# Optimal control without self-collision:
# Generation of forward twisting pike somersaults

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S2M Simulation et Modélisation du Mouvement
Mitacs
OWN THE PODIUM | À NOUS LE PODIUM
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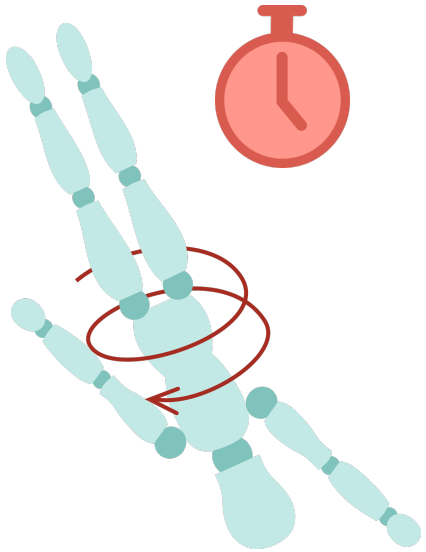
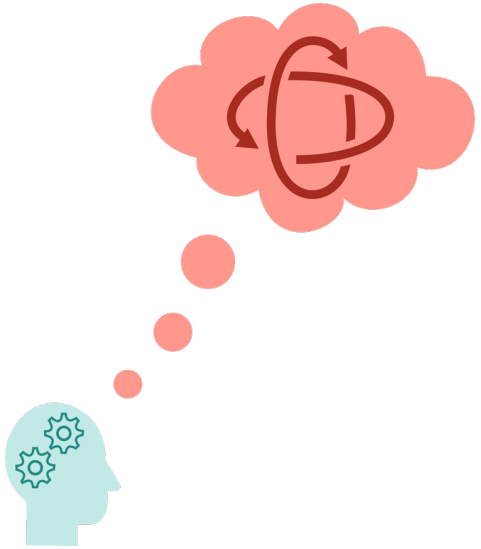
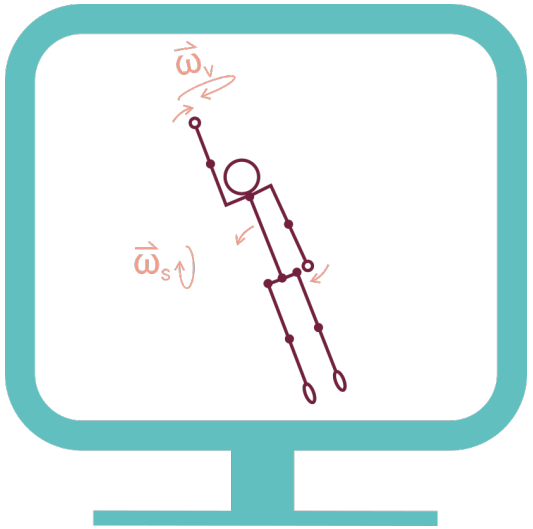


