



Physics-Based Models for People Tracking: Interactions and Contact Dynamics

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Inferring Contact

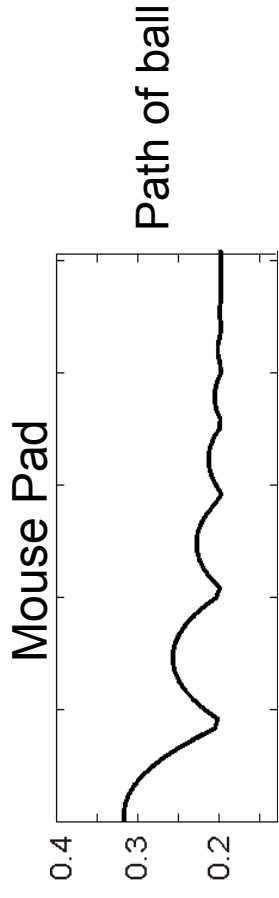
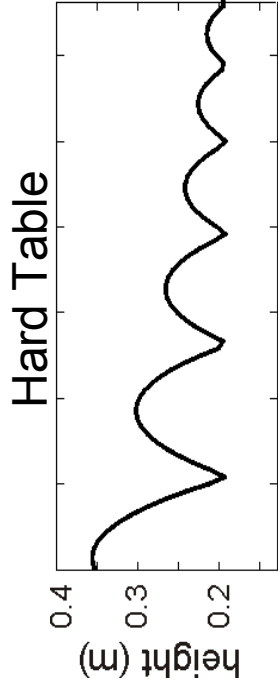


Hard Table

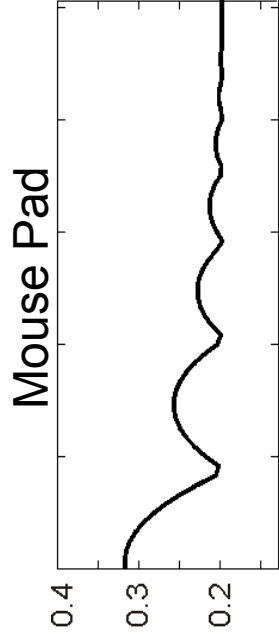
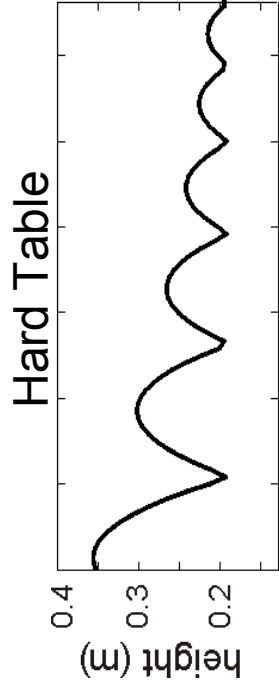


Mouse Pad

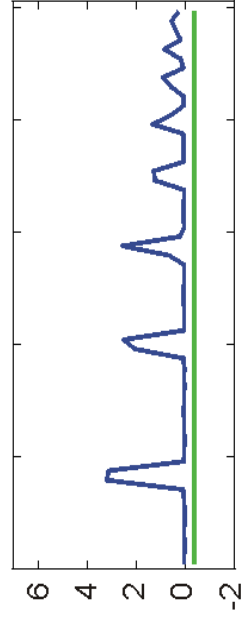
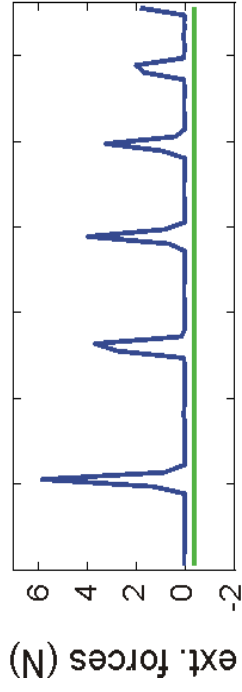
Inferring Contact



