

### The Motion Capture Soup



- Thrive for Realism
- Motion Capture is Easily Available
- Many Re-Targeting / Editing Techniques based on Mocap

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- Thrive for Realism
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### Expressive Animation

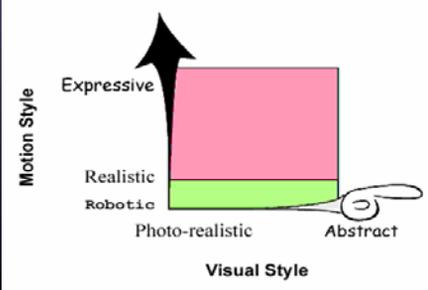
The goal is not always to be realistic.  
Sometimes the goal is:

- ✓ to create magic.
- ✓ to tell great stories.
- ✓ to create dynamic characters.
- ✓ to find new ways to bring life to the screen.

Sometimes realism isn't enough.

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### Realm of Cartoon Capture



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### New *Front-End* to existing *Pipe-line*

Focus of this Paper:  
New Cartoon Front-End



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## Cartoon Capture Challenges

1. Can't put optical markers on a cartoon
2. Low frame rate (24-30 fps)  
+ animating on 2's  
= large changes between frames
3. Often difficult to identify joint locations/large deformations

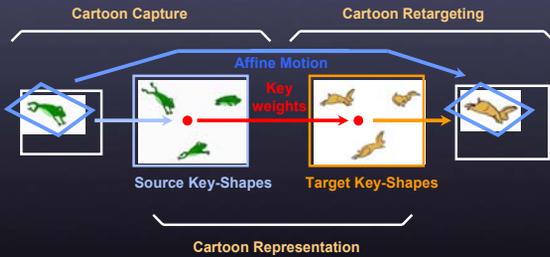


## Re-Targeting Challenges

1. Key shape based, not skeleton based
2. Need to translate from 2D to 3D
3. Map between characters with different features and body-types



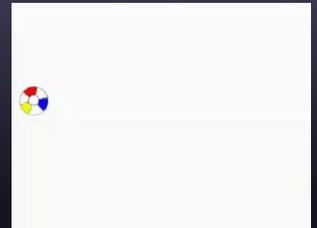
## Overview



## Representing Cartoon Motions

Primary Coarse Motion:

- Squash & Stretch
- Arcs of action
- Timing and Spacing



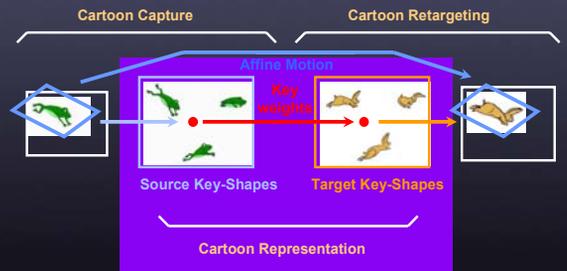
## Representing Cartoon Motions

Non Affine Motion:

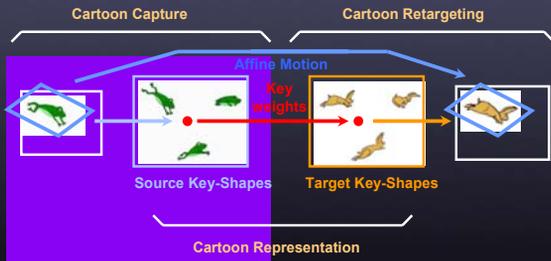
- Key-Shape Deformations



## Overview



## Overview



## Capture Cartoon Motions

*Capture = Reverse Engineer Animation*

- 1) Choose **Key-Shapes**
- 2) Build a **Cartoon Model**
- 3) Use **Least-Squares** to find Affine and PCA-Deformation

## Capture Cartoon Motions

*Example*



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## Build Cartoon Model

Segment sub-parts using Color Clustering



Segmentation results using posterior probabilities



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## Build Cartoon Model

Label **Key-Shapes**



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## Build Cartoon Model

Create In-between Database:



## Build Cartoon Model

Train Compact PCA model:

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## Capture Cartoon Motions

3) Use Least-Squares to find Affine and PCA Deformation

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## Capture Cartoon Motions

Use Least-Squares to find Affine and PCA Deformation

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## Overview

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## Retarget Cartoon Motions

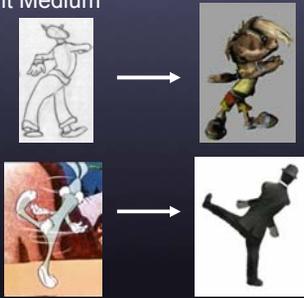
Design new Key-shapes

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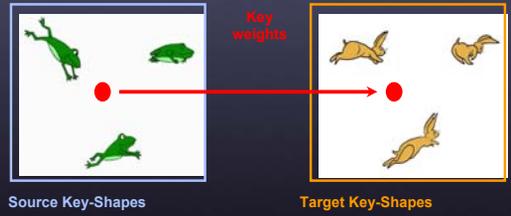
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## Retarget Cartoon Motions

Different Medium



## Retarget Cartoon Motions



## Retarget Cartoon Motions

Key-Weight Constraints:



## Retarget Cartoon Motions

Key-Weight Constraints:

- 1) No Negative Weights
- 2) Weights Sum to 1
- 3) Only a few weight are non-zero

## Retarget Cartoon Motions



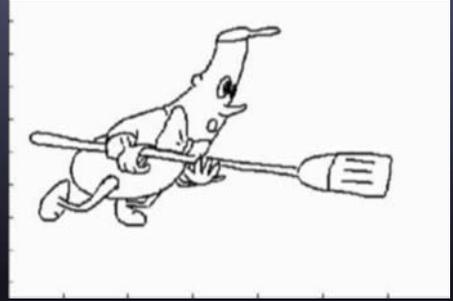
## Examples



## Examples



## Examples



## Examples



Original Photo

Cartoon Source

## Examples



## Examples



## Conclusions

- Bridges gap between mo-cap and animation.
- Useful when realism is not a goal.
- Effort to add more ingredients to the soup.

## Future Work

- Want to reduce number of key-shapes needed
- More accuracy with less information a goal
- Smoothing or constraints to reduce jitter
- Derive 3D animations from simple pencil tests
- Non-realistic animal animations
- Motion editing

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<http://Movement.stanford.edu>

Work of the Stanford Movement group

Shameless Plug:

See talk by Kathy Pullen on Motion Texture  
Today at 5:05 PM (last paper talk of the day)  
This room – C1 & C2

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