LIRIS

Contrôle physique de mouvement de personnages virtuels en environnement complexe

Laboratoire d'InfoRmatique en Image et Systèmes d'information

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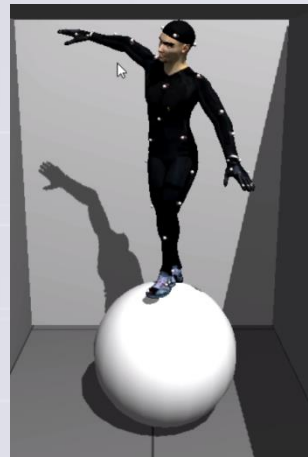*Supervisors: Pronost Nicolas, Bouakaz Saida*

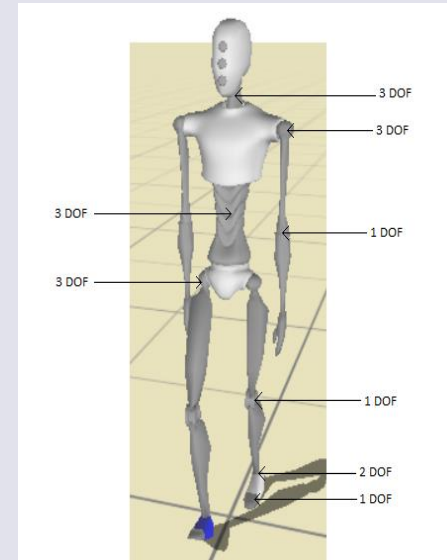cnrs   INSA   UCB Lyon 1   UNIVERSITÉ LUMIÈRE LYON 2   ÉCOLE CENTRALE LYON

Context

Example of kinematic based animation

Example of human model

Character keeping it's balance on a sphere
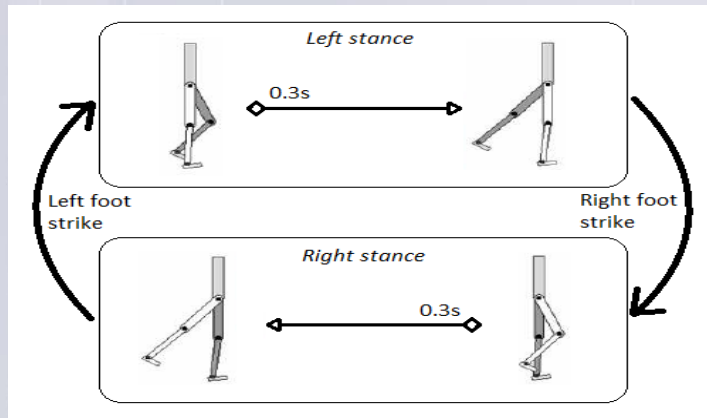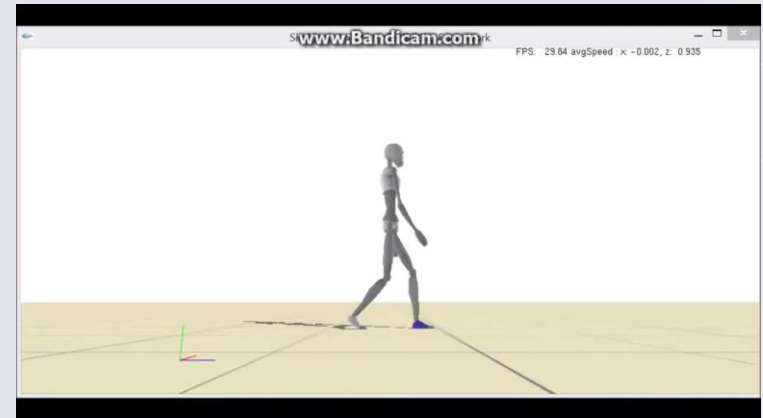
Physics-based controller

- **Two types of actuators on the character**
  - Torques on the joints
  - Forces on the body parts

- **Need to update the torques values at every time step ➔ impossible to do it manually**

- **A controller**
  - Take high level parameters as inputs (e.g. desired speed, reference poses)
  - Generate the torques at every joints to move the character

SIMBICON framework

● SIMple Biped CONtroller [Yin2007]

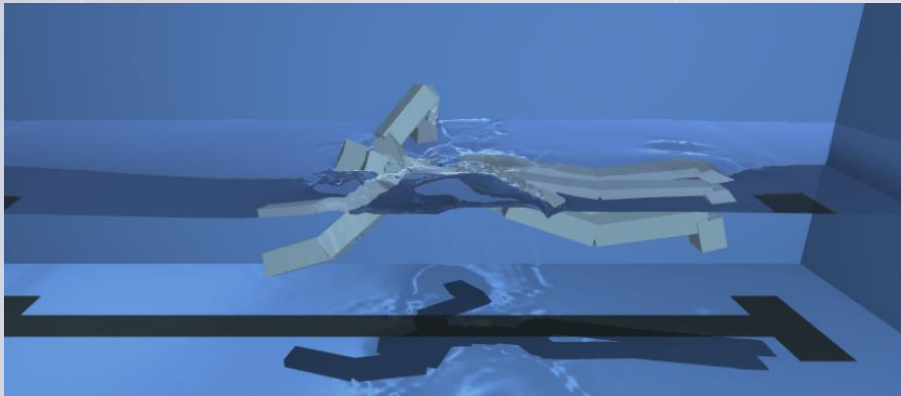Finite state machine for forward walk [Yin2007]

Example of walk motion controller based on SIMBICON

● Proportional Derivative (PD)- controller

$$\tau = k_p(\theta_d - \theta) + k_v(\dot{\theta}_d - \dot{\theta})$$

Physics-based controllers in fluids

Human swimming driven by motion capture
[Kwatra2010]

Human walking under constant wind force
[Lentine2011]

- **Navier-Stokes equations [Stam1999], [Si2014]**

Objectives

Controller able to handle various motions in liquid up to the waist, motion with soft support

- Obtain real-time and interactive simulation
- Relatively high level of realism
- Robust to environment variations.
- Easy control and wide specification of motions

Character walking in 50cm of water

Current challenges

- **Locally accurate liquid/ground simulation**

- **Robust simulation while using bigger time steps**

Possible uses

- **Animated Films, games**

- **Conception of better methods for physical therapy**

- **Conception of prosthesis**

Thanks for your attention