Inferring Contact

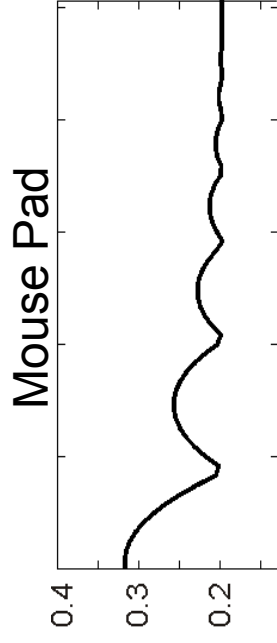
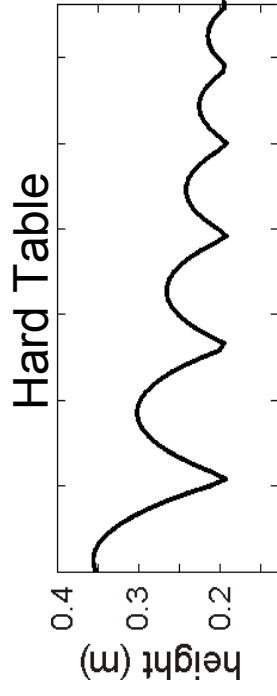


Path of ball

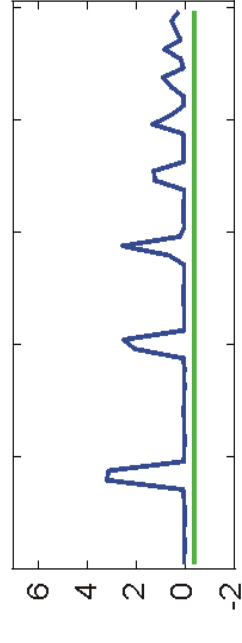
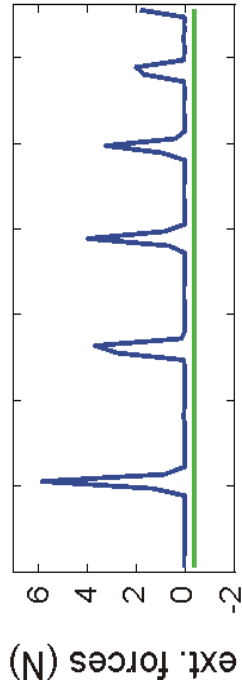


Contact force
Gravity

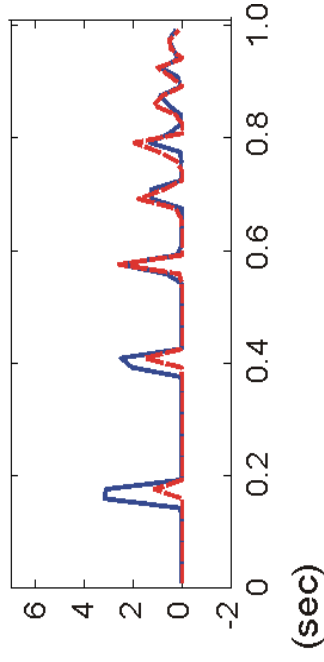
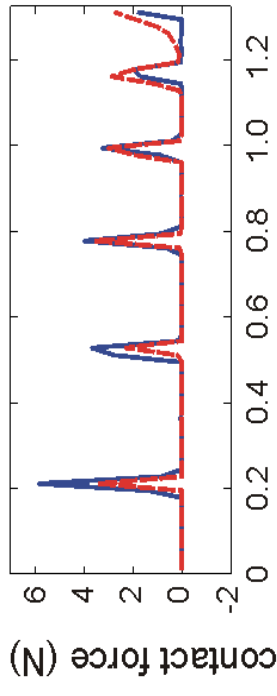
Inferring Contact



