Kinematic Analysis of a gait cycle and a jump

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Master in Biomedical Engineering

Biomechanics of Movement

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TÉCNICO LISBOA

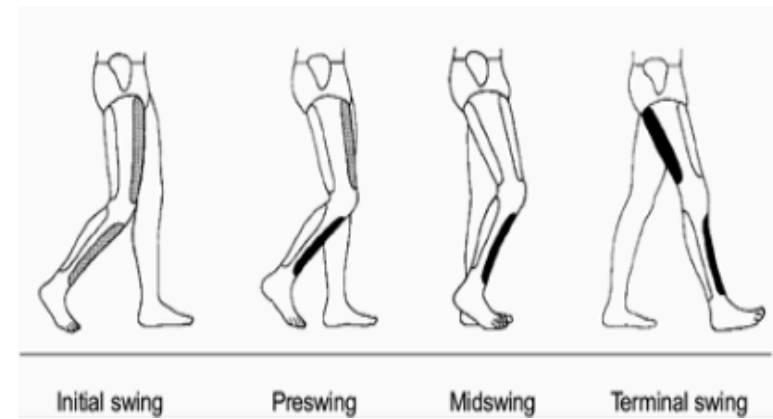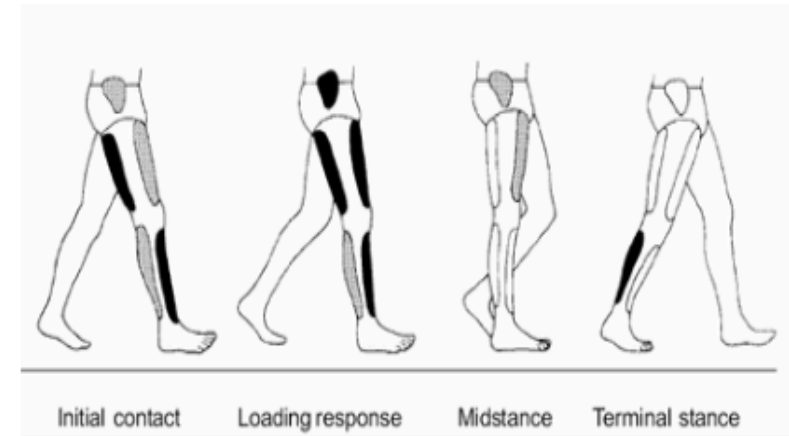# Motivation

Contribution to medicine:

- Diagnosis
- Therapy

Contribution to sports:

- Improvement in performance

Gait

Initial contact	Loading response	Midstance	Terminal stance

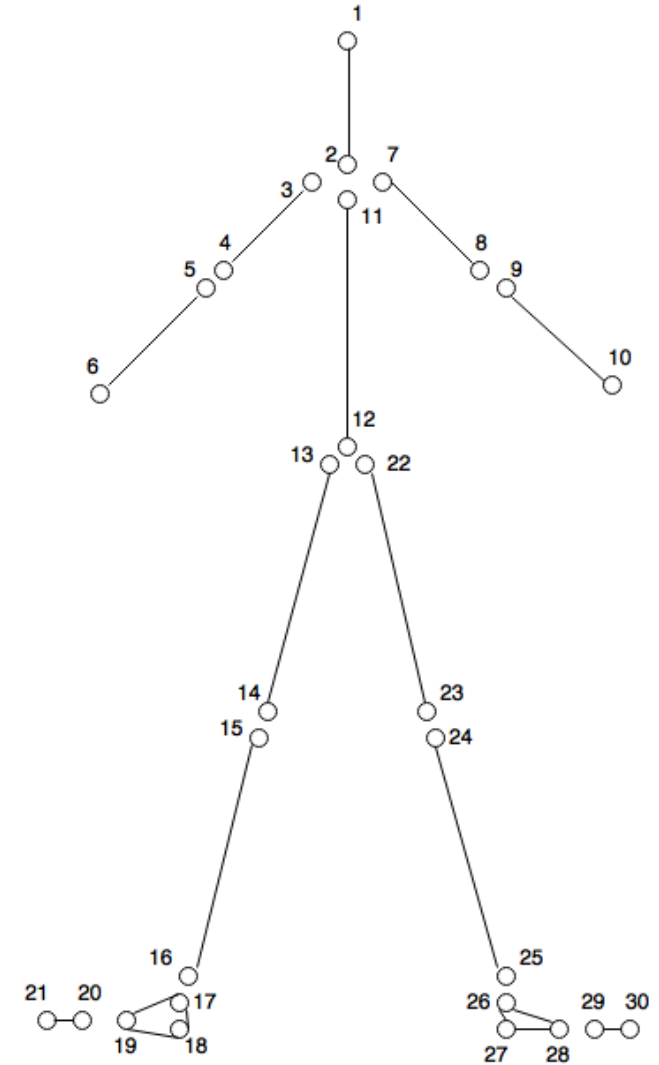|			
Initial swing	Preswing	Midswing	Terminal swing

Jump

Methodology

- 30 Points
- 18 Rigid bodies
- 13 Revolute joints
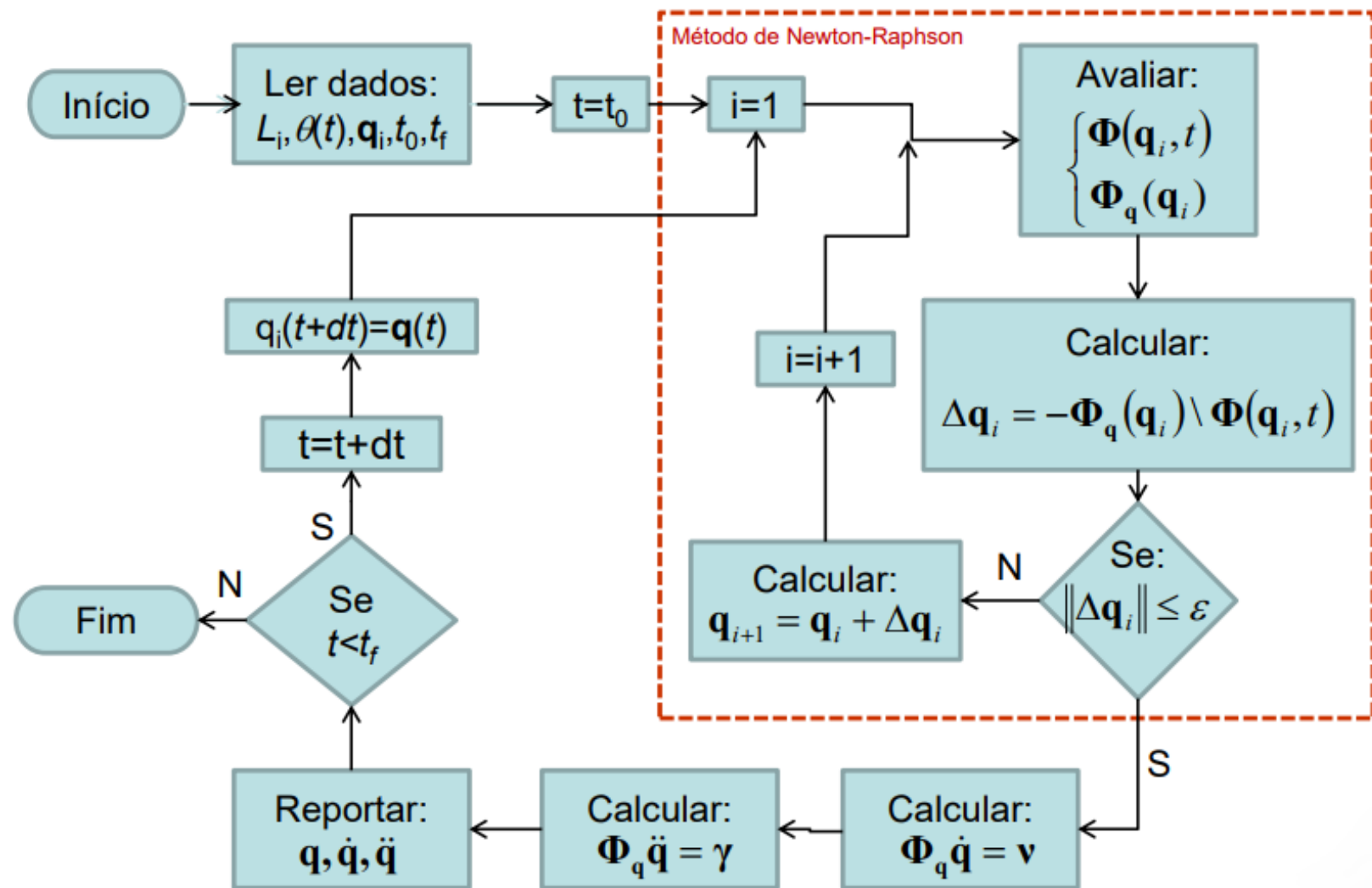- 14 Angular drivers
- 2 Trajectory drivers

