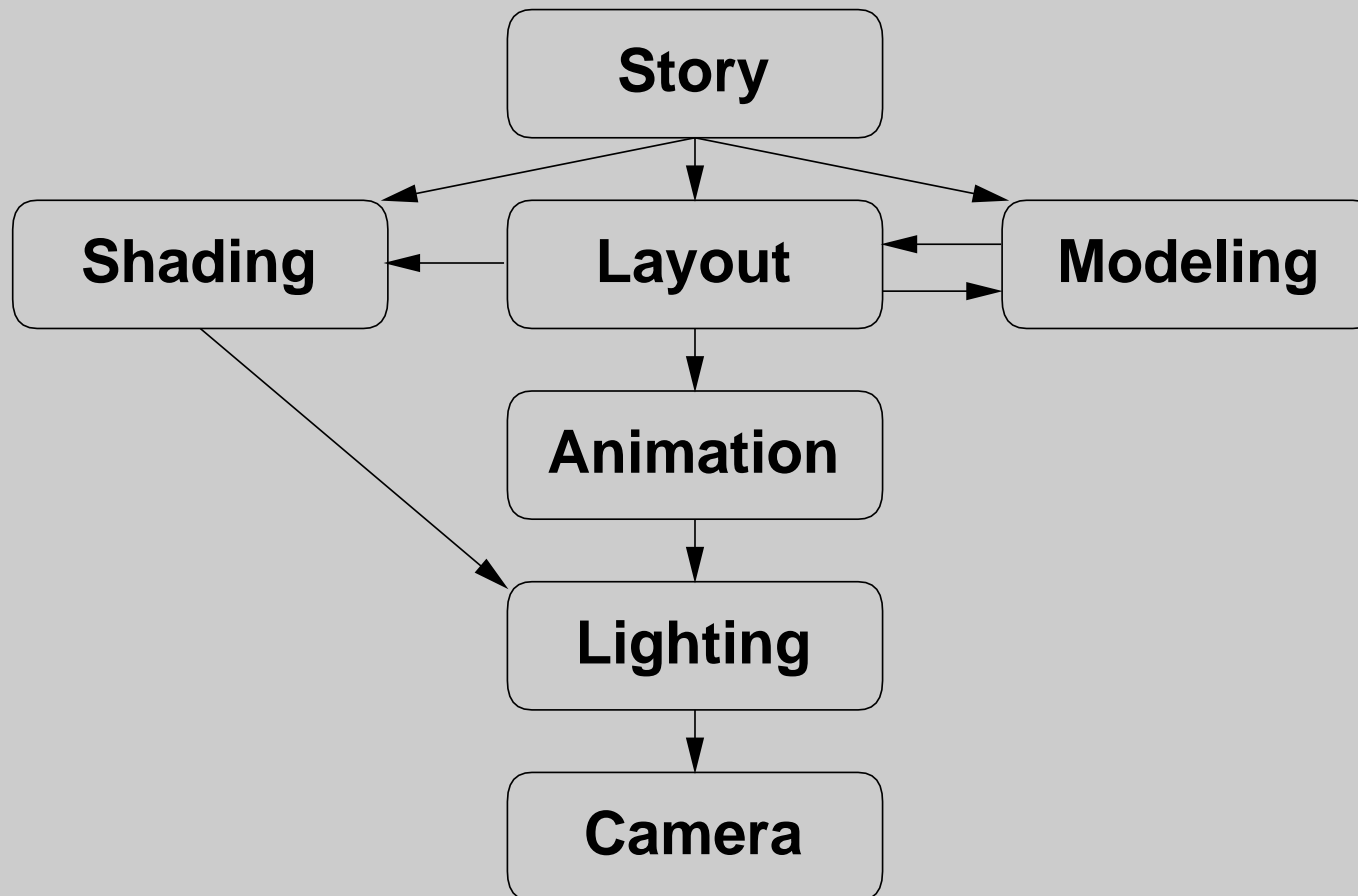


# **Intro to Animation**

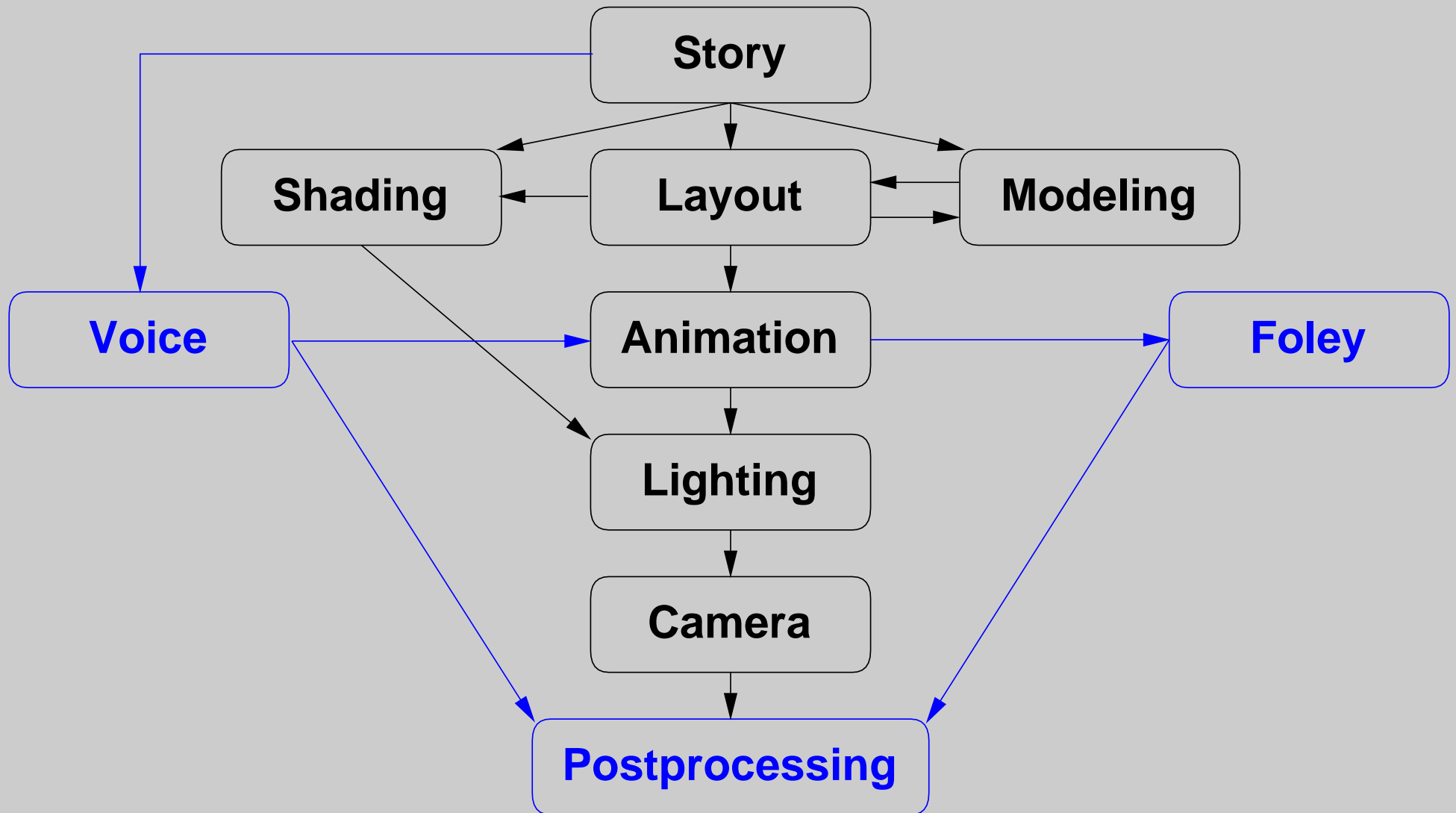
**Computer Graphics/Animation**

**Prof. James O'Brien**

# Computer Animation Pipeline



# Computer Animation Pipeline (v 1.1)



*For more detailed diagram, see Kerlow p.54*

# What do you do with finished animation?

**(A) Video Tape**

**(B) Digital Video**

**(C) Print it on yellow sticky notes**

# Video Tape

**Most video tape formats are analog**

- VHS/SVHS**
- Beta SP**
- 3/4" U-matic**

**Digital formats becoming more common**

- Digital Beta (high end)**
- DV**

**VHS tapes use NTSC standard**

- 720x486 (sort of)**
- 1.33 aspect ratio**
- Limited color range**
- 30 Frames per second (sort of)**
- Interlaced**
- Overscan!**

# Digital Video

## Wide range of file formats

- QuickTime
- MS Audio/Visual Interleaved (AVI)
- MPEG/MPEG-2
- DV Stream
- Bunch 'o images

## Some formats support multiple CODECs

- QuickTime: Cinepak, Apple Video, DV, Sorenson, ...
- AVI: Cinepack, Indeo, DV, ...

