

This paper exploits three heterogeneous but complementary technologies along with a cellular automata particle filtering technique for enhancing localization positioning performance. The system is designed to meet challenging indoor operational conditions, thus different types of humanoid motions and industrial conditions were studied and evaluated according to qualitative attributes. In order to assess the proportional contribution of each navigation subsystem based on their accuracy, the extracted qualitative components are introduced to a particle filtering inference system. The final location estimate is calculated by applying different weights in the resampling stage depending on their accuracy performance for each time step. Experimental and simulation results have shown not only a reduced positioning error in terms of localization effectiveness but also a superior performance in several challenging industrial operational conditions. More accurate and real-time positioning is offered by the proposed method which can be also applied to any biped robot even in challenging operational conditions.