

Human Knee Simulation Using CMAC ANN

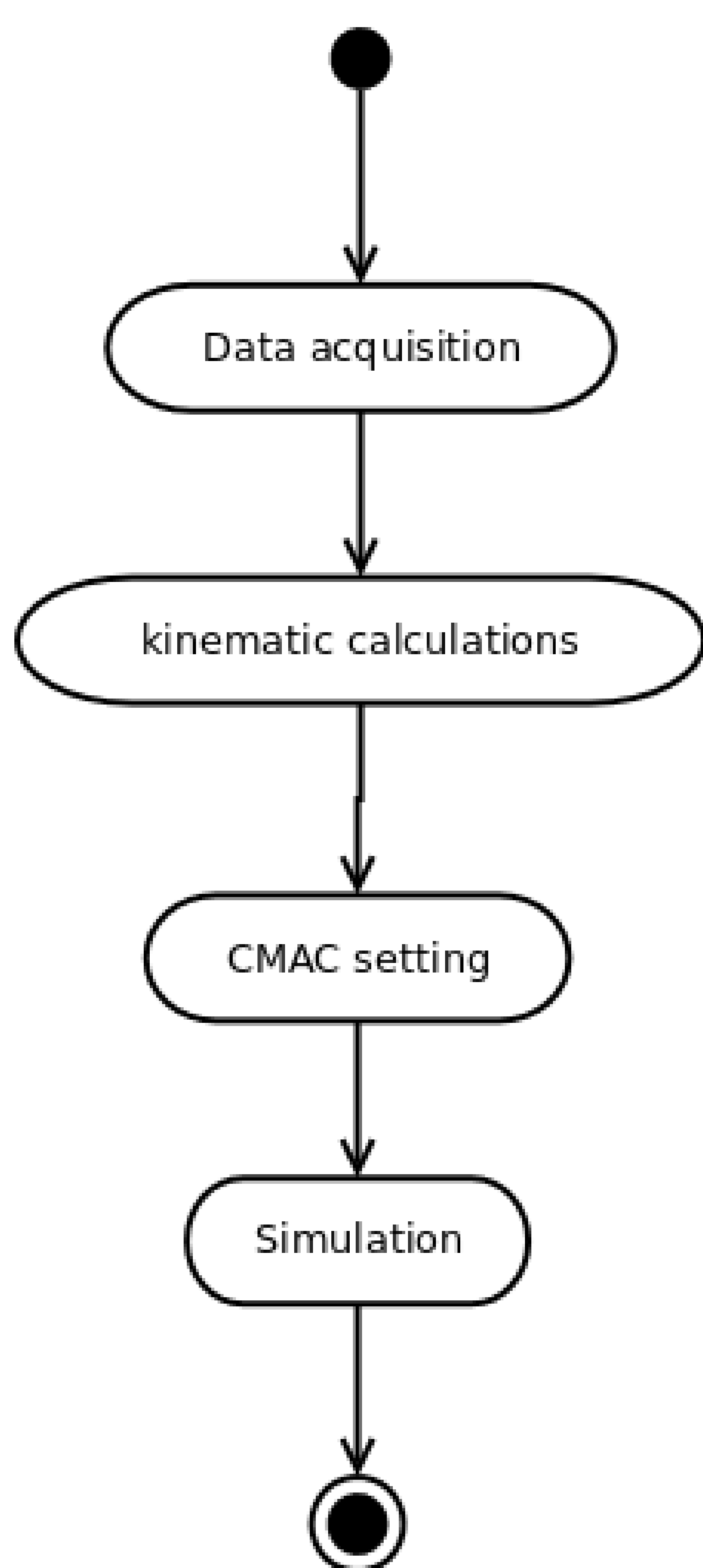
R. A. Lima¹, V. R. F. S. Paz^{1,2}, J. P. Martins¹ and L. M. Brasil¹

¹University of Brasília-UnB at Gama-FGA, Brasília, Brazil, ²University of Brasília-UnB at Ceilândia-FCE, Brasília, Brazil