Path of ball



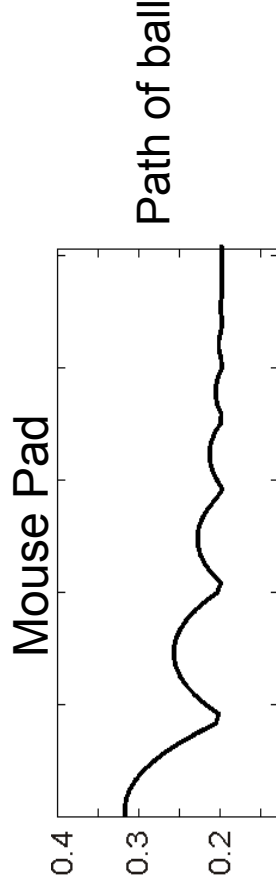
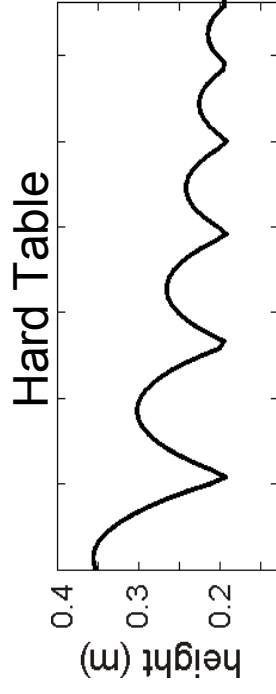
Contact force
Gravity



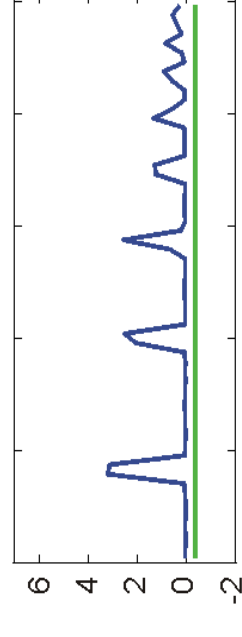
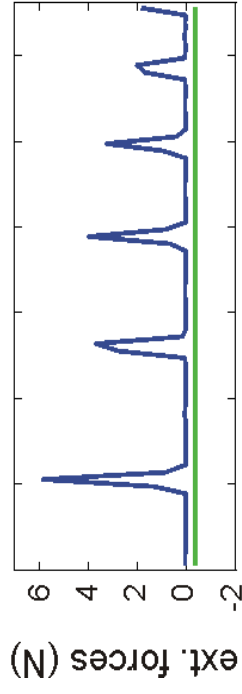
Contact force
Model

time (sec)

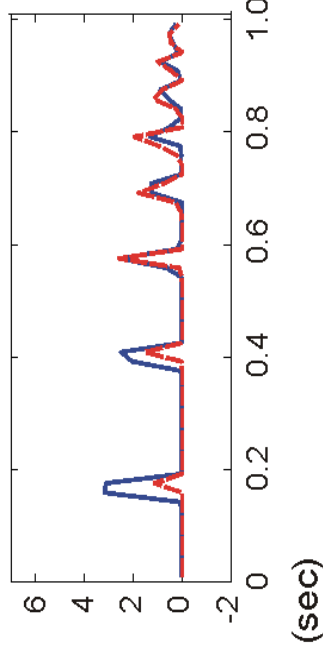
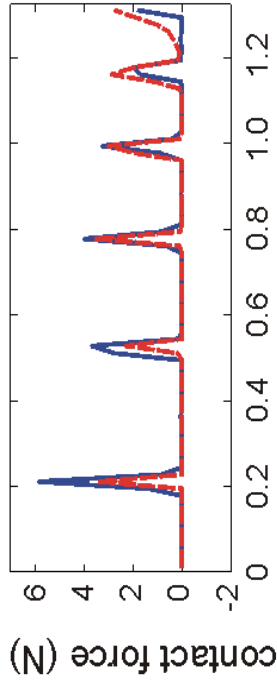
Inferring Contact



