

# A Symbolic Approach to Gait Analysis Using Inertial Sensors

CAISR Centre for Applied Intelligent Systems Research

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## Gait Analysis

Walking is an important activity and can reflect several aspects of one's health. The clinical analysis of the human walk can improve the diagnosis and assessment of a number of physical and cognitive conditions such as stroke and Parkinson's Disease.

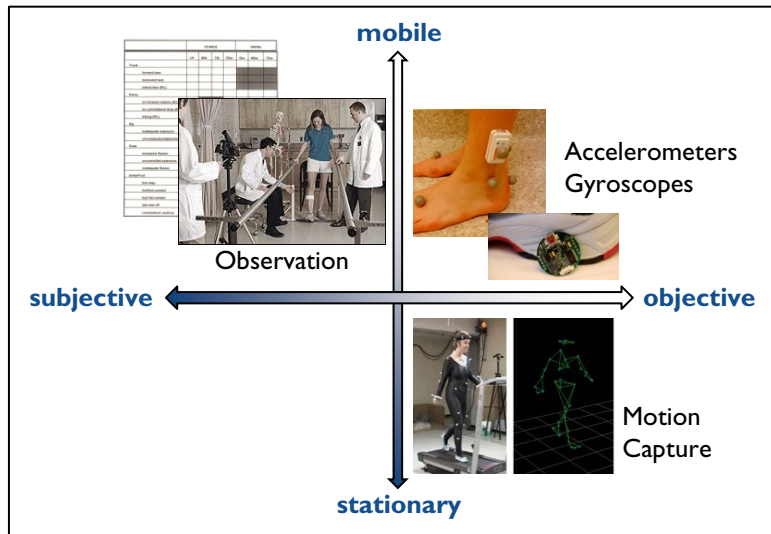
## The problem

Gait analysis is still not part of routine clinical practice due to the costs involved in training clinicians for observational gait analysis and setting up gait labs with motion capture technology. As a result, gait analysis remain limited to research or very specific medical cases.

## The solution

Alternatively, inertial sensors can be used in the development of cheap and wearable gait analysis systems. Inertial sensors are cheap, and easy to embed into garments such as shoes. They can provide unobtrusive and continuous acquisition of important gait information for a greater number of patients.

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## The challenge

Appropriate processing of the sensor data is important in the development of accurate and robust systems that can be widely accepted within the medical community. We propose a combination of data symbolization and expert knowledge that provides an intuitive and general analysis of the sensor data.

## Related publications

A. Sant'Anna, N. Wickström. *A symbol-based approach to gait analysis from acceleration signals: identification and detection of gait events and a new measure of gait symmetry*. IEEE Transactions on Information Technology in Biomedicine, 14(5):1180-1187, 2010.

A. Sant'Anna, A. Salarian, N. Wickström. *A new measure of movement symmetry in early Parkinson's disease patients using symbolic processing of inertial sensor data*. IEEE Transactions on Biomedical Engineering, 58(7):2127-2135, 2011.

A. Sant'Anna, N. Wickström. *Symbolization of time-series: an evaluation of SAX, Persist, and ACA*. 4th International Congress on Image and Signal Processing, 4:2223-2228, 2011.

A. Sant'Anna, N. Wickström, R. Zügner, and R. Tranberg. *A wearable gait analysis system using inertial sensors Part I: evaluation of measures of gait symmetry and normality against kinematic data*. International Joint Conference on Biomedical Engineering Systems and Technologies, 2012.

A. Sant'Anna, N. Wickström, H. Eklund, and R. Tranberg. *A wearable gait analysis system using inertial sensors Part II: evaluation in a clinical setting*. International Joint Conference on Biomedical Engineering Systems and Technologies, 2012.