↳ **Hip**

Methodology

- Pre-processing

- Filter data with double pass Butterworth filter

- Calculate average lengths of every rigid body for static data

- Calculate mapping matrix

- Calculate the angles

- Calculate the piecewise polynomial

Methodology

- Kinematic Analysis

Interface

UI Figure

Kinematic Project

1. Choose the movement you want to analise: [Get file]

2. What graphics do you want to see?

Points [None ▾]   Angle: [None ▾]

☐ Position   ☐ Angles

☐ Velocity   ☐ Angular Velocity

☐ Acceleration   ☐ Angular Acceleration
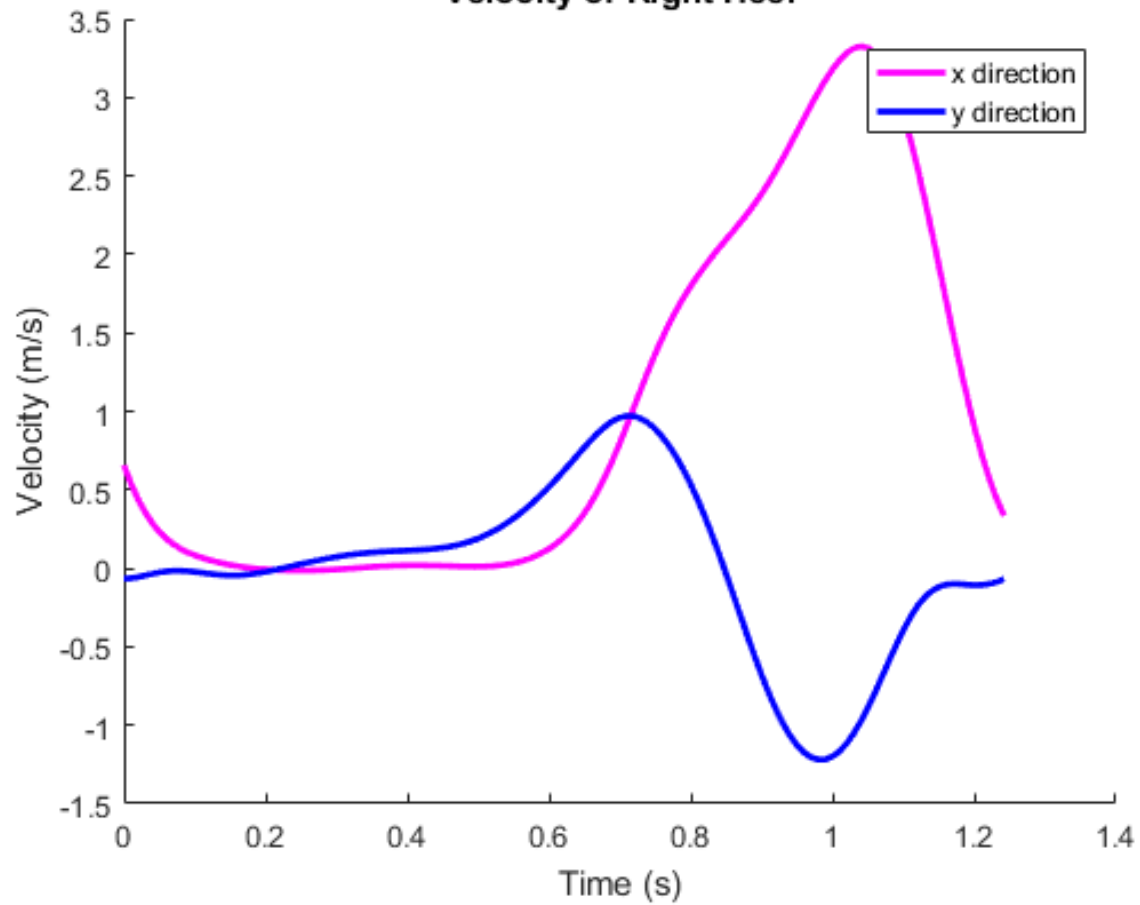
☐ Show Animation   [Evaluate]