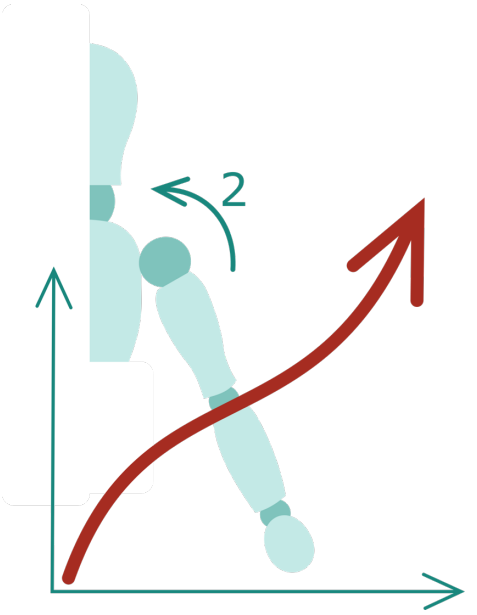
Need to twist fast



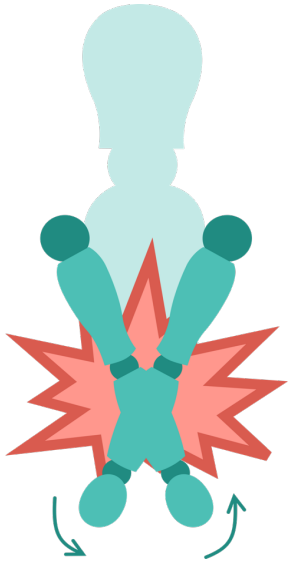
Complex biomechanics




Computer simulation




2 degrees of freedom



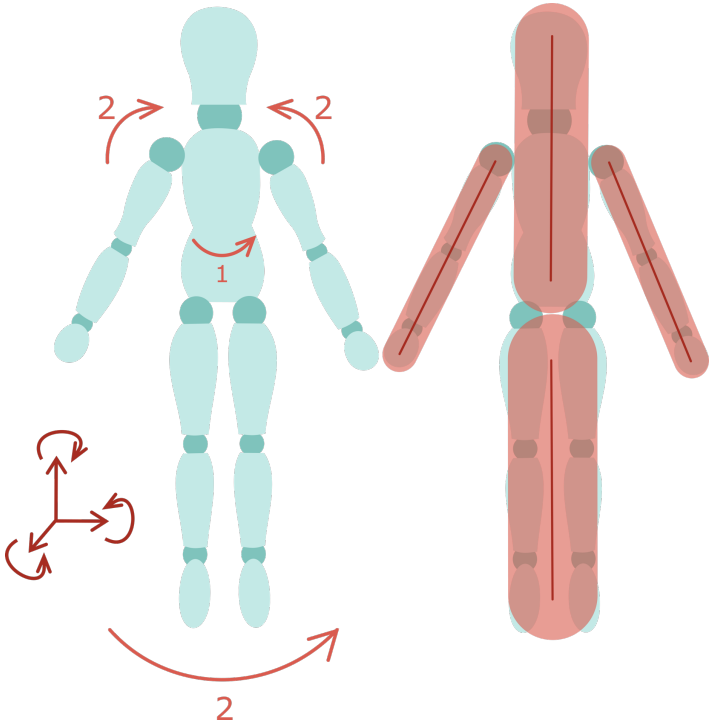
Segments collision

# Methods

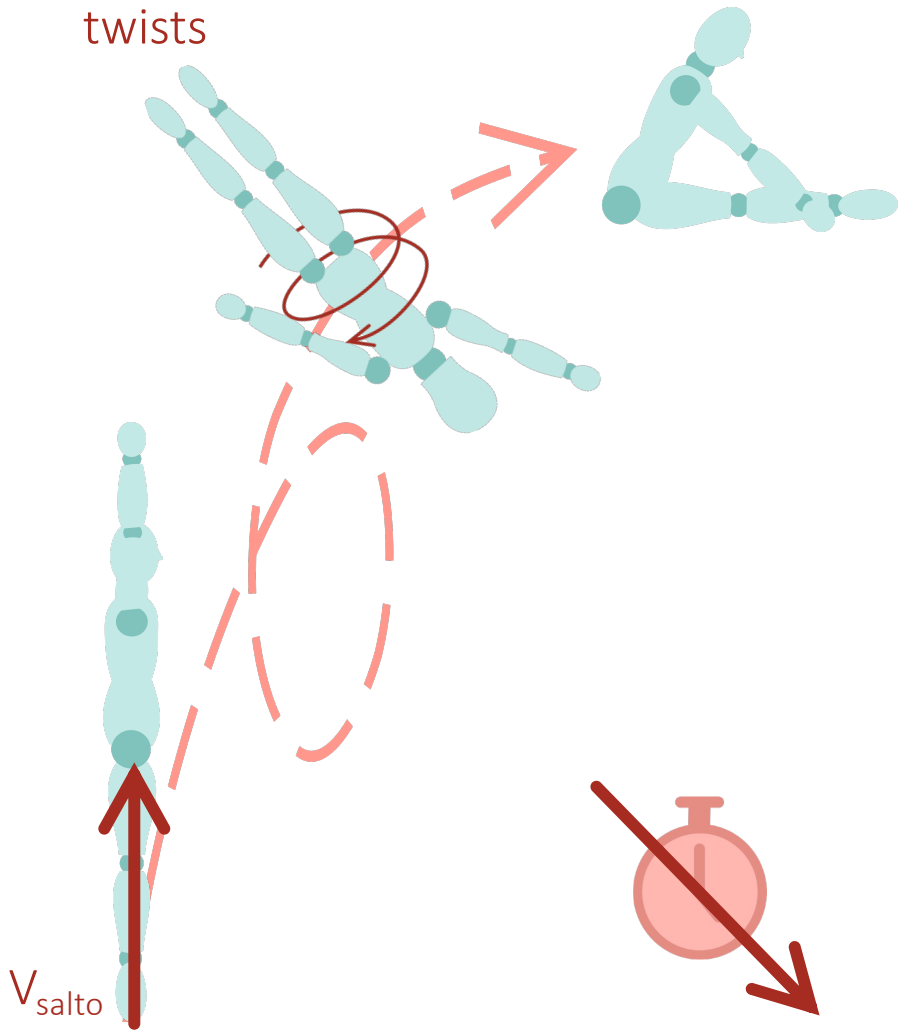
Unconstrained

Solution

Non-collision constrained




1, 2 or 3 twists



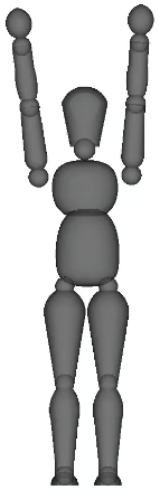

Optimization method

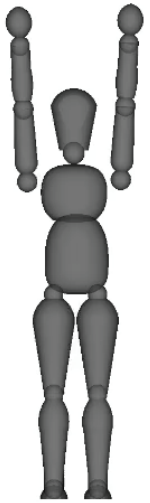
Model

Optimal control problem

Yeadon's model : Yeadon, M. R. (1990). The simulation of aerial movement—II. A mathematical inertia model of the human body. *Journal of biomechanics*, *23*(1), 67-74.

