

# GHOST

OF TSUSHIMA

BLOWING FROM THE WEST: SIMULATING WIND IN GHOST OF  
TSUSHIMA





# INTRO VIDEO

GHAST





PS4

Volume Over Accuracy

What We Did (Differently)



Vector

+ Noise

+ “Vortices”

(+ Displacement)





# PARTICLES

*Blown from the west,  
fallen leaves gather  
in the east - Yosa Buson*



- Details in 2014 GDC session
  - <https://www.gdcvault.com/play/1020367/The-inFAMOUS-Second-Son-Particle>
- Particles emitted, updated, and rendered entirely on the GPU
  - ~100K particles
- Highly programmable
  - Expression-based language compiled into PSSL
  - Building blocks
  - New extensions for wind and terrain
- Matt Vainio's PlayStation.Blog
  - <https://blog.playstation.com/2021/01/12/how-stunning-visual-effects-bring-ghost-of-tsushima-to-life/>



# PARTICLES – LEAVES VIDEO

GHAST

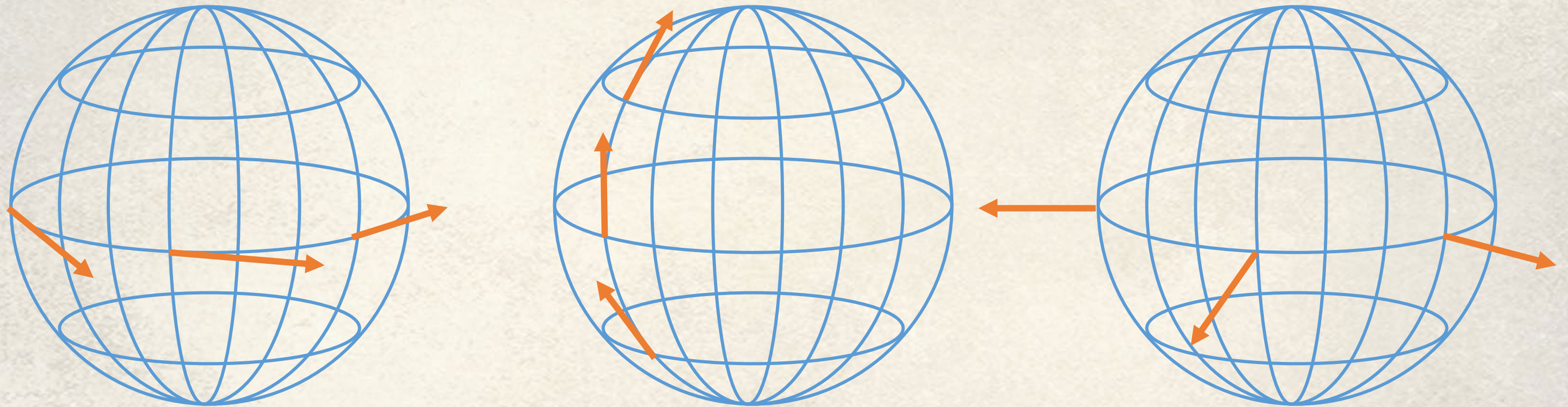




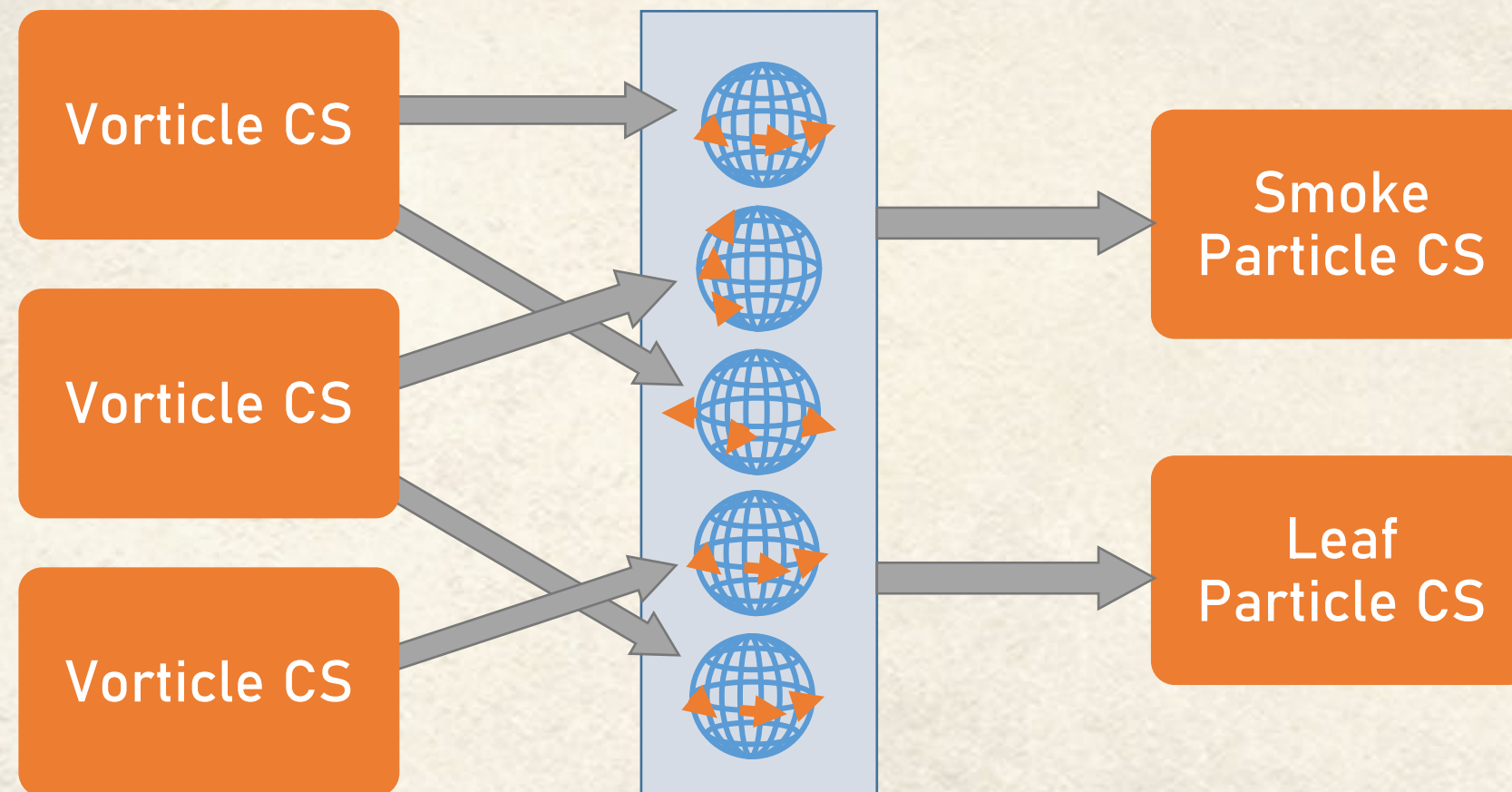
# PARTICLES – TERRAIN VIDEO

















# PARTICLES – VORTICLE VIDEO

GH © S T