## Some formats define CODEC

- MPEG
- DV Stream

# Digital Video – Cont.

## Nearly all CODECs are lossy

- Parameter setting very important
- Not all CODECs not good for all video
- Compressors are not all equally 'smart'
- Compression artifacts are cumulative

## Playback on PCs... your results may vary...

- Bandwidth limitations
- CPU limitations
- Hardware acceleration
  - specific to a given CODEC
  - may be limited (e.g. MPEG1 and SIF)
  - driver problems
- **Getting better... but tape is still more predictable**

## Audio

- Most video formats support audio
- Similar compression issues
- More reliable playback (but sync problems)

# "Path to Tape"

## Used to be hard

- Expensive equipment (e.g. Abekas)
- Slow
- Difficult to set up

## All digital pathes are easier and cheaper

- Make use of lossy compressions
- Maintaining high quality is still hard



# Editing

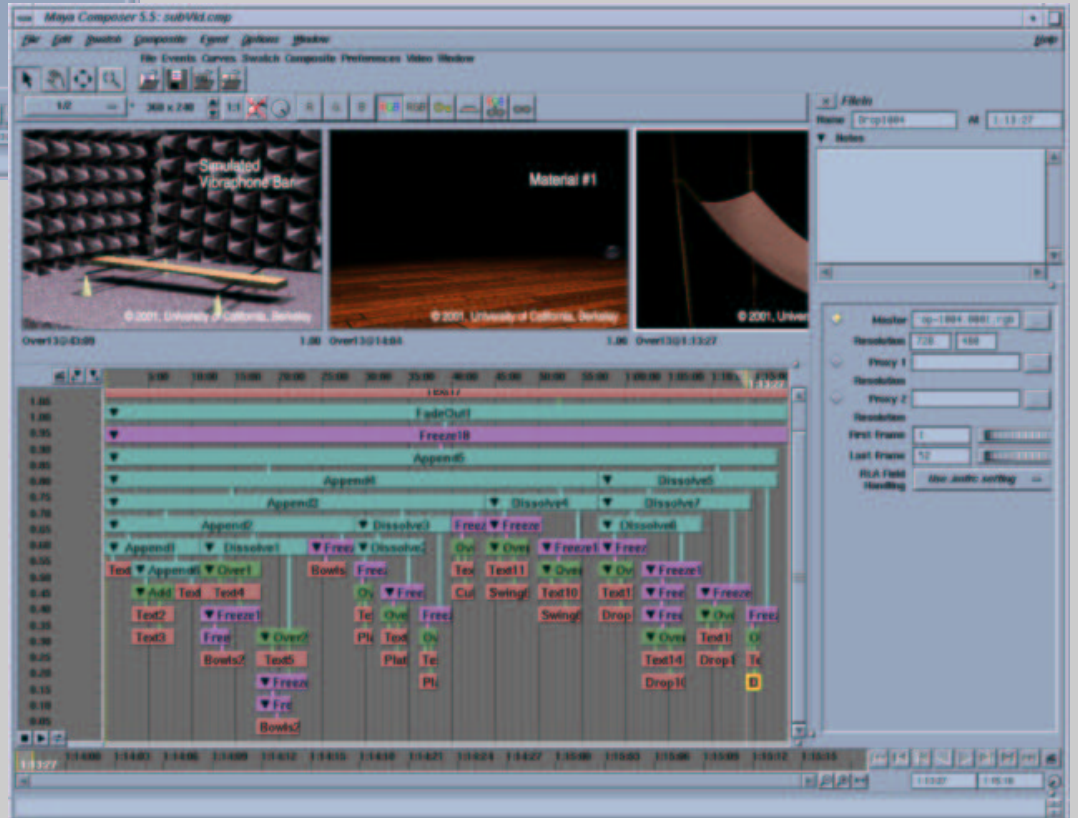
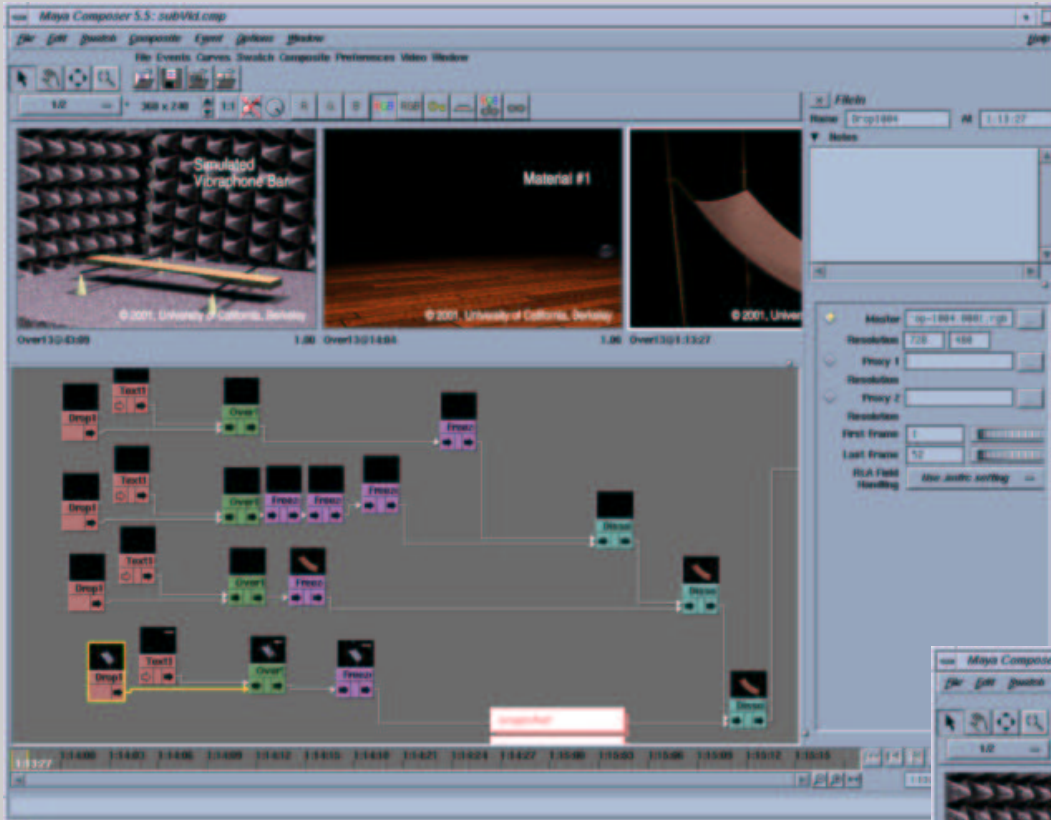
## Editing on tape