Results-Gait
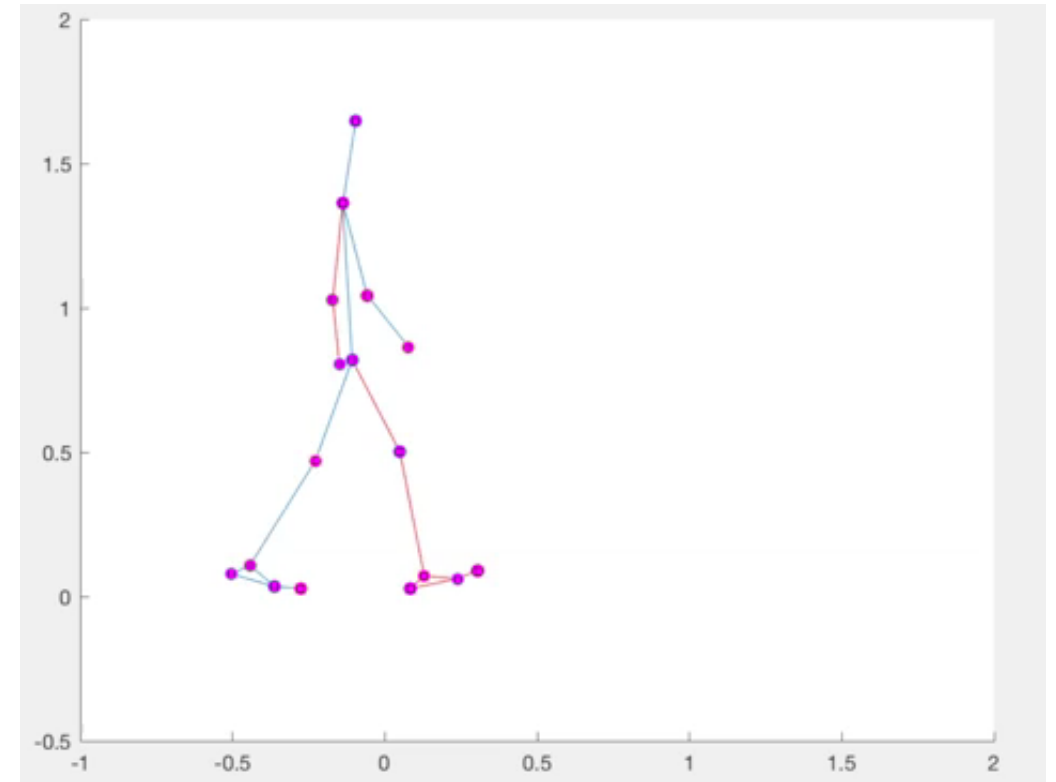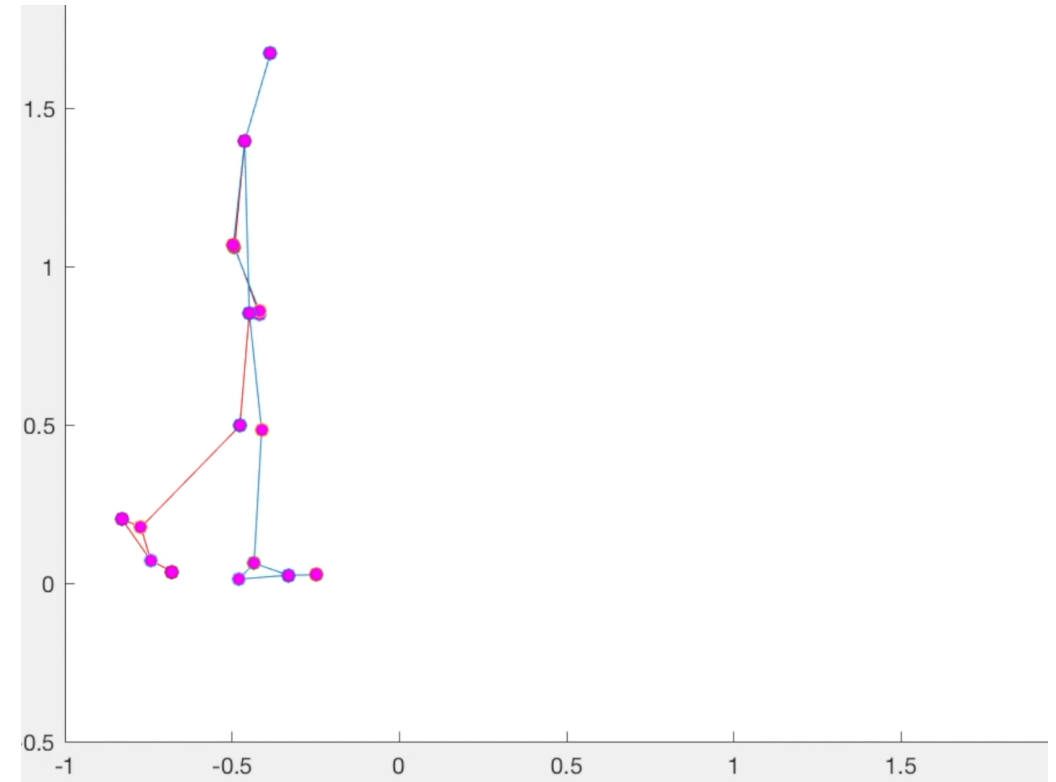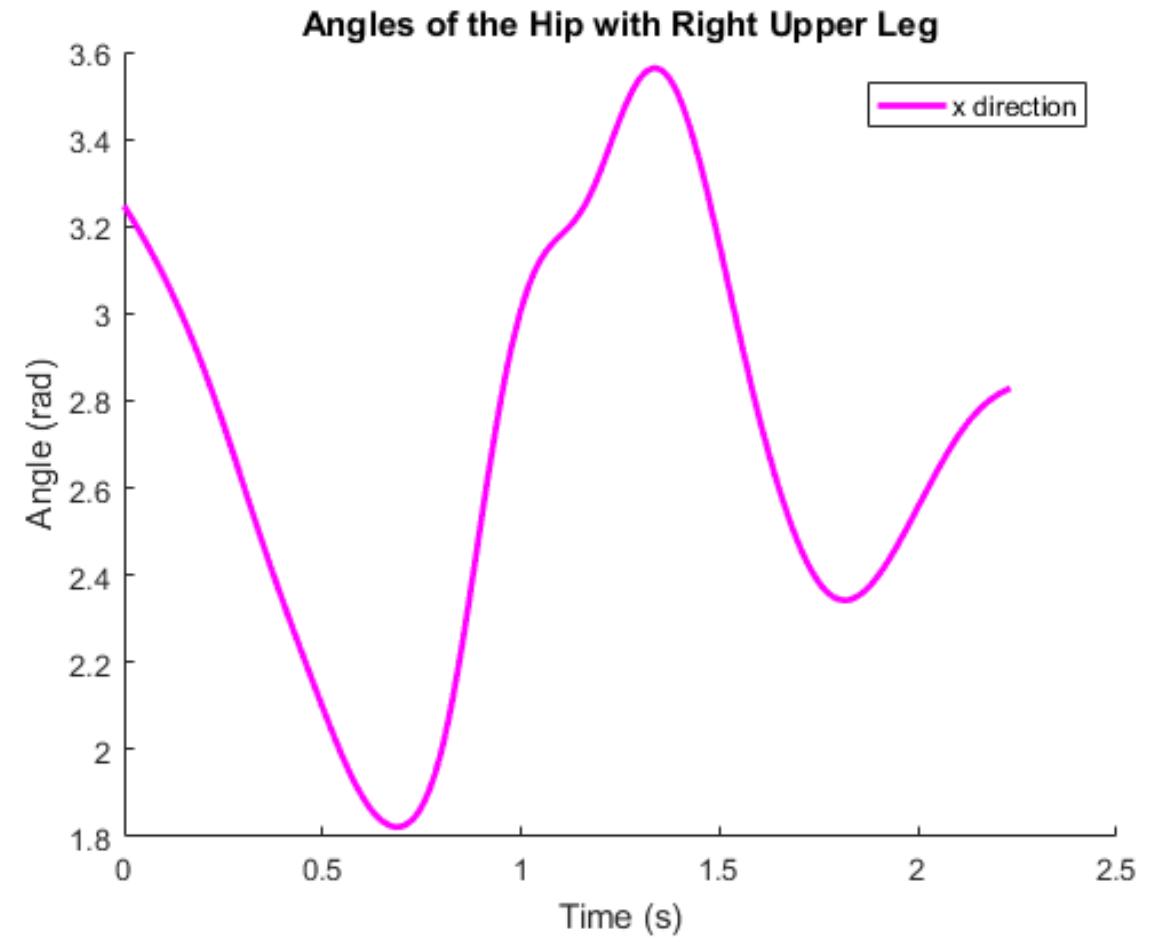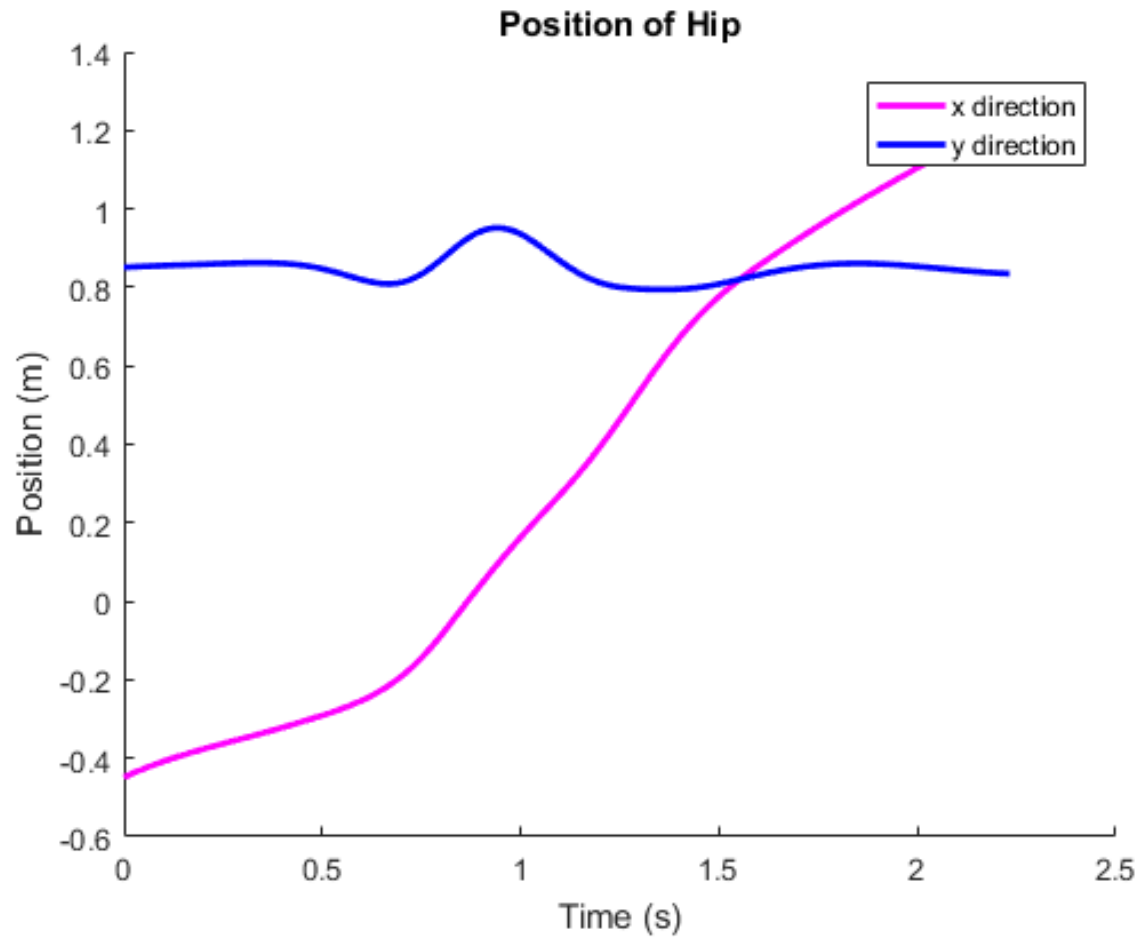