# PARTICLES - ANIMATED

GH  ST











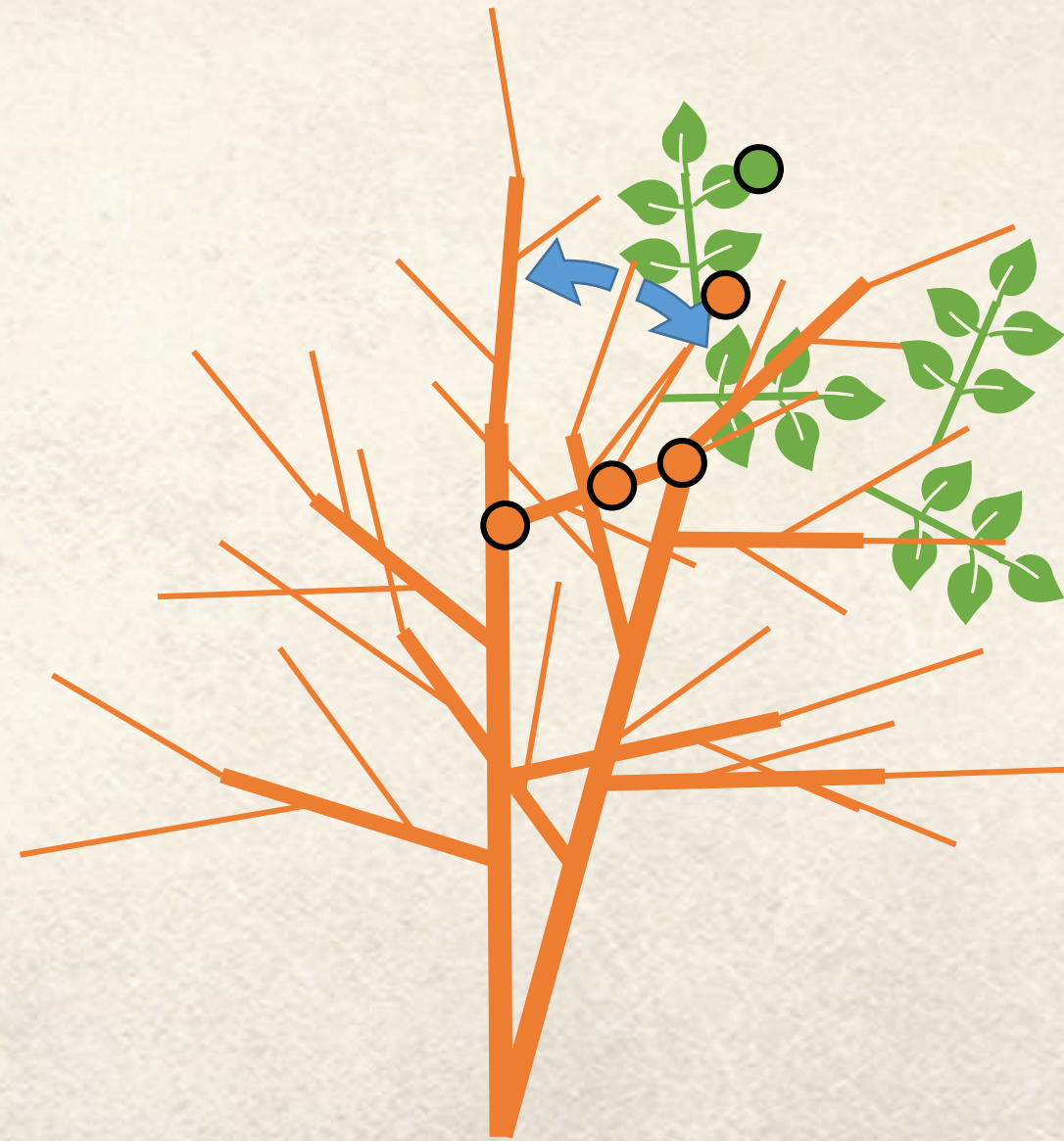


A misty Japanese garden scene. In the foreground, a large, gnarled pine tree branch hangs down from the top left. In the background, a stone lantern sits on a small island in a pond. Two figures in traditional Japanese clothing are visible in the distance, one holding a long staff. The scene is shrouded in mist, with a soft light source in the background creating a hazy atmosphere.

# FOLIAGE

*Wind in the pines  
swirling round the eaves  
as autumn ends - Bashō*















The background is a painting of a landscape. In the center, a wooden torii gate stands on a grassy hill. The sky is a mix of blue and white, suggesting clouds or a bright day. In the foreground, there are tall, dark, and light-colored grasses, some of which are blurred, giving a sense of movement. The overall style is impressionistic, with visible brushstrokes and a soft focus.