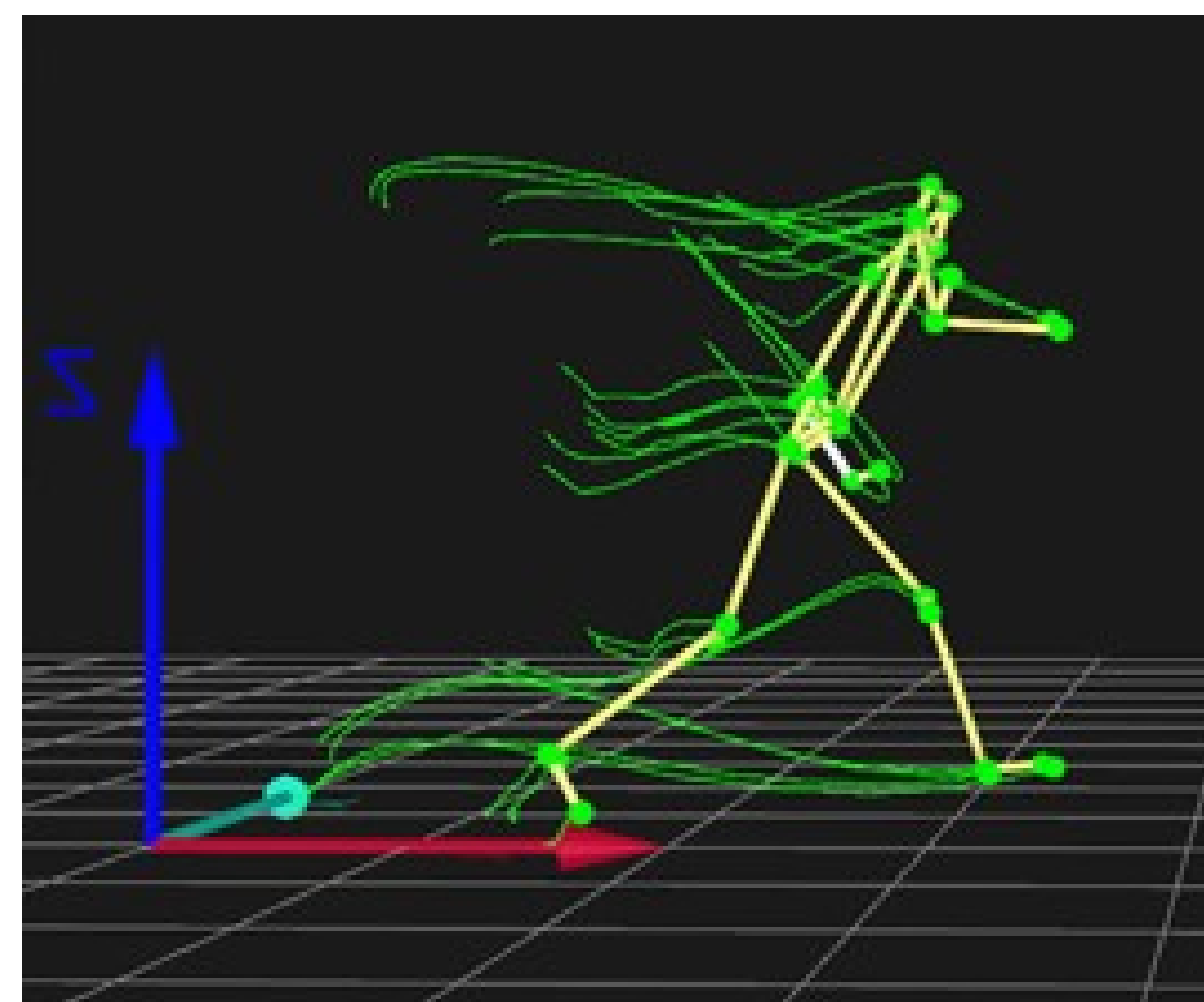
ABSTRACT

This paper aims to show the use of a CMAC (Cerebellar Model Articulation Control), a kind of ANN (Artificial Neural Network), to simulate human knee signals. The CMAC is based on cerebellum of mammals, but despite this characteristic, actually what promotes its use, is its very fast operation, which contributes to turn it suitable for adaptive control in real time. This type of control is needed, for example, to control an active transfemoral prosthesis. Simulation of knee angular velocities, based on collected data from the contralateral knee, is presented. The simulation is available as open source software.