Gait –Heel
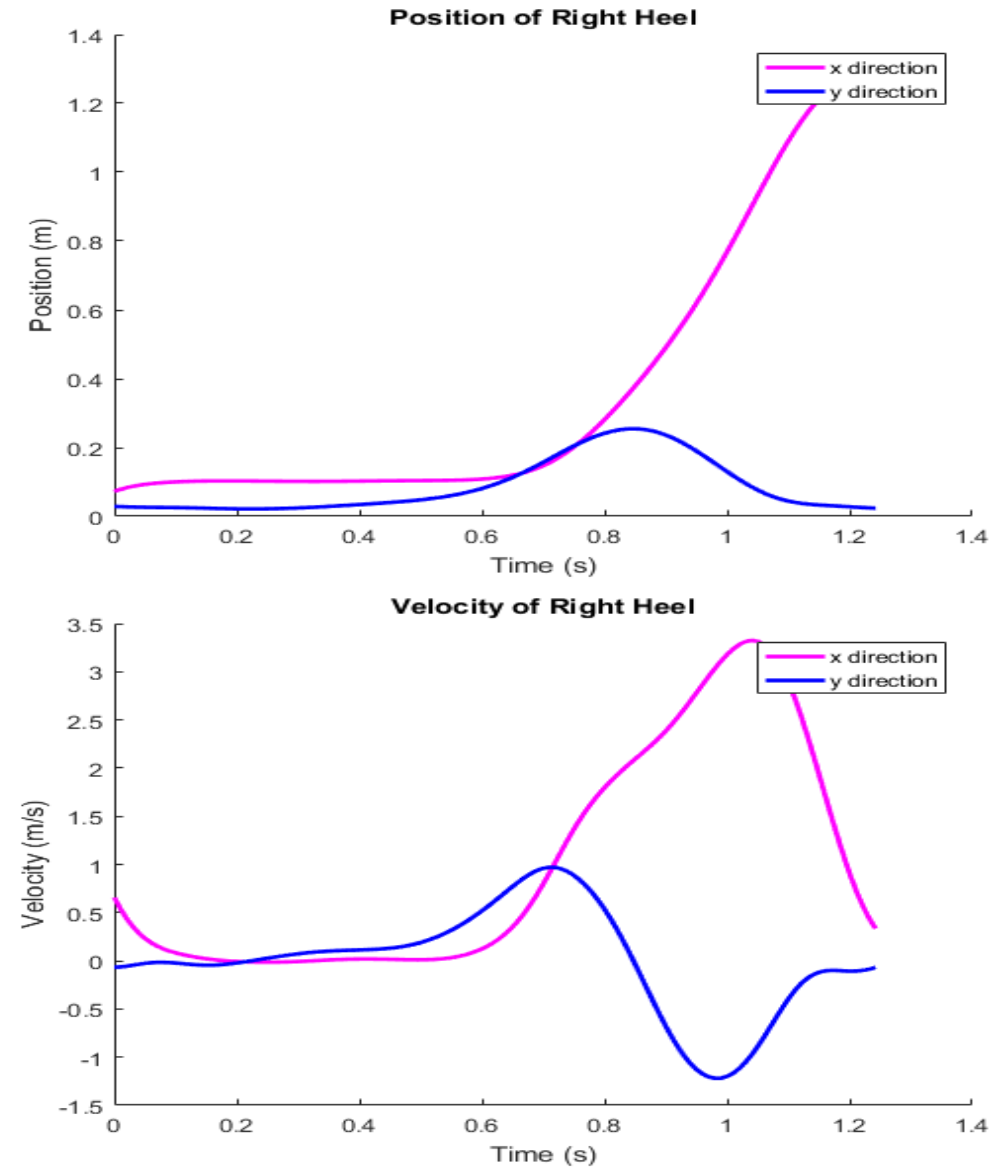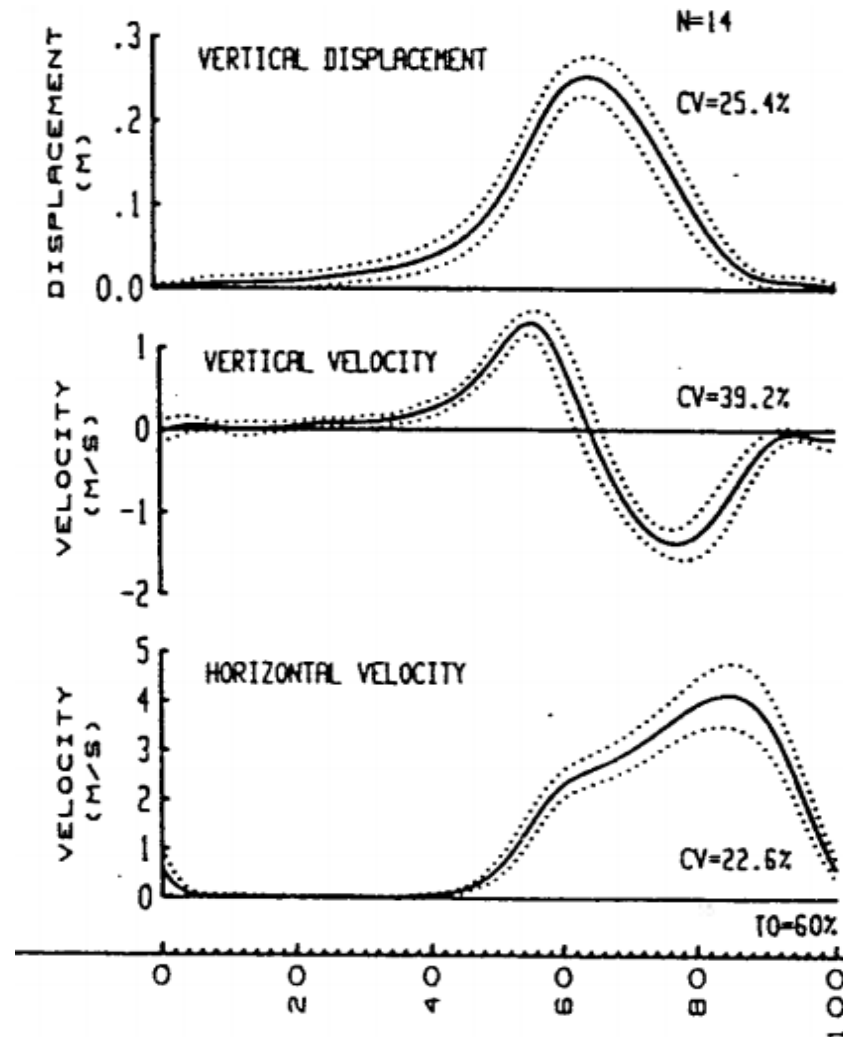
Gait –Heel acceleration