# GRASS

*A lovely name —  
at Komatsu blows  
bush clover and pampas - Bashō*





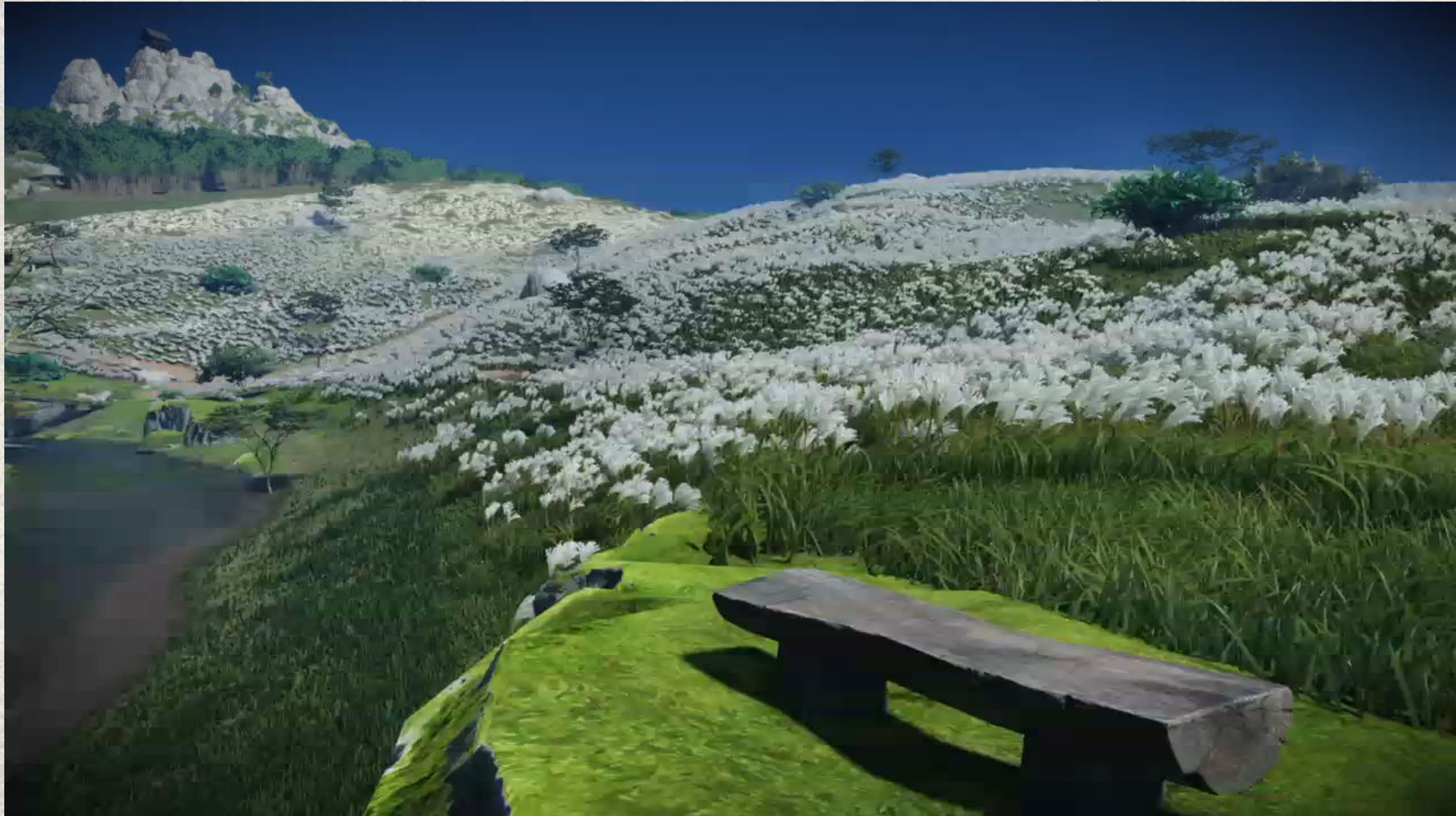




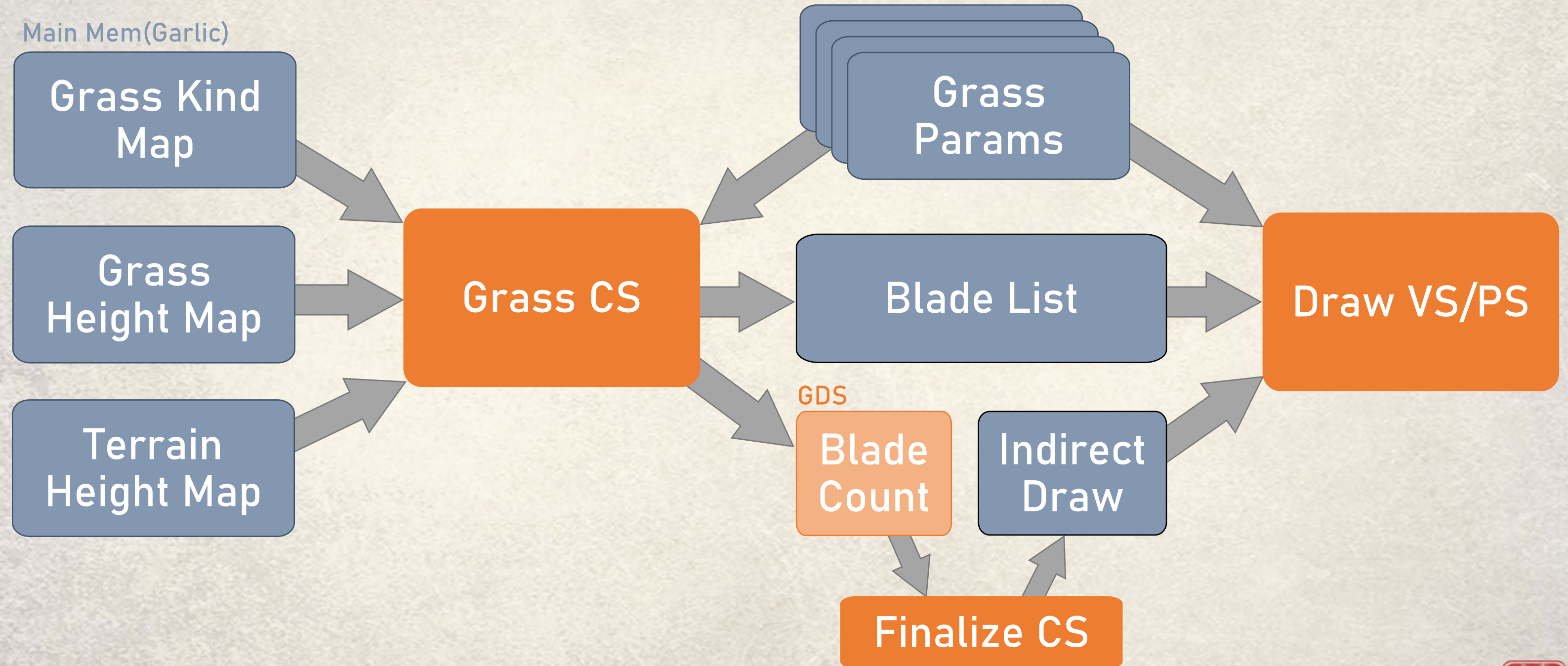


# GRASS

# GHOST









# GRASS

# GH@ST





A samurai warrior is depicted on horseback, wearing traditional Japanese armor (yoroi) with a prominent straw rain cape (sawabiki) draped over his shoulders. The cape is blowing back, suggesting a breeze or rain. The samurai is holding a sword (katana) in his right hand. He is surrounded by various flags and banners, including a large red flag and a black flag. The background shows a cloudy sky and distant hills.

