

# Sit-to-stand transfer detection and power analysis with accelerometer and pressure sensor

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## Introduction

- Falls are one of the major health risk factors in elderly people.
- Peak power of a sit-to-stand (STS) transfer has been suggested as a potentially useful parameter for early prediction of fall risk [1].
- Laboratory validation has shown strong linear relationship between standard and sensor-based estimation of STS peak power [1].
- A pendant-worn sensor platform is developed for detecting STS and analyzing peak power of STS transfers. A preliminary validation is done with elderly people in home environment.

## Method

- The sensor platform consists of a tri-axial accelerometer and an air pressure sensor, with sampling frequency of 50 Hz and 1.8 Hz, respectively.
- In total 9 elderly people participate in the validation. A continuous data collection of about 30 minutes with each elderly is executed in his/her home when he/she is doing daily activities. A researcher is present to make annotation. A snapshot of the data collection is shown in Figure 1.



Figure 1. Data collection with elderly people.

## Result

- Statistics of STS detection validation are listed in Table 1.

STS	True Positive	False Alarm	Sensitivity	Positive Predictive Value	False Alarm Rate
55	39	10	71%	80%	1.1/p

Table 1. Analysis of STS detection algorithm.

- Peak powers of 39 detected STS transfers are calculated with body mass normalized to 1kg. Difference between the calculations based on manually determined (star) and automatically determined (circle) transfer timing is shown in Figure 2.

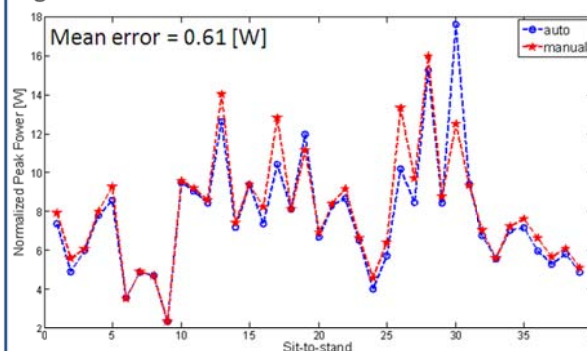


Figure 2. Analysis of peak power calculation.

## Conclusion

- Preliminary validation with elderly people in their home environment shows good result of positive prediction of sit-to-stand transfers.
- Automatic peak power calculation is in general well aligned with the calculation based on manual detection.
- The method allows easy and unobtrusive monitoring and measurements of peak power of STS transfer in daily life.

## Reference

[1] Zijlstra W, Bisseling R, Schlumbohm S, Baldus H. A body-fixed-sensor-based analysis of power during sit-to-stand movements. *Gait&Posture*, 2010; 31: 272-278