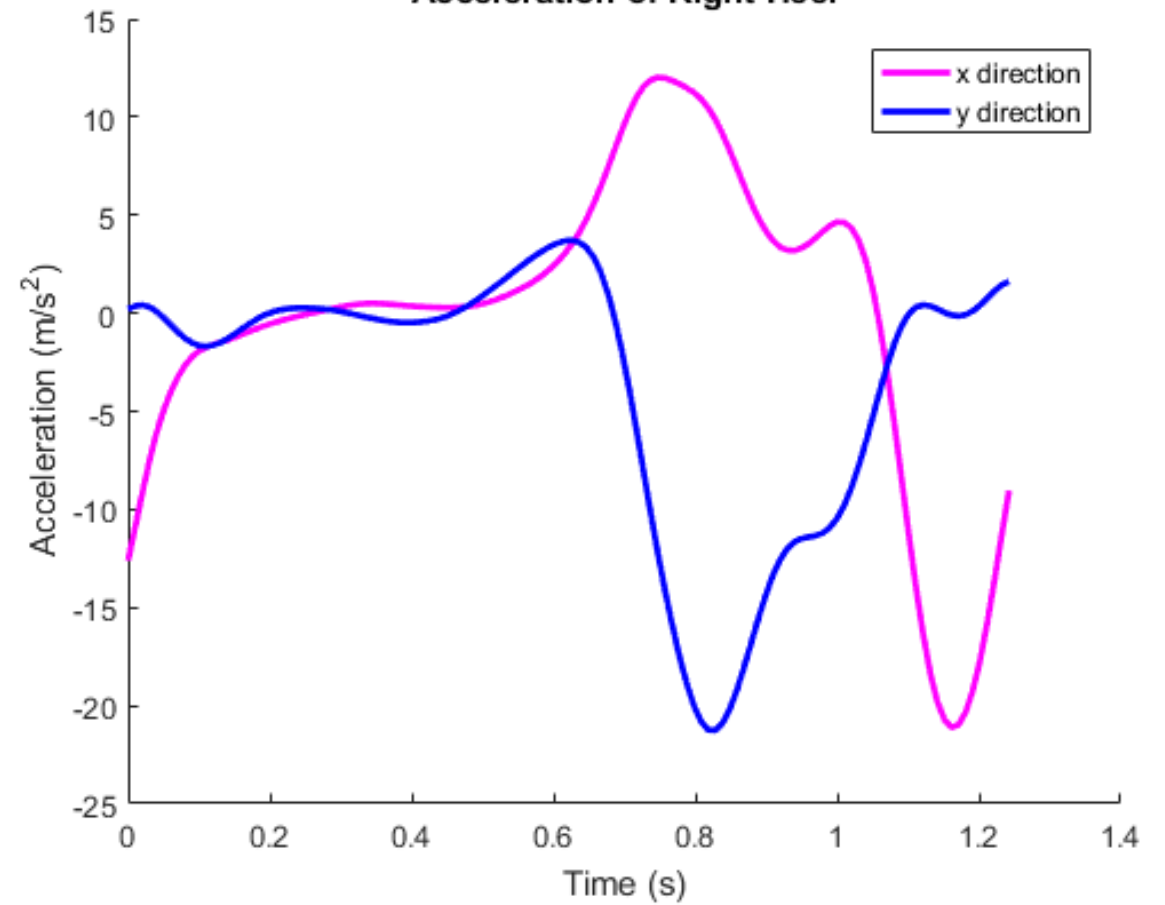
Gait – Hip and Right Toes angles
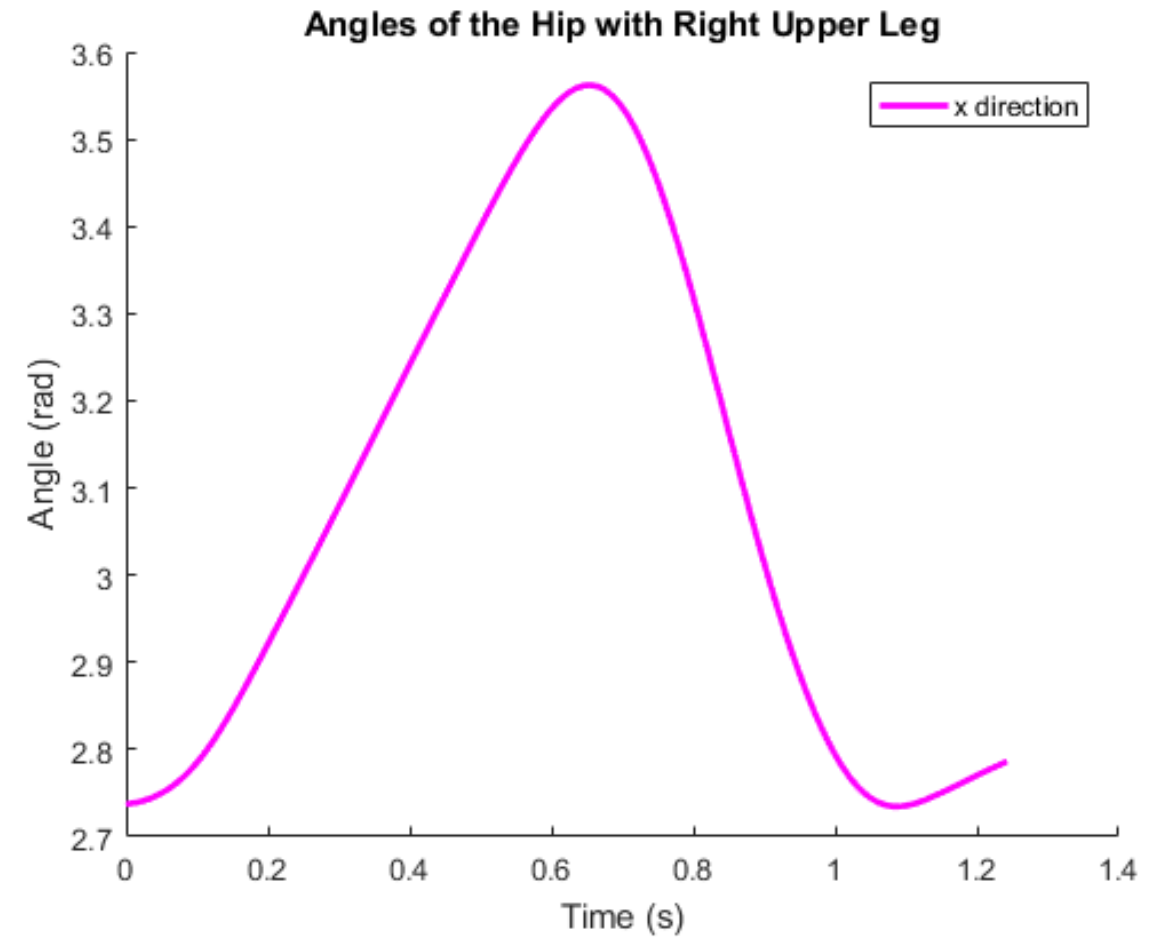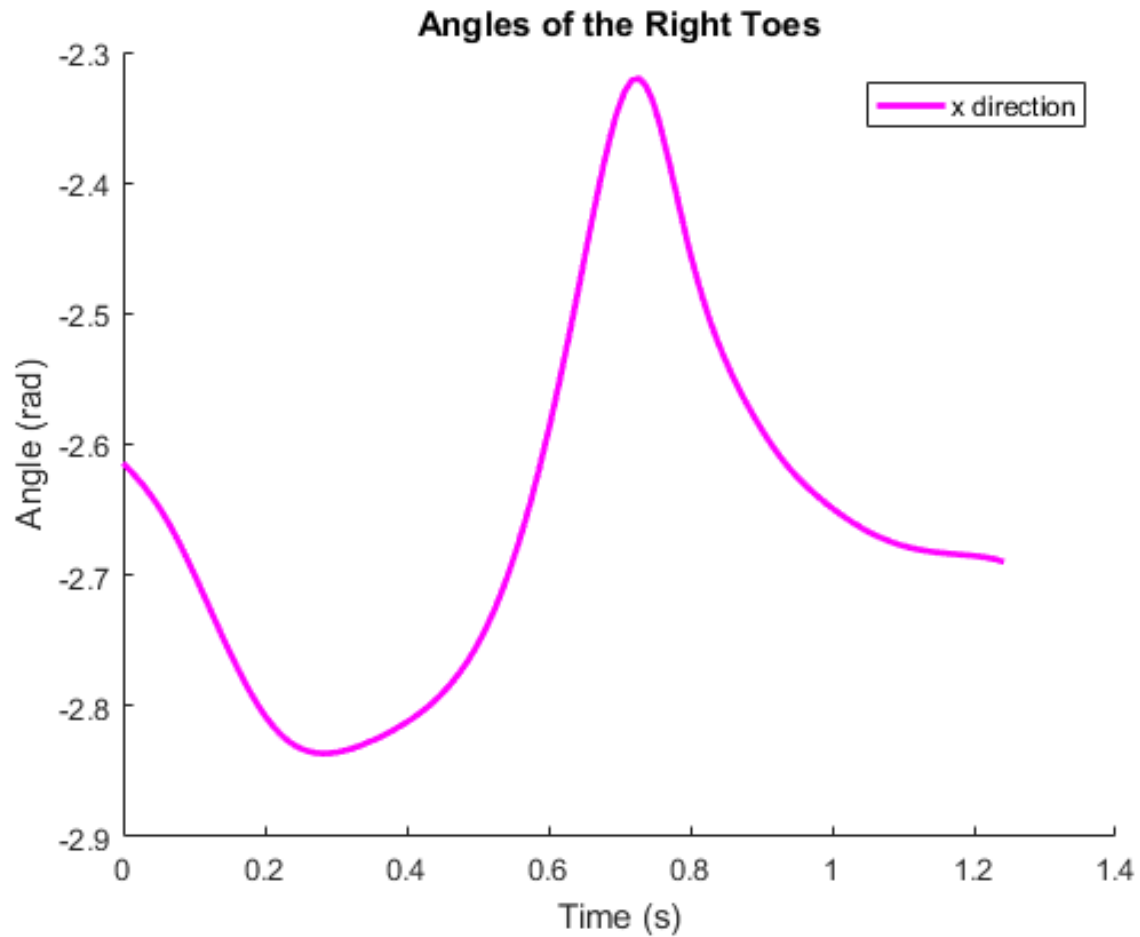
Results - Jump