# CLOTH

*Spring rain*

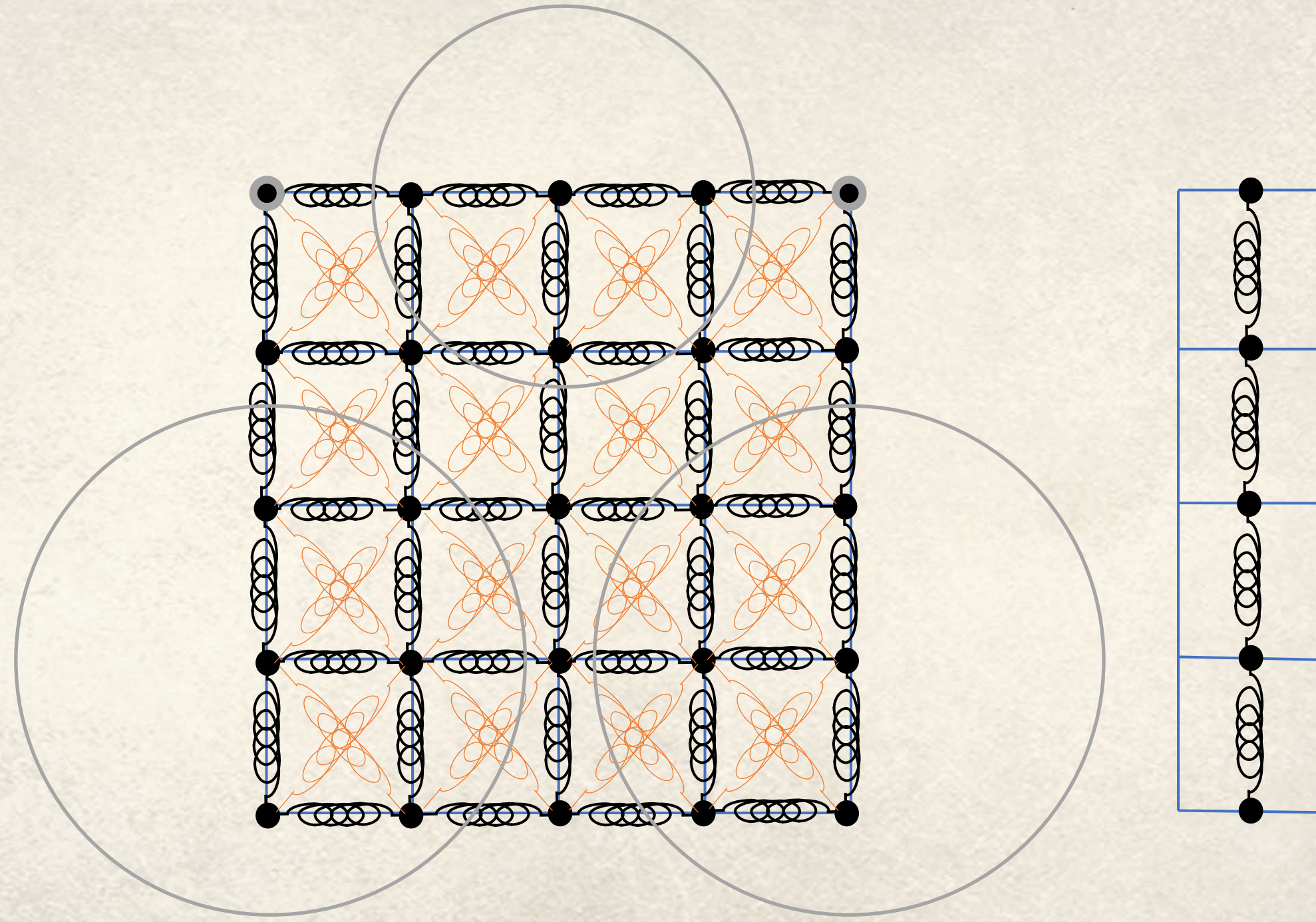
*a straw rain cape blows back*

*as river willows - Bashō*

