

Structural Displacement Estimation Through The Fusion Of Fmcw Millimeter Wave Radar And Accelerometer

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In this study, a structural displacement estimation technique was developed by fusing measurements from accelerometer and millimeter wave radar. An initial calibration is firstly performed using a short time period (less than 1 minute) acceleration and radar measurements to select the best target from the surroundings and estimate a conversion factor for the target. Then, displacement is estimated from radar measurement using the selected best target and the estimated conversion factor. Finally, the estimated radar-based displacement is fused with acceleration measurement using a finite impulse response (FIR) filter to estimate a displacement with improved accuracy at the cost of a short time delay. The feasibility and effectiveness of the proposed displacement estimation technique were validated by performing a laboratory test on a four-story building model and a field test on a pedestrian steel box girder bridge.