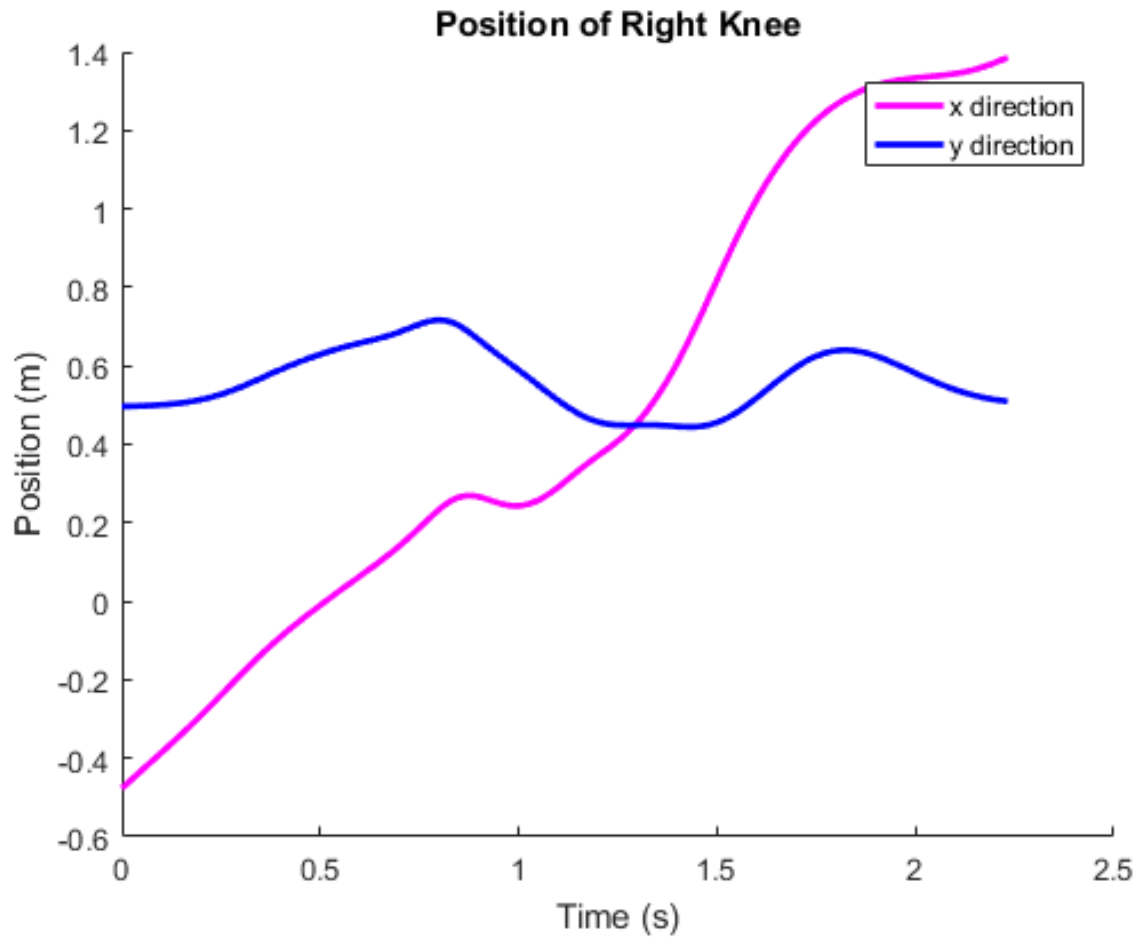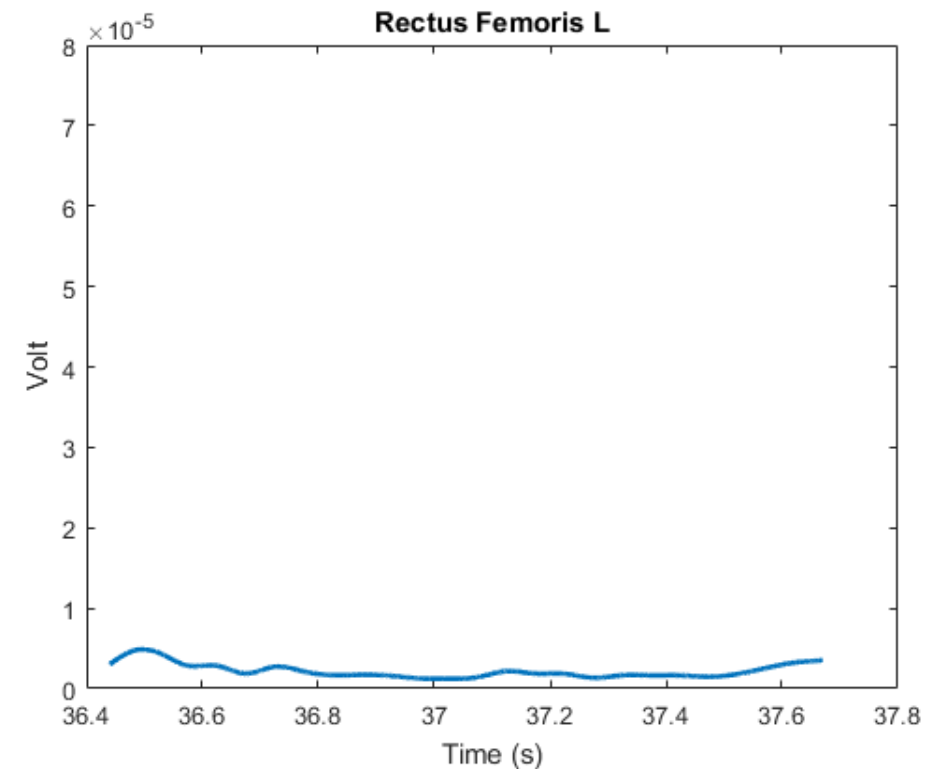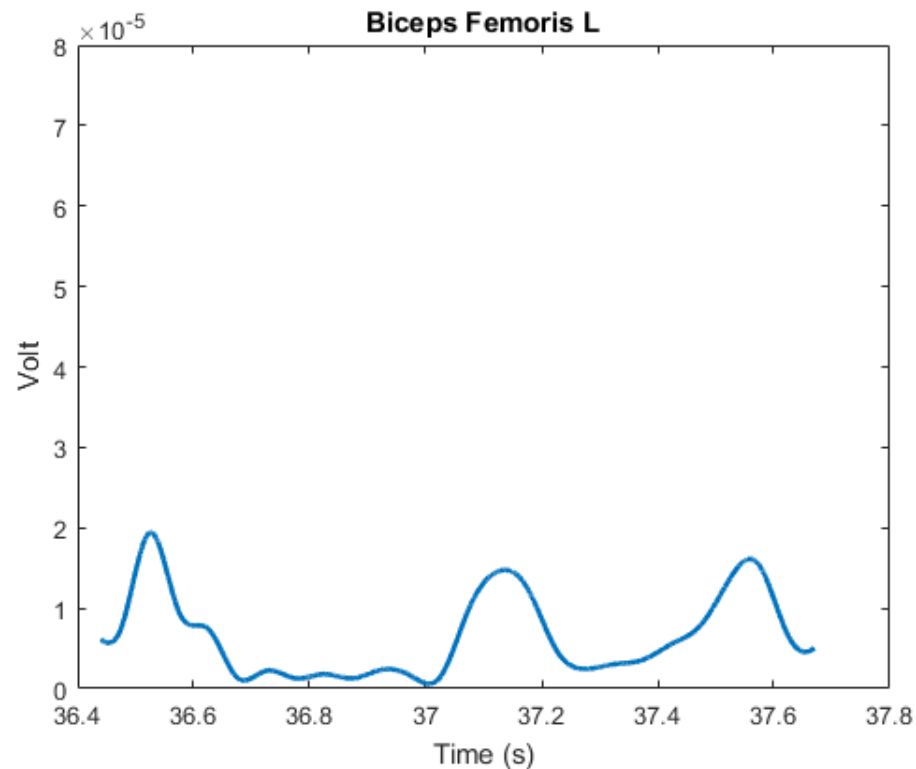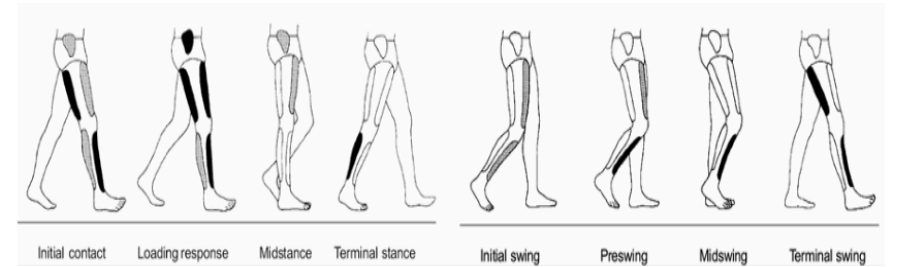