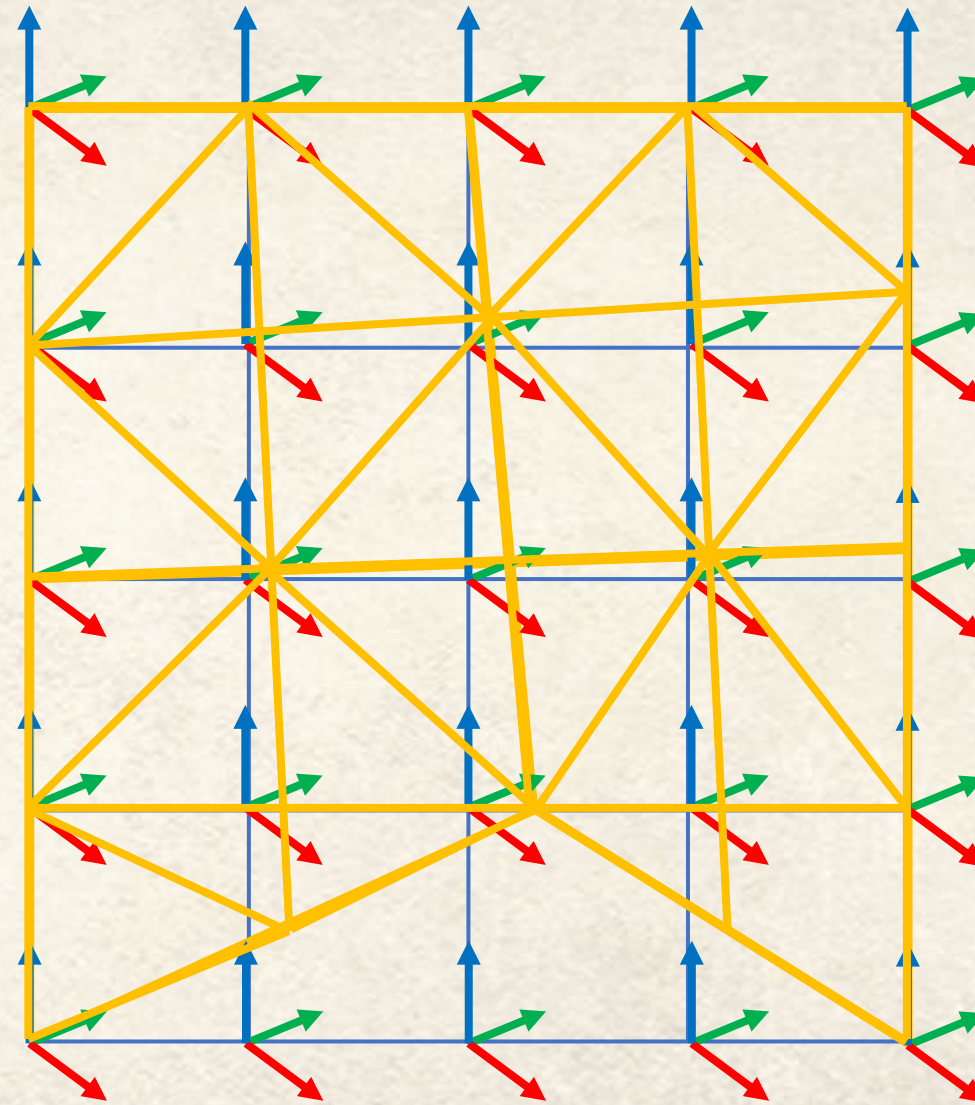




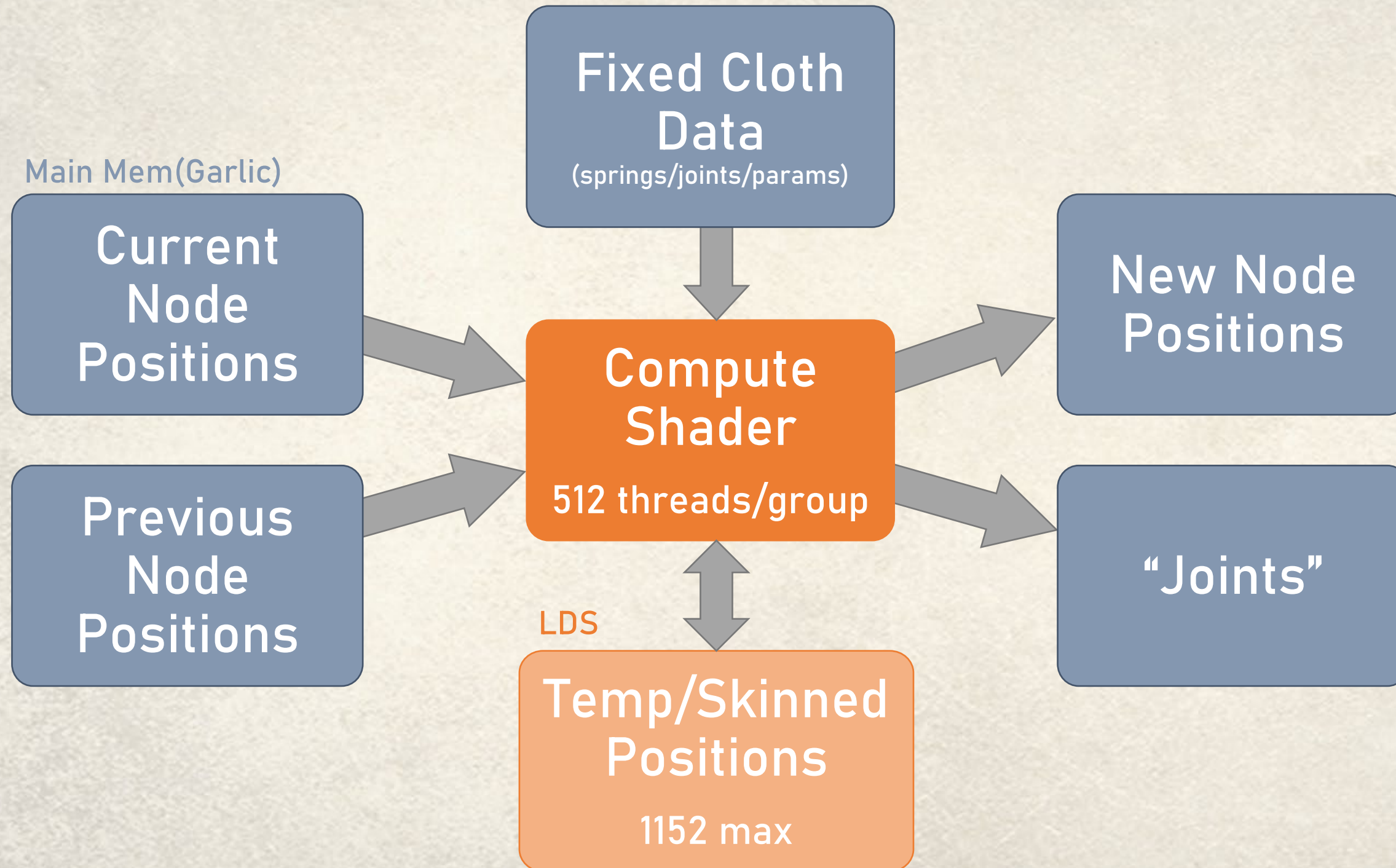














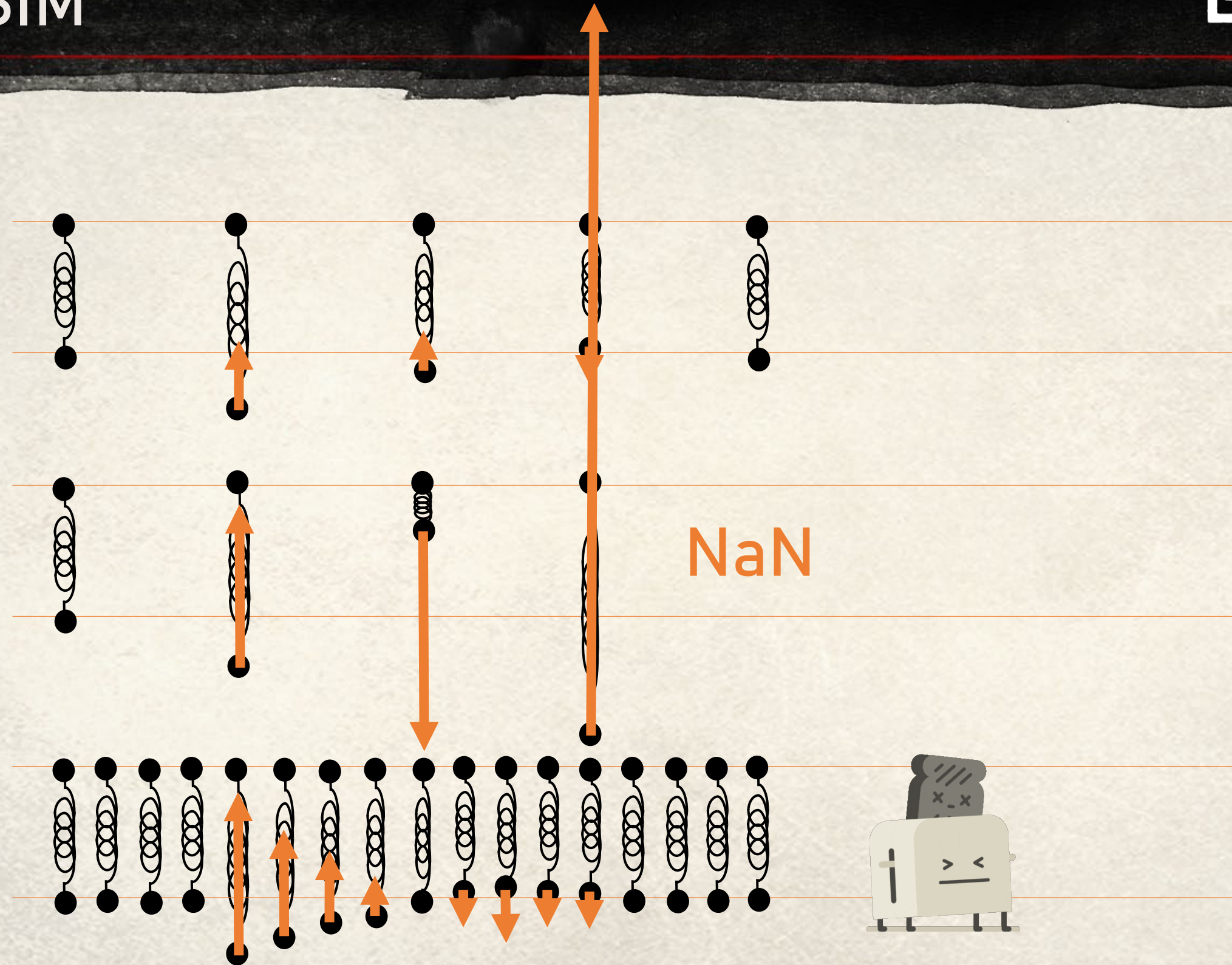
