Learning an Intrinsic Garment Space for Interactive Authoring of Garment Animation

Tuanfeng Wang, Tianjia Shao, Kai Fu, Niloy J. Mitra
Background

Tang (Dunhuang), ~ 530 AD

French, 1799

Greece (Parthenon) ~ 400 BC

Tang (Changan), ~ 600 AD
Background

Disney, 1937

Toei Animation, 1990

Illumination Entertainment, 2010
Problem formulation

Character Motion

Garment Animation
A possible approach: physically based simulation

+) Automatic

- Lots of parameters
  - Hard to tune as a combination
  - Some parameters lack physical meaning
  - Global parameter set may not exist
  - Parameters interpolation leads to unexpected shape change

- Difficult to apply shape constrains (keyframe control)
Current workflow: keyframes + interpolation

+ ) full control
- ) editing a keyframe is labor-consuming
- ) dense keyframe
Motivation

Can we use fewer keyframes?

36 frames $\approx$ 1.5s
Key observation

What can be changed in a certain keyframe?
Solution: factor out character motion and motion independent parameters
For a batch generated with the same parameters:

\[ E = \text{Var}(z) + \lambda \cdot \|S_i - S_i^*\| \]
Data generation
Evaluation

\[ (V, M) \quad (V_1, M_1) \quad (V_2, M_2) \quad (V_3, M_3) \]

\[ (V', M) \quad (V'_1, M_1) \quad (V'_2, M_2) \quad (V'_3, M_3) \]

\[ \text{Diff. map} \]

\[ \text{Recon.} \]

\[ \text{Target} \]

\[ \text{Diff. map} \]

\[ \text{Recon.} \]

\[ \text{Target} \]
Evaluation
Evaluation

![Graphs showing evaluation results for different dimensions and weights.](image-url)
Interactive design pipeline
User interface
User interface
More results
More results
More results
Free editing

original

after editing

project into garment shape space
Free editing
Free editing

original

after editing

project into garment shape space

back view
Other applications

Loop Animation: loop 1

Front View

Back View
Limitation & Future work

• Unicode for different types of garment
Thank you