

Abstract: Multi-Camera, Multi-Person, and Real-Time Fall Detection Using Long Short Term Memory

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Falls occurring at home are a high risk for elderly living alone. Several sensor-based methods for detecting falls exist and - in majority - make use of wearable or ambient sensors. The field of video-based fall detection is emerging; however, restricted view of single cameras, distinguishing/tracking of persons, and high false-positive rates pose limitations. Hence, a novel approach for video-based fall detection was proposed [1]: The human pose estimation algorithm *openpipaf* was augmented for fall detection by adding multi-camera and multi-person tracking support. For each person, five temporal and spatial features are extracted and processed by a long short-term memory (LSTM) network, classifying each frame as a *fall* or *no fall* event. The UP-fall detection dataset was used for evaluation, achieving a F1-score of 92.5%. Still, a trend of false-positives was observed due to imbalance as the dataset contains 36% videos showing falls; contrary to their rare occurrences in real life. We aim to improve this work by integrating it in a smart home laboratory: We will acquire a multi-camera dataset representing falls and everyday activities extending the binary to multi-class classification.

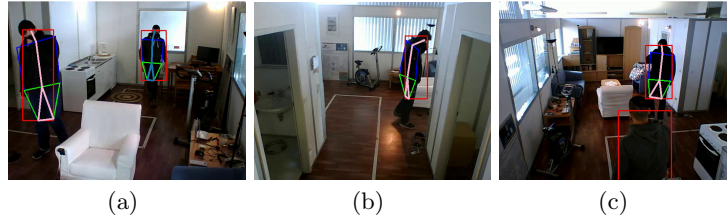


Fig. 1. Initial results acquired in the smart home lab from three cameras (a-c) capturing two persons. Each person is surrounded by a red bounding box and pose key points are visualized by colored lines. In c) the view is restricted which underlines the need for multi-camera support. Faces are masked due to the COVID-19 pandemic.

References

1. Tafseeque M, Koita S, Spicher N, et al. Multi-camera, multi-person, and real-time fall detection using long short term memory. Proc SPIE. 2021;(accepted).