## Verlet Integration

- ◆ Gravity, Wind, Inertia, Damping

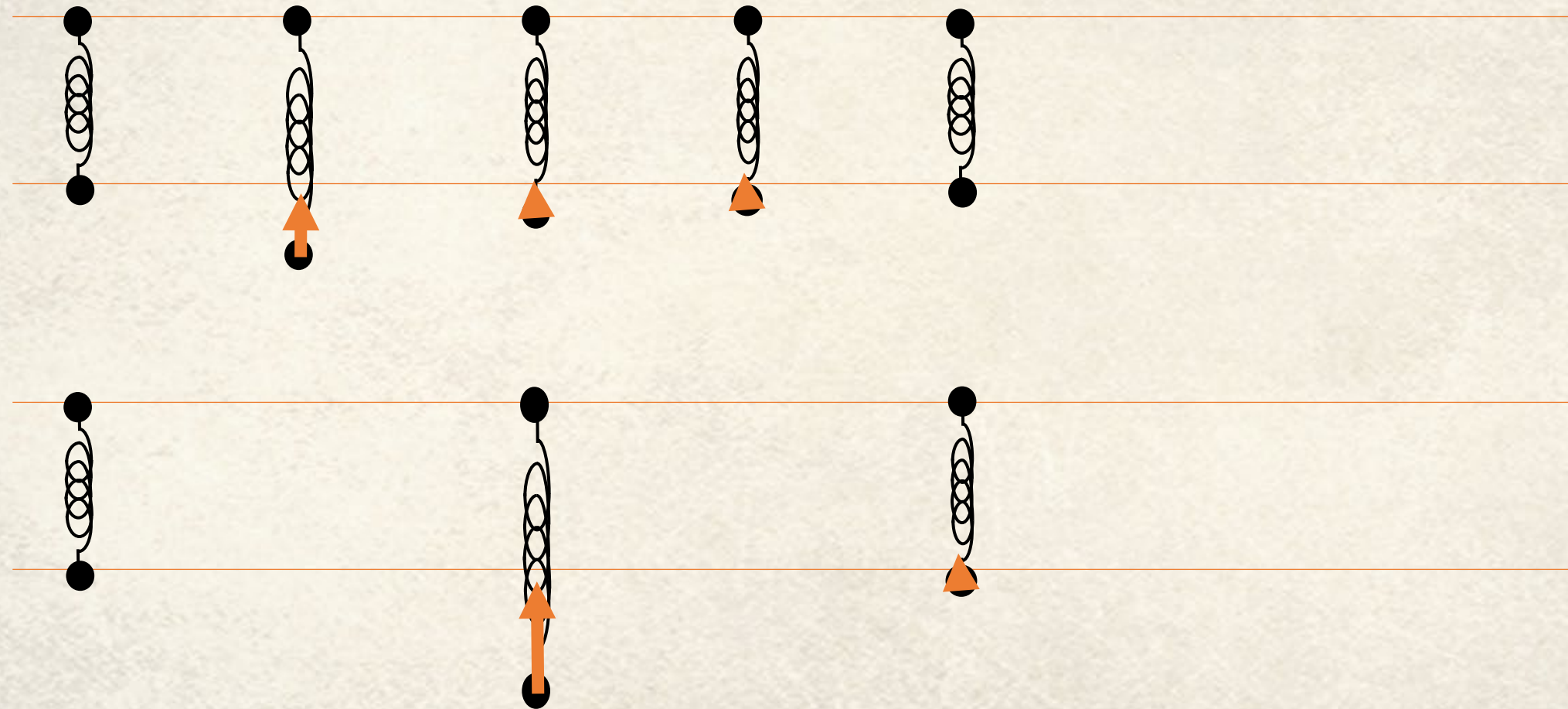
## Solving Cloth

- ◆ To do it “right” takes full matrix inversion