- Expensive equipment
- Generation hits
- Difficult to set up
- Limitations (e.g. insert?)

## Digital editing

- Software + PCs cheaper than good tape decks
- Can be lossless
- Wider range of effects
- Non-linear
- Not always as fast as tape editing

**\*\* Composer, Fusion, Premiere**



# Compositing

**Build images out of multiple layers**

**Use alpha channel to represent transparency**

$$\alpha = \alpha_F + (1 - \alpha_F) \cdot \alpha_B$$

$$c = \alpha_F \cdot c_F + (1 - \alpha_F) \cdot \alpha_B \cdot c_B$$

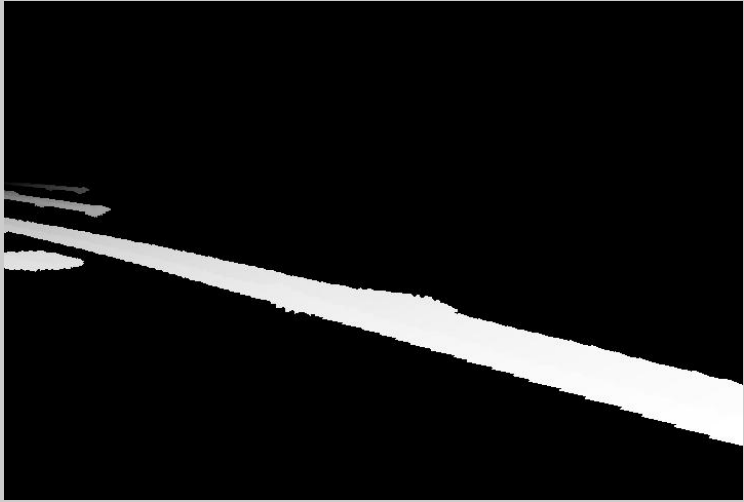
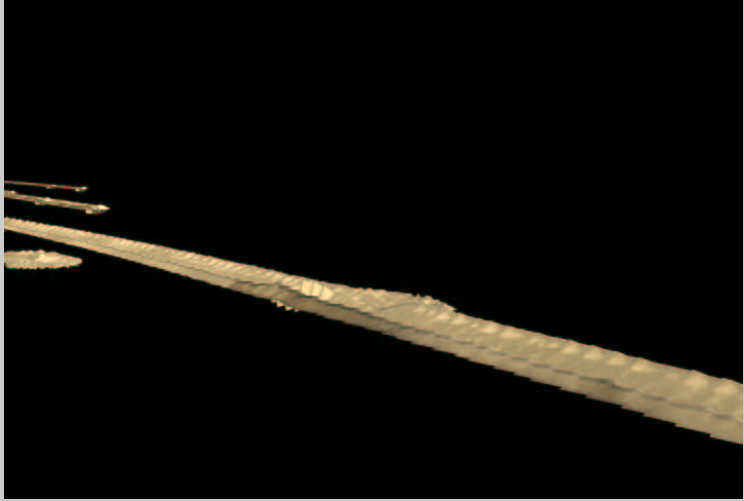
**The above assumes non-pre-multiplied alpha**

