the second filter uses RGB camera observations to estimate the drift of the wearable sensor so as to estimate the global state (pose and posture).

In order to combine those filters, the estimated human posture distribution of the first filter is used as a proposal distribution for the second fusion filter so as to focus on particles with an already high-likelihood posture and to improve the efficiency of the pose estimation.

Results showed this approach can perform online estimation of the human posture and the human pose (through the drift of the wearable sensor) and performed better than techniques relying only on inertial sensor or on direct pose estimation.