- ◆ We’re not doing that

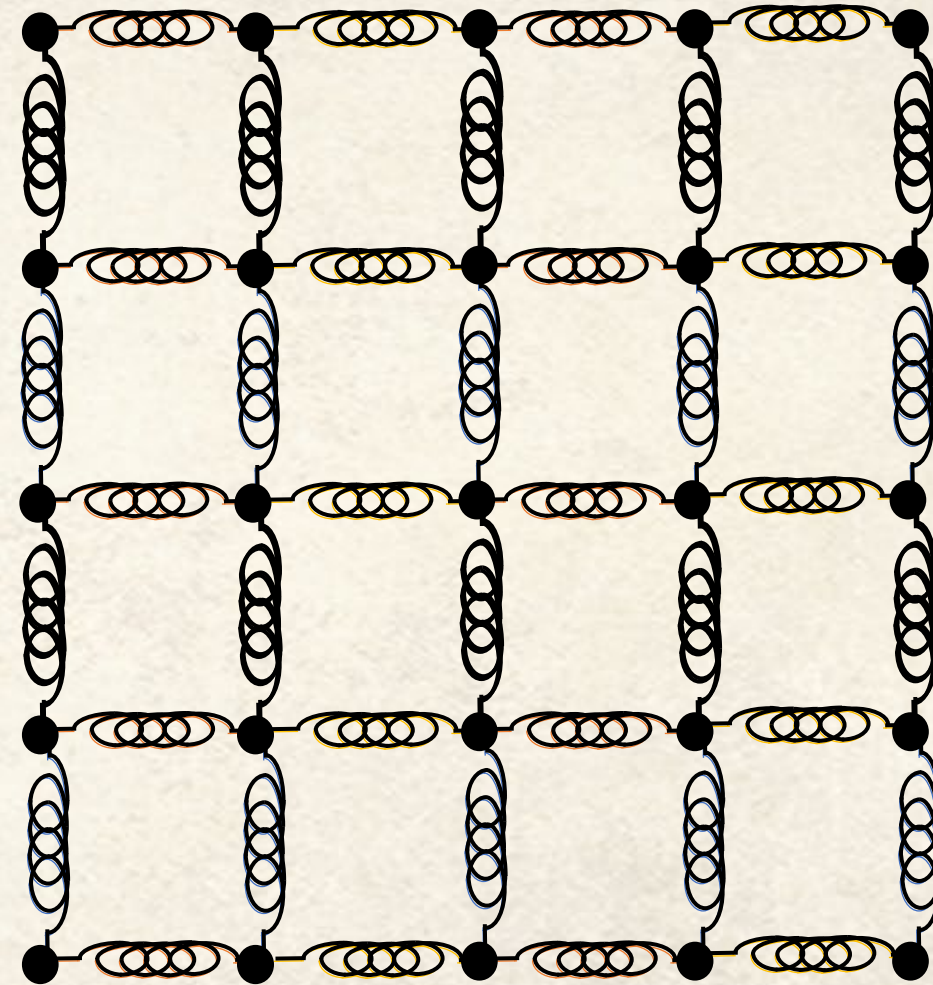




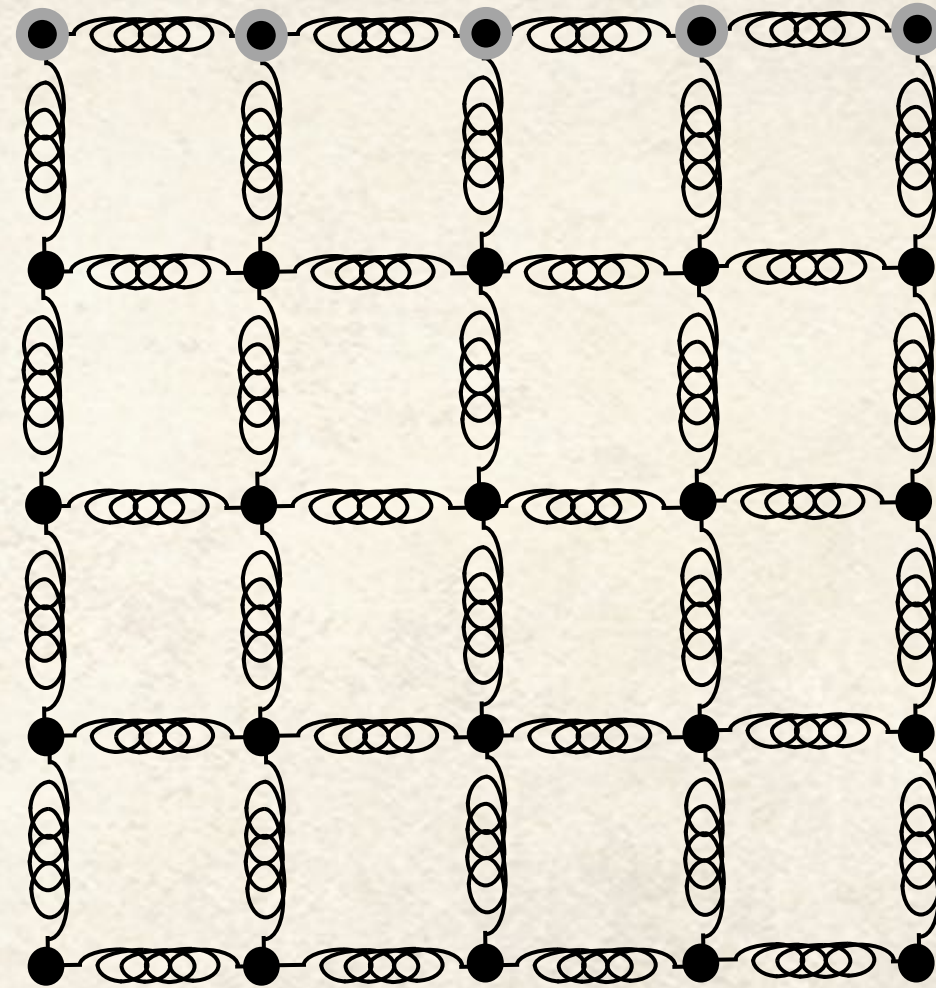