Path of ball



Contact force
Gravity



Contact force
Model

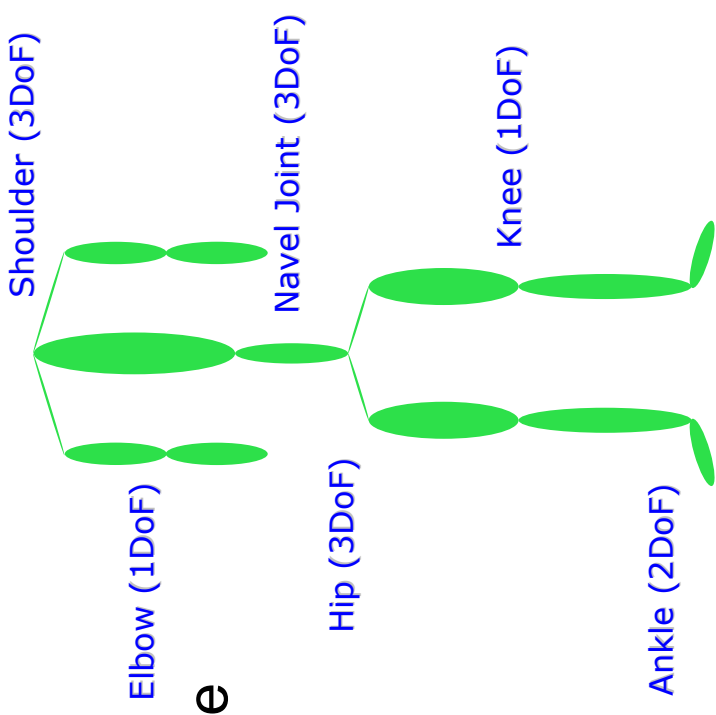
24 N/m surface stiffness
15 N/m

Inferring Contact with People

- People are much more complicated
 - Complex, articulated system
 - Internal and external forces
 - Multiple possible contacts
 - ...
- Principle is essentially the same
 - Use physics to relate forces with state and its derivatives
 - Explain external forces with contact

Articulated Motion

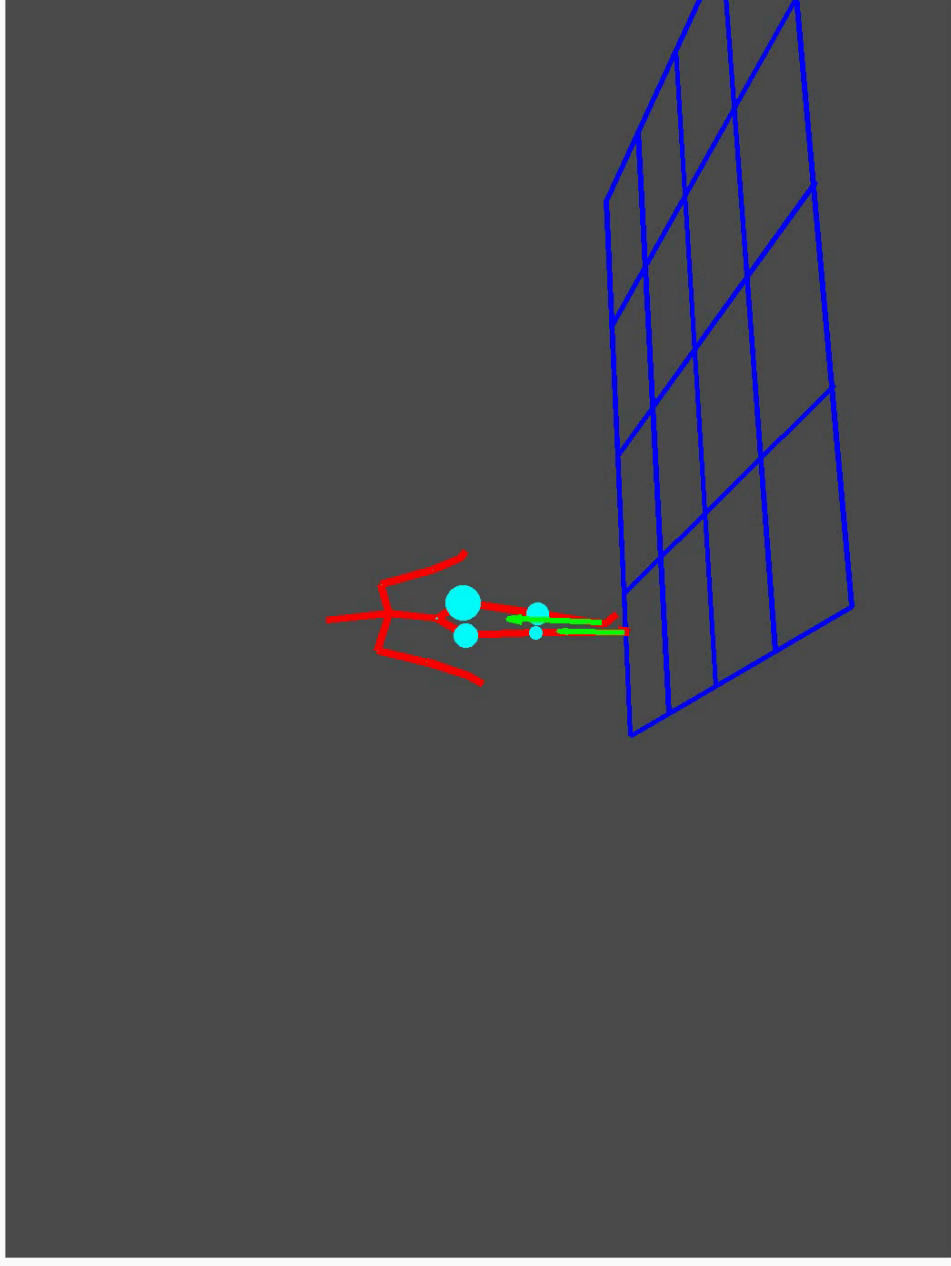
- Pose specified with generalized coordinates \mathbf{q}
- Joint angles and root position and orientation
- 12 rigid parts connected with 23 pose DoF plus 6 root DoF



