

Character Skinning

- Vertex deformation algorithm (linear blend skinning)
 - old, easy, well-known since 80's, hardware acceleration
 - but
 - weights hard to choose, can look awful
 - weights typically sum to one, so not all configurations are available

$$\bar{\mathbf{v}} = \sum_{i=1}^n w_i M_i D_i^{-1} \mathbf{v}_d$$

where w_i are the influence weights, \mathbf{v}_d is the dress-pose location of a particular vertex \mathbf{v} , M_i is the transformation matrix associated with the i th influence, and D_i^{-1} is the inverse of the dress-pose matrix associated with the i th influence. Taken together, $D_i^{-1} \mathbf{v}_d$ represents the location of \mathbf{v}_d in the local coordinate frame of the i th influence.

From Mohr, Tokheim, Gleicher, "Direct Manipulation of interactive character skins"

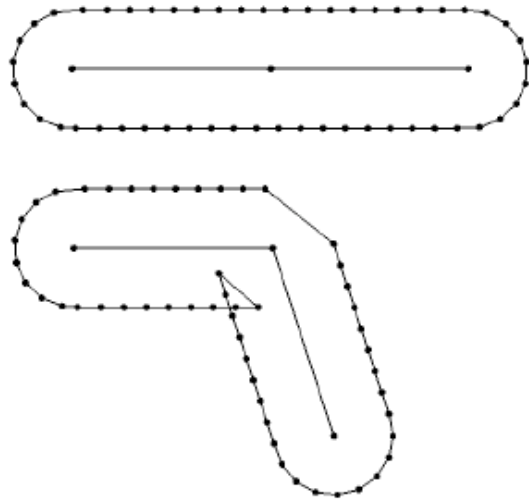


Figure 6. At-rest and articulated contours, unweighted

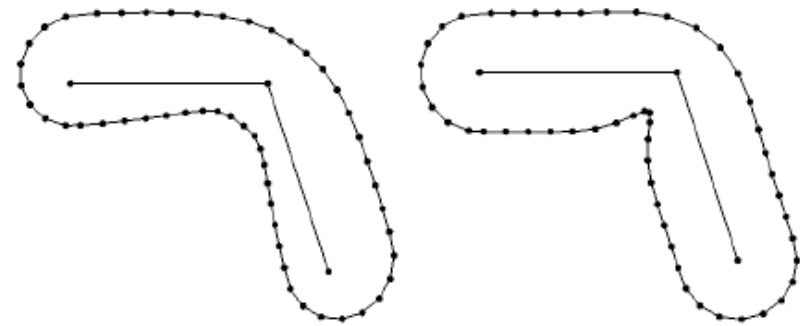


Figure 7. Left: weight based on $1/d^2$, where d is distance from q to limb; right: weight based on the convolution of a limb, measured at q



Figure 2: The 'collapsing elbow' in action, c.f. Figure 1.