**Alpha channel has limitations**

**-- See SIGGRAPH '96 paper by Smith & Blinn**

**Can also save z-buffer**

**-- Problems at intersections**



# Motion Blur

**Fast moving things look blurry**

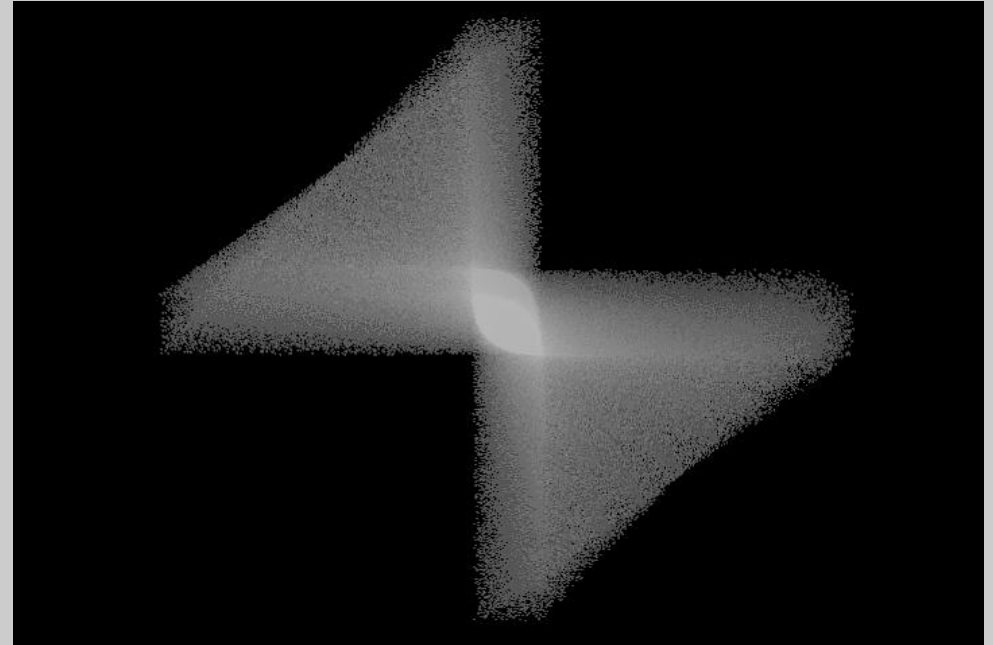
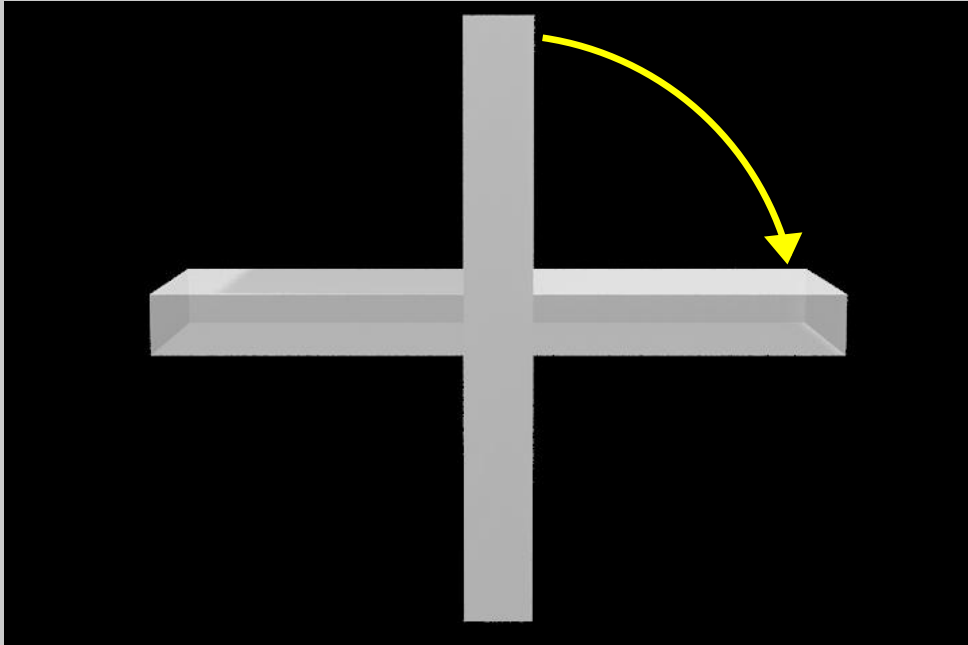
**Can accomplish blur using analytical or discrete methods**