METHODOLOGY



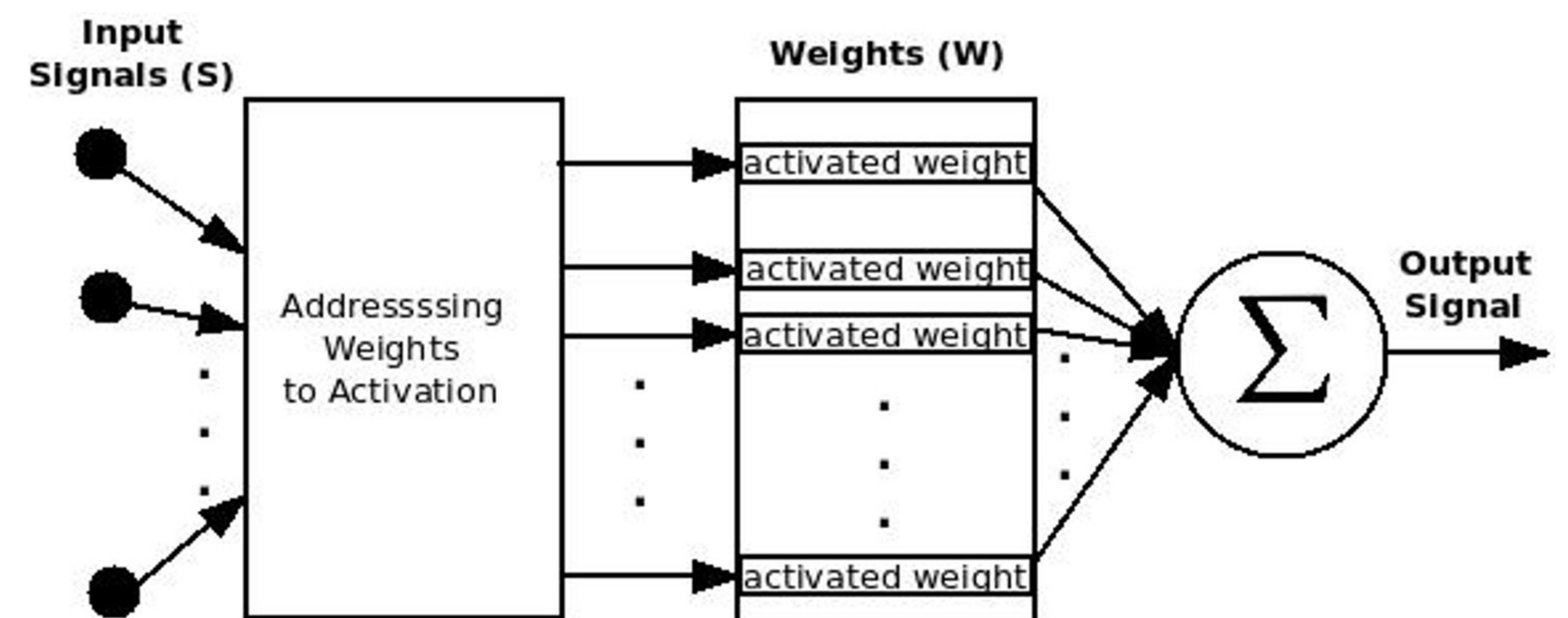
Knee simulation process



Data acquisition using motion capture

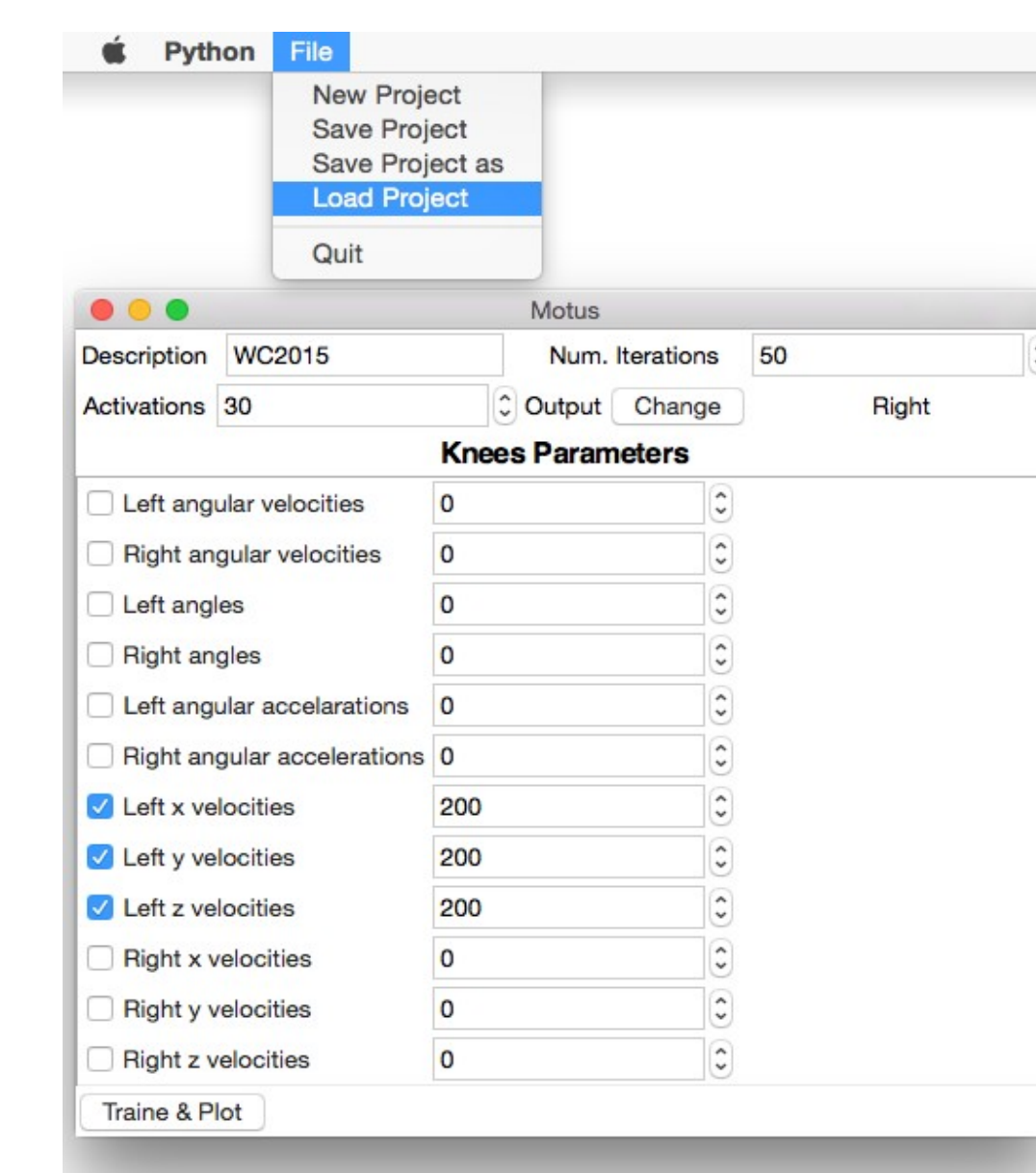


Software developed using python technology