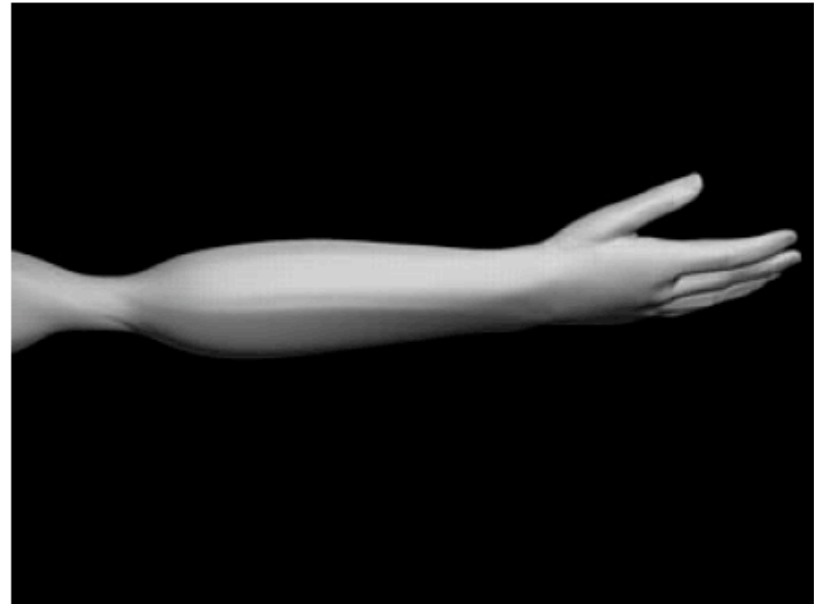
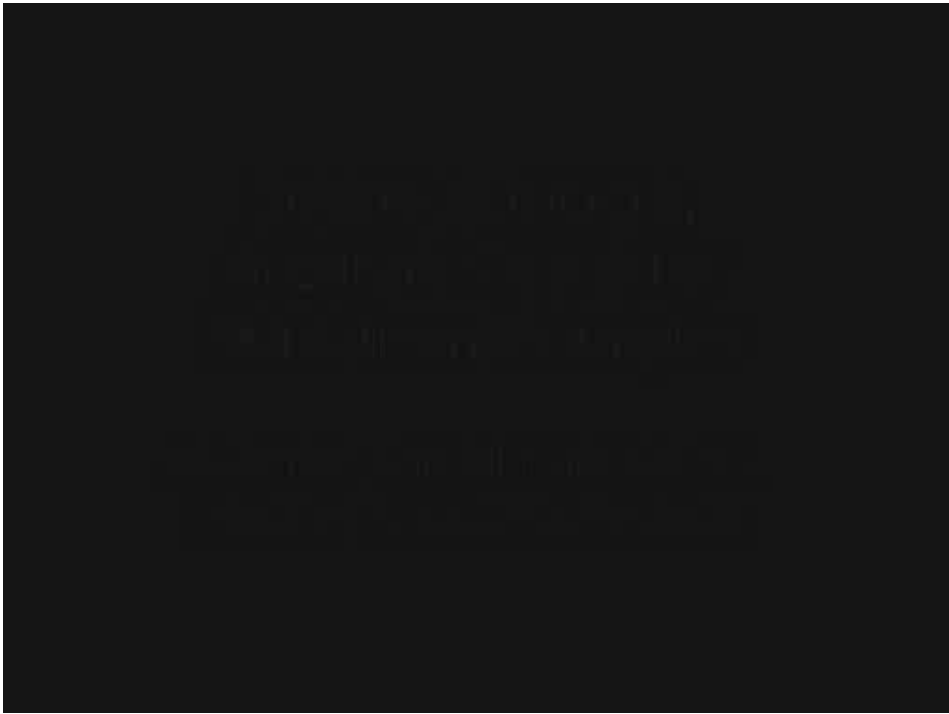


Figure 3: The forearm in the 'twist' pose, as in turning a door handle, computed by SSD. As the twist approaches 180° the arm collapses.

Figures from Lewis, Cordner and Fong, **Pose Space Deformation: A Unified Approach to Shape Interpolation and Skeleton-Driven Deformation**

How to choose weights?

- Paint weights, influences on skin in dress pose
 - fiddle, look, fiddle, look
 - this cycle is mysterious, and hated
- Use direct interface to edit skin positions, determine weights
 - Mohr et al
 - Choice of weights typically massively overconstrained
 - M: edit skin at some pose; solve for weights; look at other poses
 - Desired skin point can lie only in convex hull of influence points
 - M: display in interface, project



Regression

- Applications
 - skinning
 - motion scoring
- Ideas
 - linear regression
 - non-linear regression
 - correlation and regularization
 - fitting
 - scattered data interpolation and radial basis functions
- Dimension, and the curse of dimension
 - Principal components

Pushing People Around

Movie by Okan Arıkan

Q1: Economics of online games

- People trade artifacts for money
 - Economist estimates this as 100M\$ market (?)
 - Questions:
 - how can I, as a player, be confident that expenditure is worthwhile?
 - technology (can this be done for non-networked games?)
 - company, etc.
 - As a game manufacturer, should I support this or not?
 - how can I prevent it?
 - how can I design game so that this is not attractive to players?

Q2: Command hierarchies in networked war games

- Networked strategy/tactics games are common
- But lack command hierarchies
 - and there's not much specialization
 - why?
 - can this be fixed?

Q3: The girls' games movement

- Big movement some 6-7 years ago, several books, companies (Purple moon, Mattell)
 - contention: girls need different types of games than boys
 - success --- Barbie fashion designer
 - nice games, but failed --- Rocket, etc.
 - disappeared
 - Q: did it fail, or was it just incorporated into the mainstream?
 - Q: if it failed, what went wrong?

Q4: Animation standards in computer games

- Q: What is the best current human animation in a game?
 - should handle interactions, collisions, contacts
- Q: What matters for the game experience?
- Q: Will the future bring more realism?
 - if so, how does one control the interactions?

Further ideas in skinning

- The skin might be obtained from range data of a person in various configurations
 - procedure:
 - scan
 - hole fill
 - obtain parametric surface model by least squares