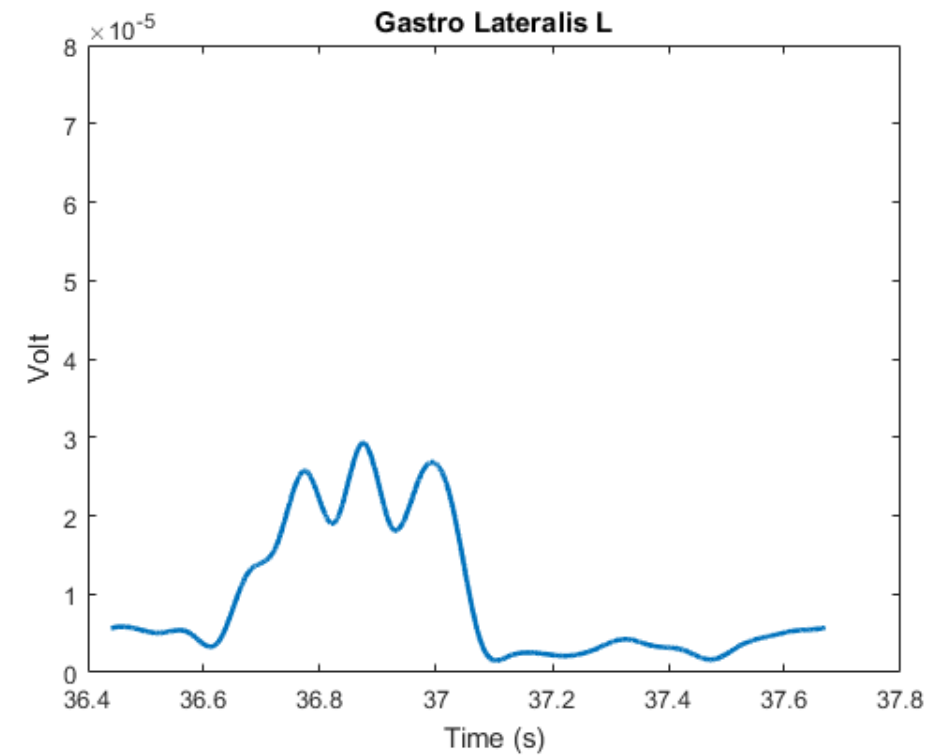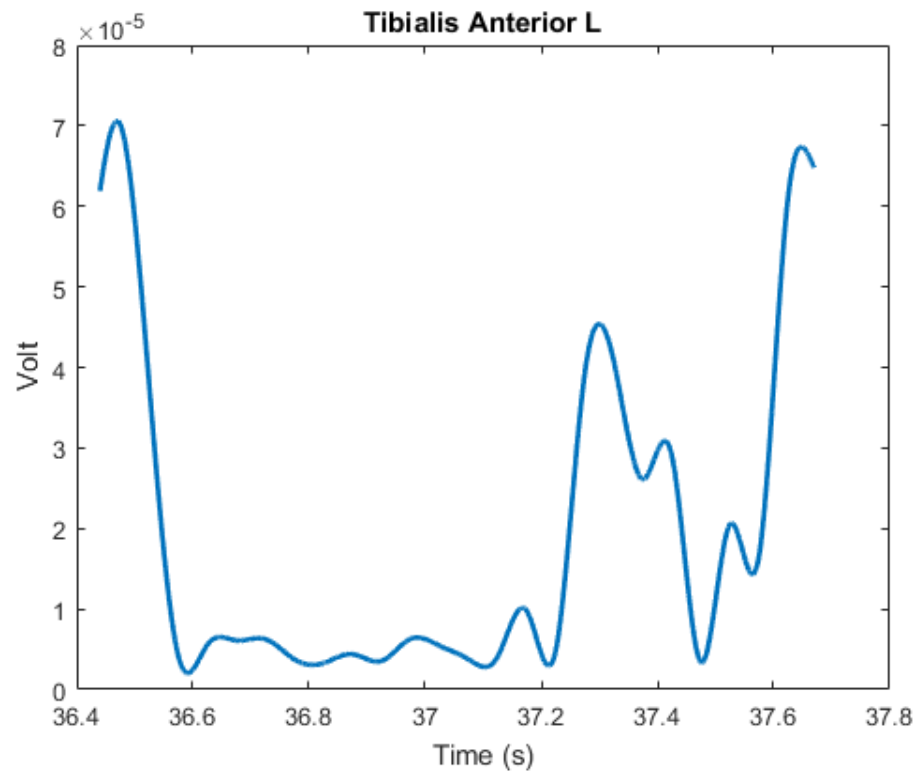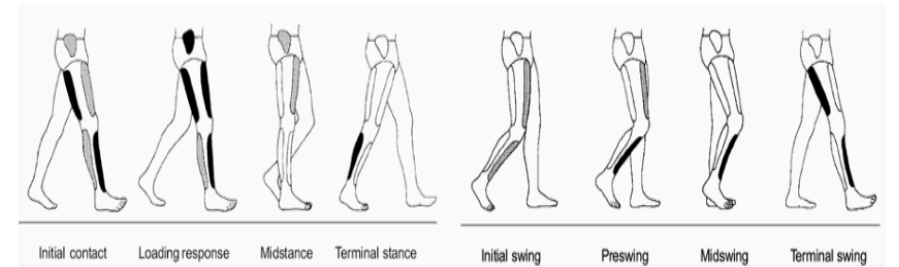# Jump – Angle and Position of the Hip