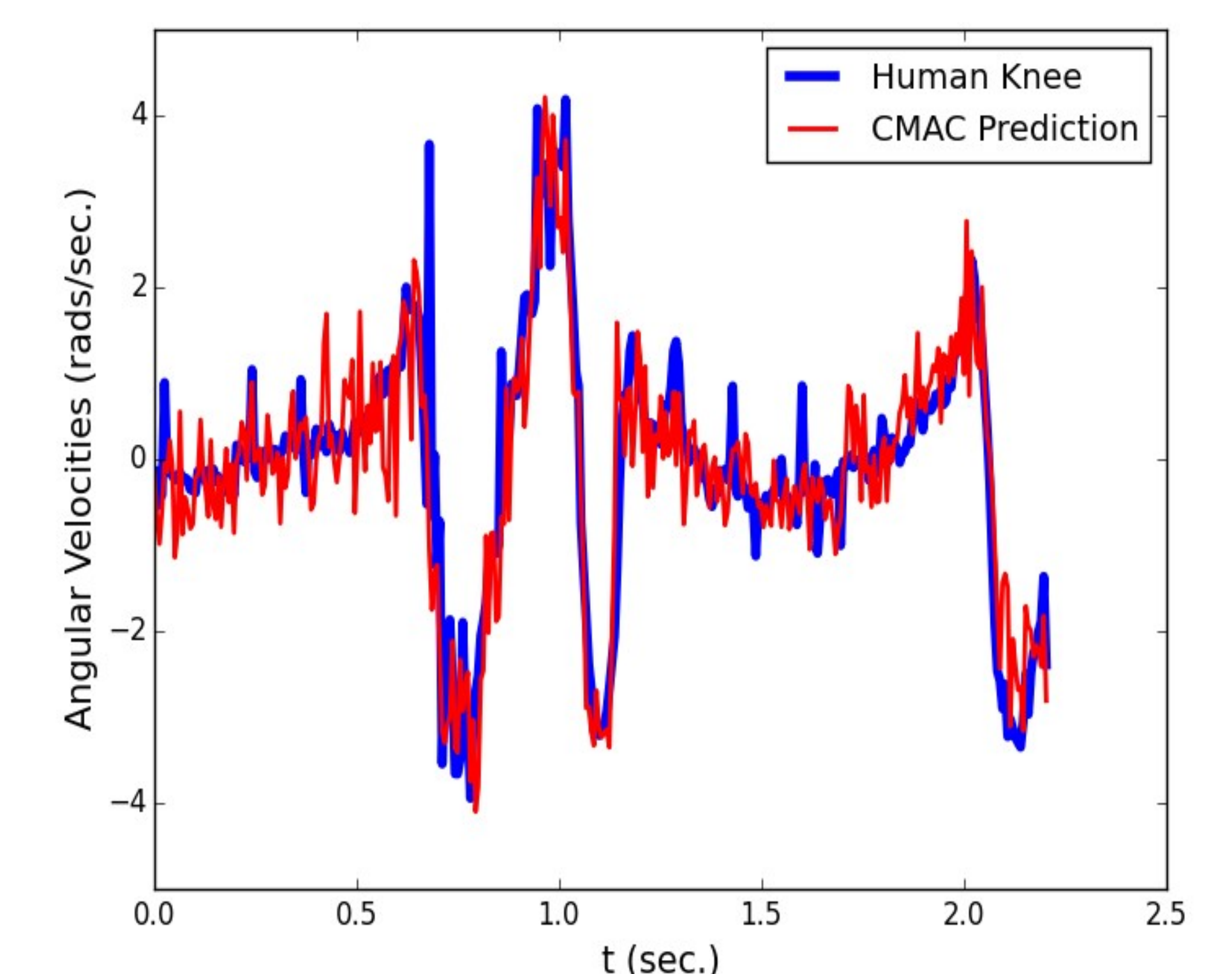
CMAC schematics

RESULTS



Motus – Software for knee simulation

An example of simulation. The signal represents knee angular velocities. The input signals for this simulation are contralateral knee velocities.



SPONSORS



Postgraduate Program in Biomedical Engineering – UnB

Human performance laboratory - University of Brasilia at Ceilândia

Project website:
<http://github.com/rob-nn/motus>