

Particle Filter Implementation of a Non-Linear Dynamic Fall Model

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Abstract : For the elderly living alone, falls can be a serious problem encountered in daily life. Some elderly people are unable to stand up without the assistance of a caregiver. They may become unconscious after a fall, which can lead to serious aftereffects such as hypothermia, dehydration, and sometimes even death. We treat the subject as an inverted pendulum and model its angle from the equilibrium position and its angular velocity. As the model is non-linear, we implement the filtering method with a particle filter which can estimate true states of the non-linear model. In order to evaluate the accuracy of the particle filter estimation results, we calculate the root mean square error (RMSE) between the estimated angle/angular velocity and the true values generated by the simulation. The experimental results give the highest accuracy RMSE of 0.0141 rad and 0.1311 rad/s for the angle and angular velocity, respectively.

Keywords : fall, microwave Doppler sensor, non-linear dynamics model, particle filter

Conference Title : ICHMDMII 2017 : International Conference on Health Monitoring Devices and Medical Imaging Innovations

Conference Location : Tokyo, Japan

Conference Dates : September 07-08, 2017