Jump – Angle and Position of the Knee
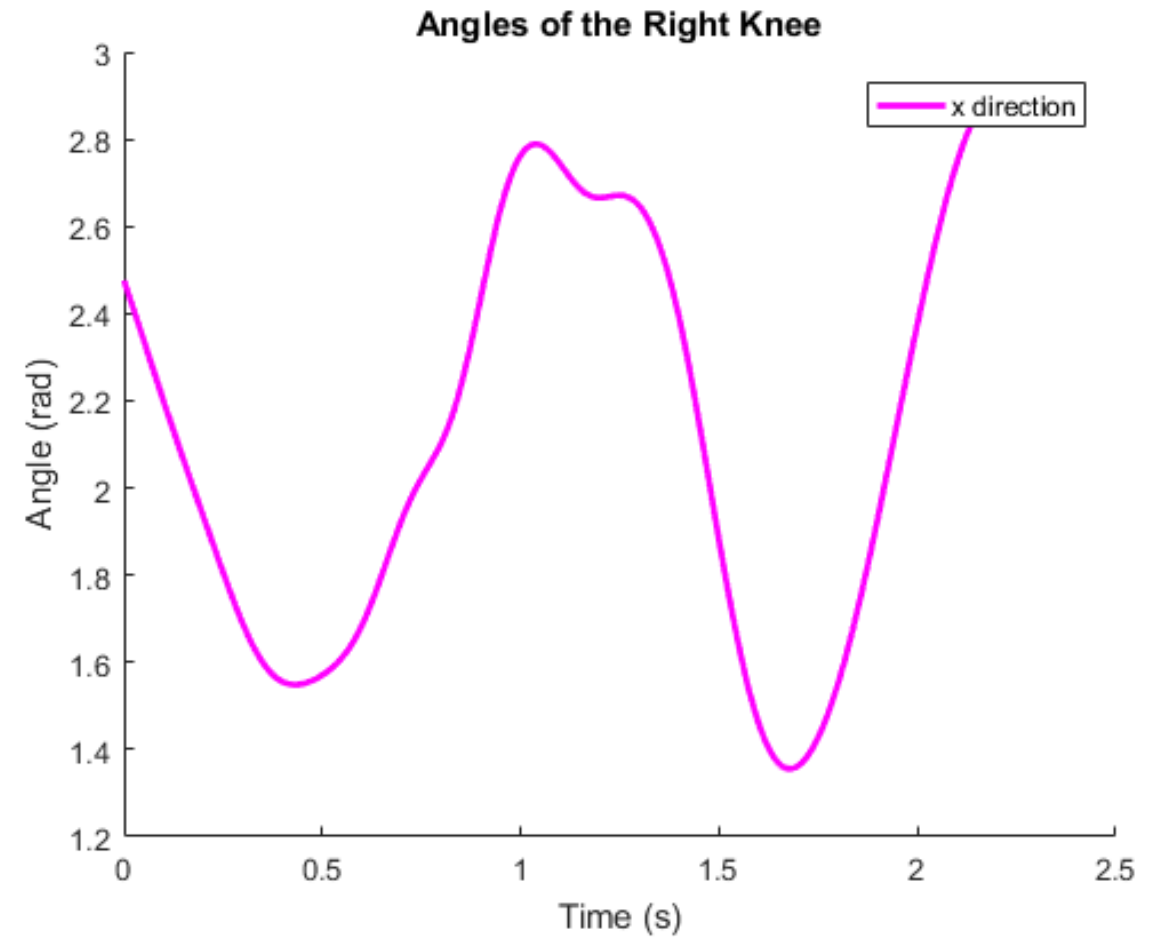
Results - EMG

Results - EMG

Conclusions

- The results can be considered close to the literature.

- Matlab code is suitable for any movement in the sagittal plane.

- The method for the kinematic analysis is efficient.

References

- Winter. David A. The Biomechanics and Motor Control of Human Gait: Normal, Elderly and Pathological, Second Edition. (1991);

- Silva, Miguel T. Apontamentos da Disciplina de Biomecânica do Movimento. Lisboa, IST, 2004-17;

- Pinto, Susana, A marcha humana em análise. Lisboa, IMM - FM UL, 2007.