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# Monitoring Harness Use in Construction with BLE Beacons

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## Abstract

This paper introduces a novel approach to measure and evaluate the proper use of harnesses at construction sites: we deploy Bluetooth Low Energy (BLE) beacons for delimiting areas where the use of a harness is mandatory and to detect whether the harness is attached to the corresponding lifeline when the worker enter these areas. Our method is based on local estimation, through statistical filtering of RSSI measurements (Extended Kalman Filter), of the proximity between the beacons that delimit the different areas and the one in the lifeline, followed by a finite state machine risk status detector. Experiments have been performed in a real construction work-place with a wearable device; their results show that our solution is ideal for dynamic construction environments. Its main advantages are robustness of the detection system, easy relocation of the beacons as the construction zone evolves, and no need for calibration, communication infrastructure, external processing support, or configuration/map updates. Additionally, optional remote IoT for online monitoring is possible.

*Keywords:* Harness, construction safety, fall from height, beacon, sensor, safety at work.

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