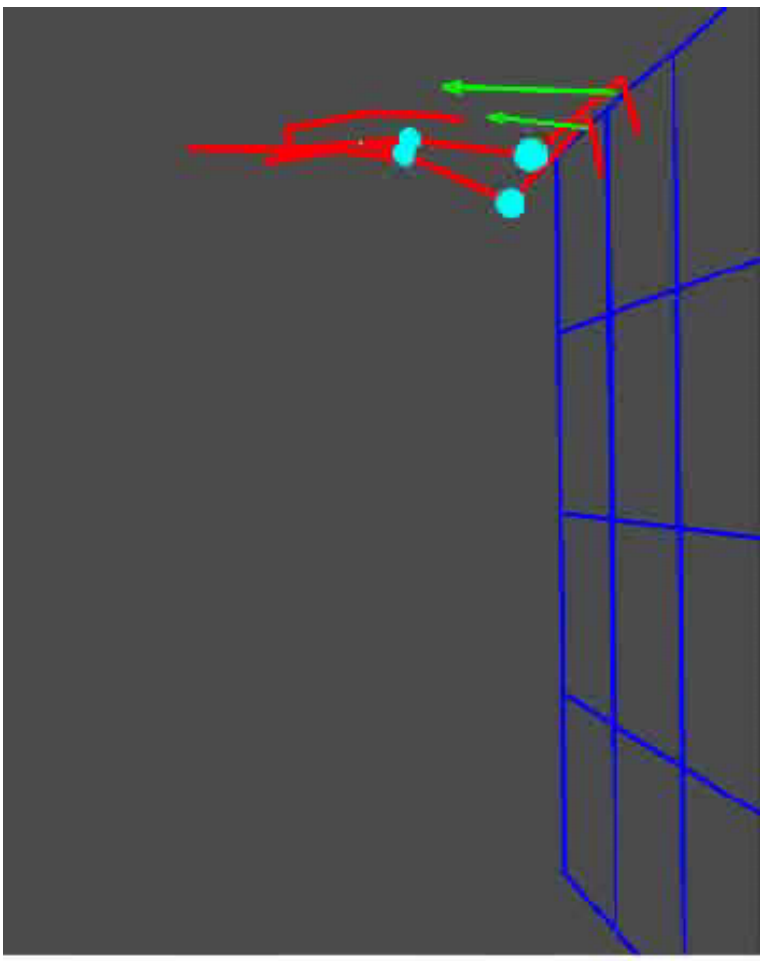
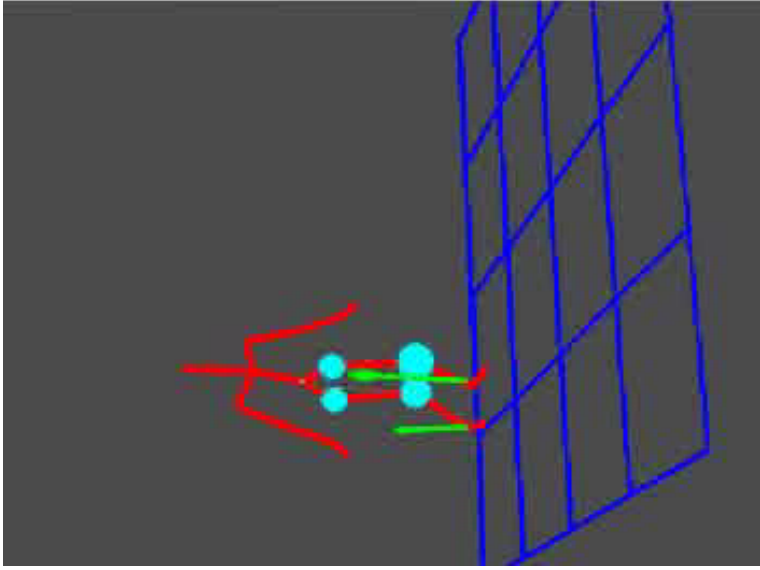
Overview of Procedure