- Analytical only for limited situations**
- Both depend on render method**

**Blurring over entire frame interval looks bad**

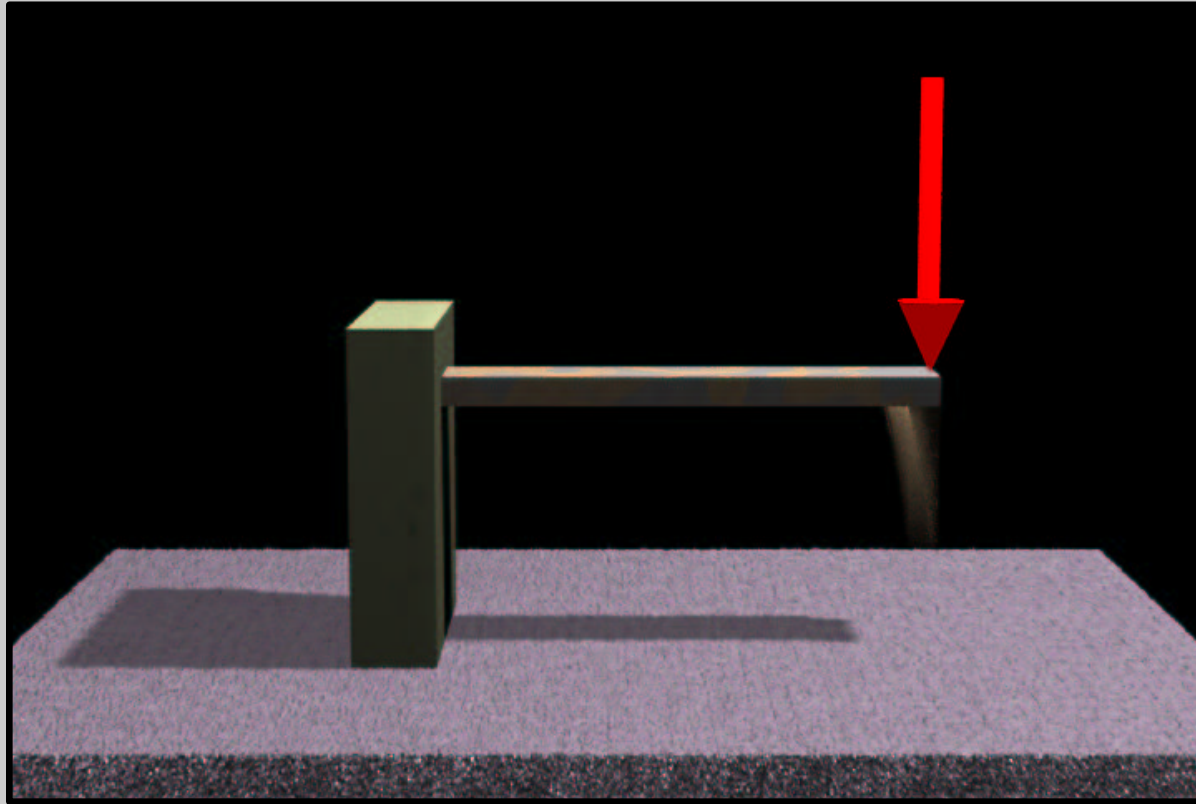
- Interval often measured in degrees [0..360]**
- Something like 30 may look good**

## Motion Blur – Cont.



**Interpolation is an issue**

## Motion Blur – Cont.



**Problems with velocity based blurring**