# Results





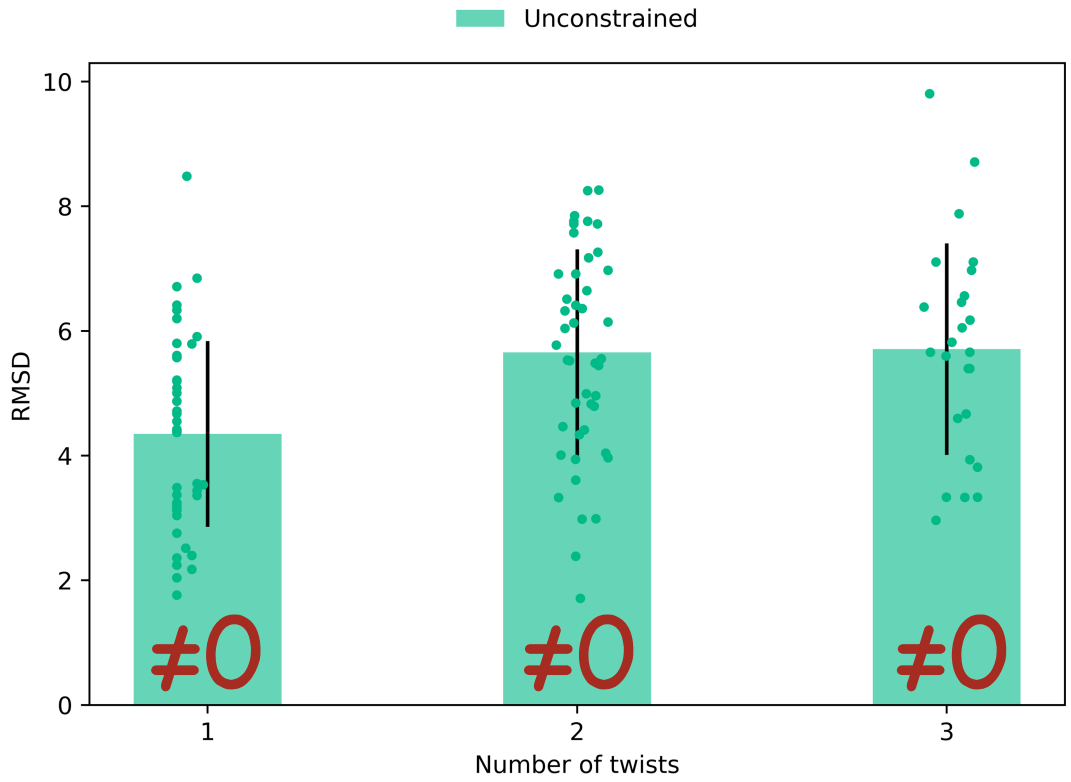
2 twists

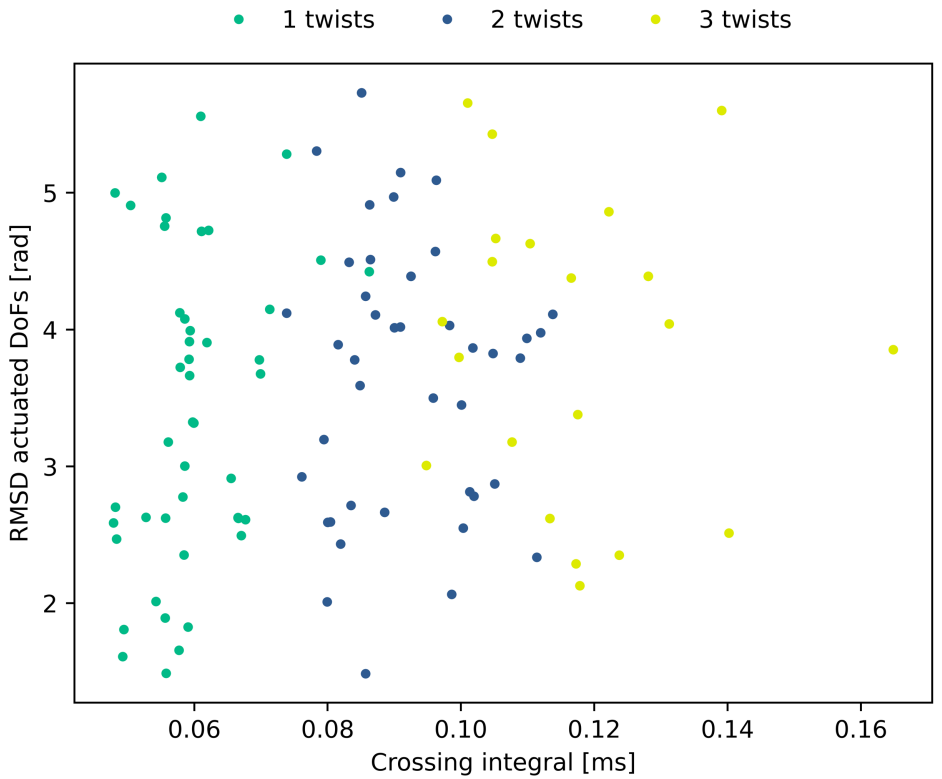
3 twists

- Circular motion of the hips
- 3D arm movements
- Wait in straight position arms above the head

Results

# Did the non-collision constraint change the twisting strategies?



Results

# Did it affect the performance of the optimal solutions?