1. Acquire a sequence of poses, either from mocap or tracking
2. Compute time derivatives
3. Estimate contact parameters

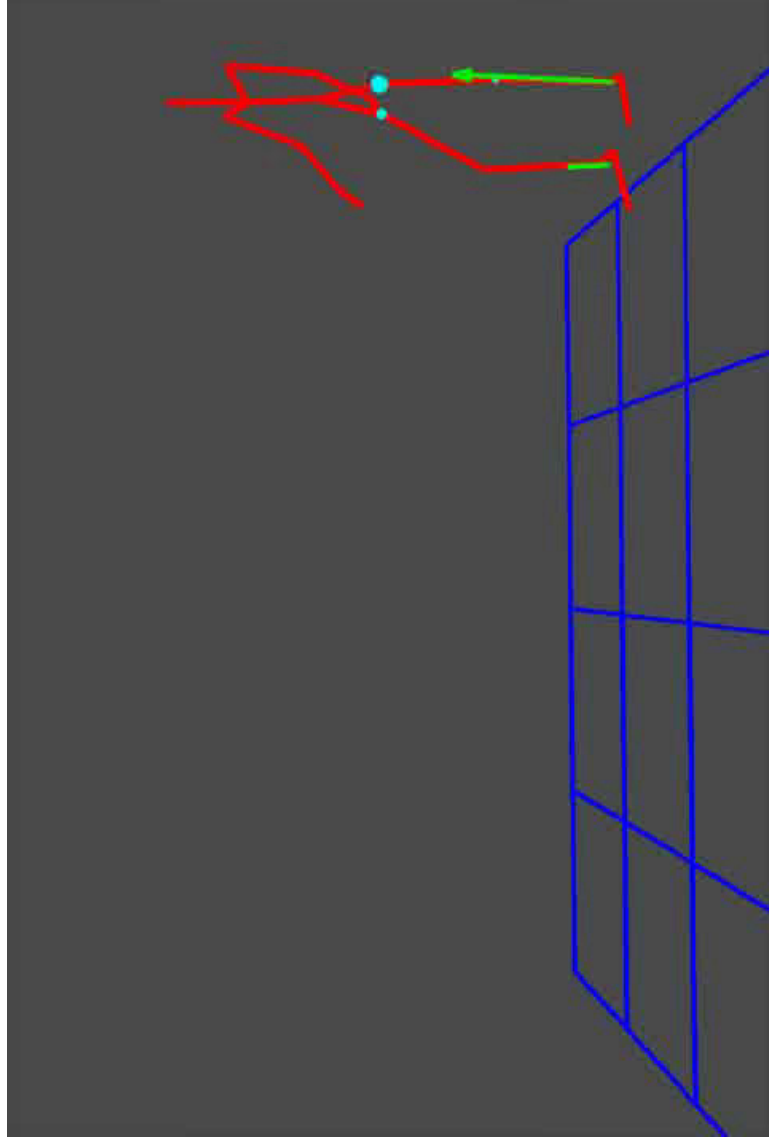
Results from MoCap data



Results from MoCap data



Results from MoCap data



Results on tracking

- Performed binocular tracking using Annealed Particle Filter
- Likelihood based on background subtraction and 2D patch tracks using WSL

Comparison with mocap