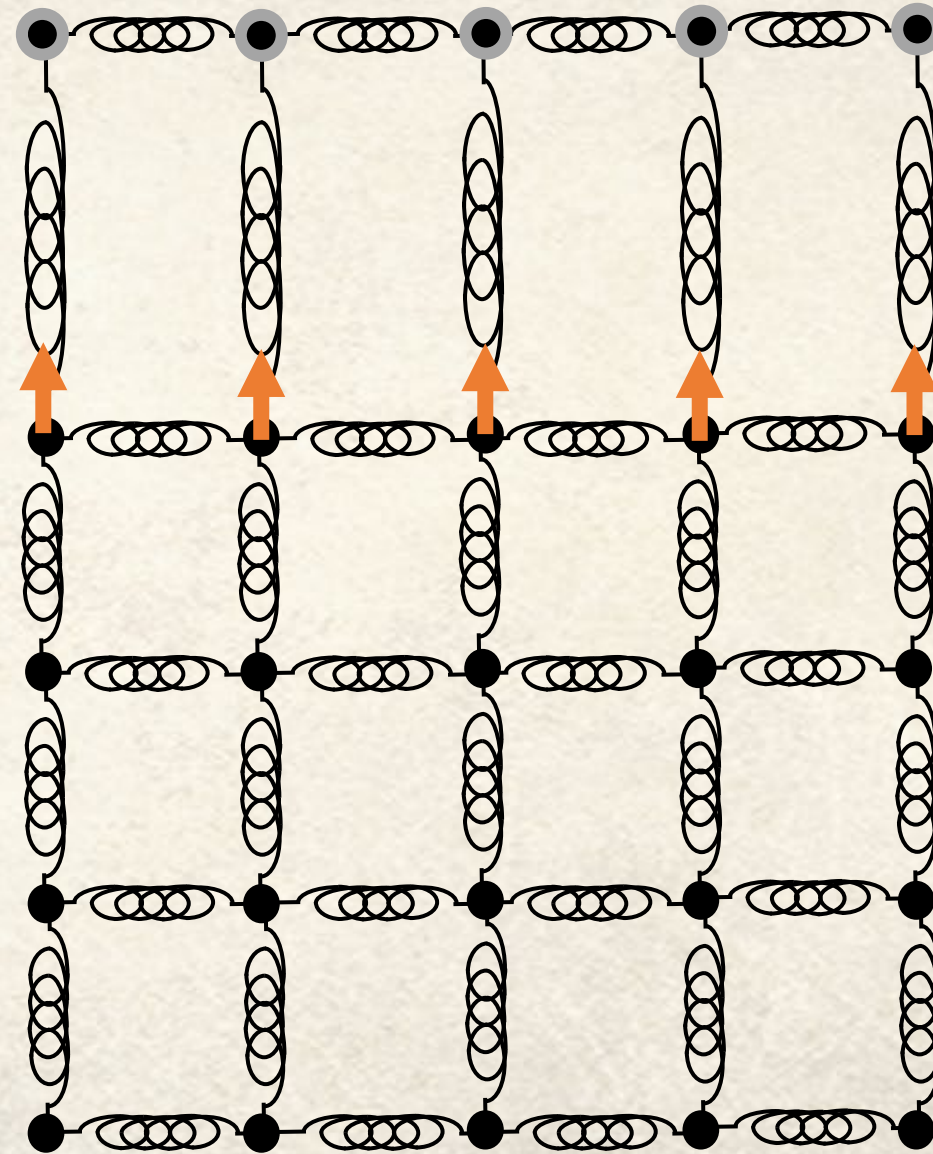




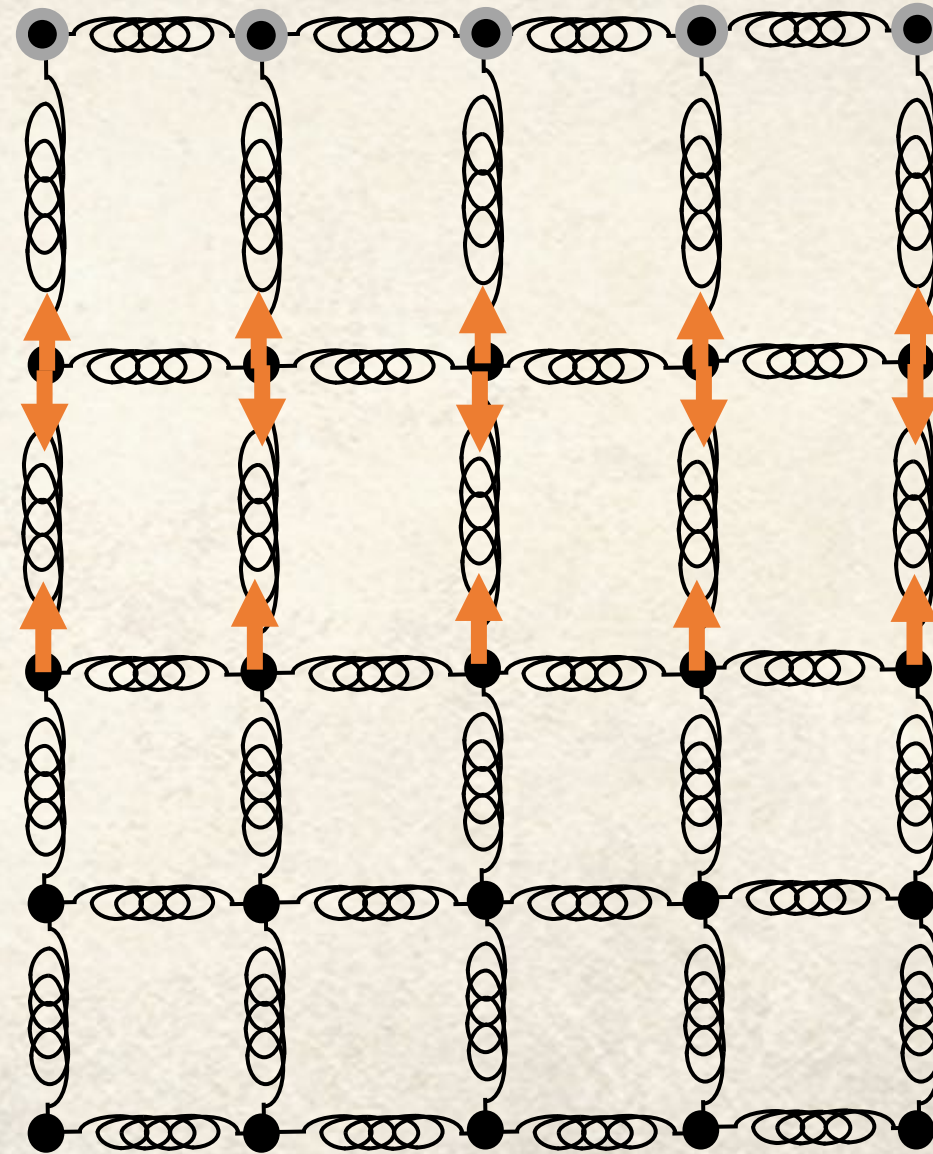




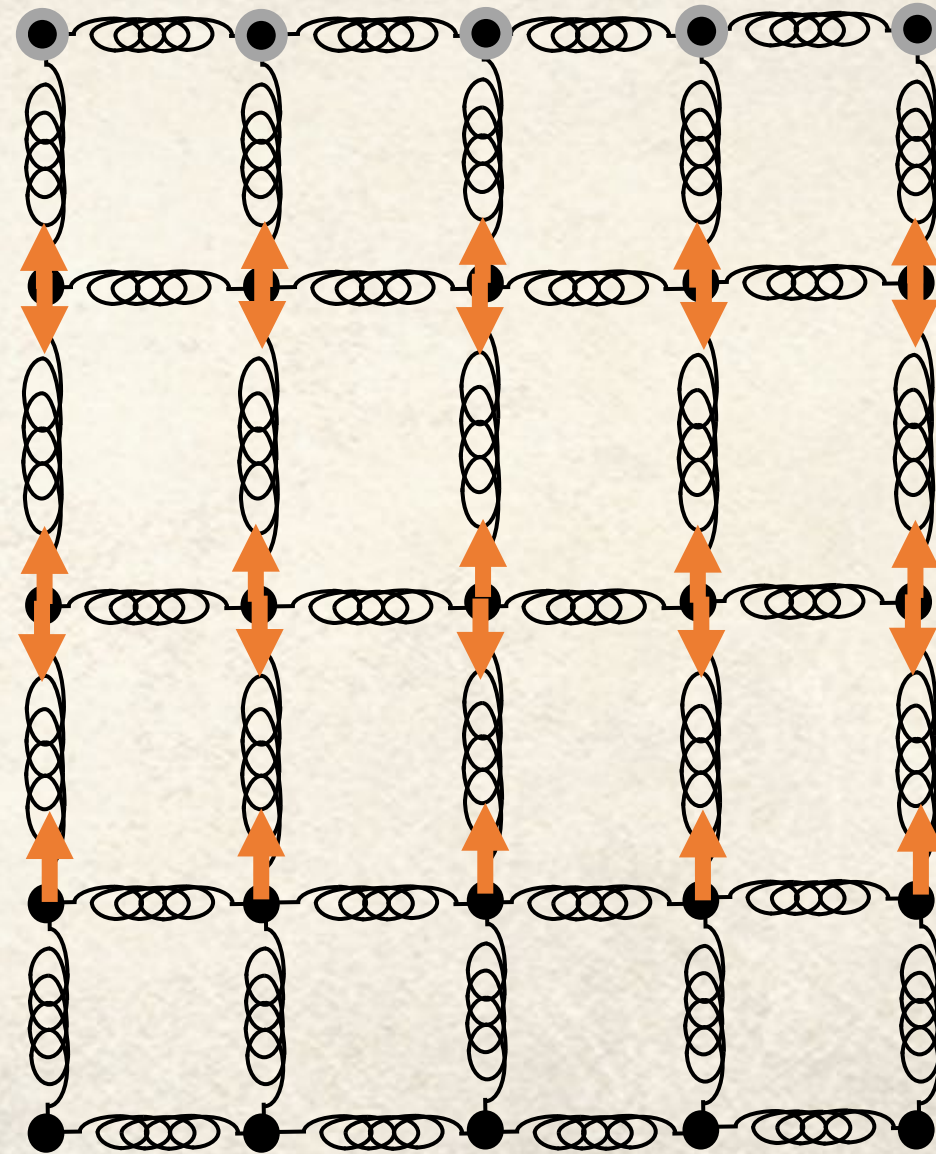










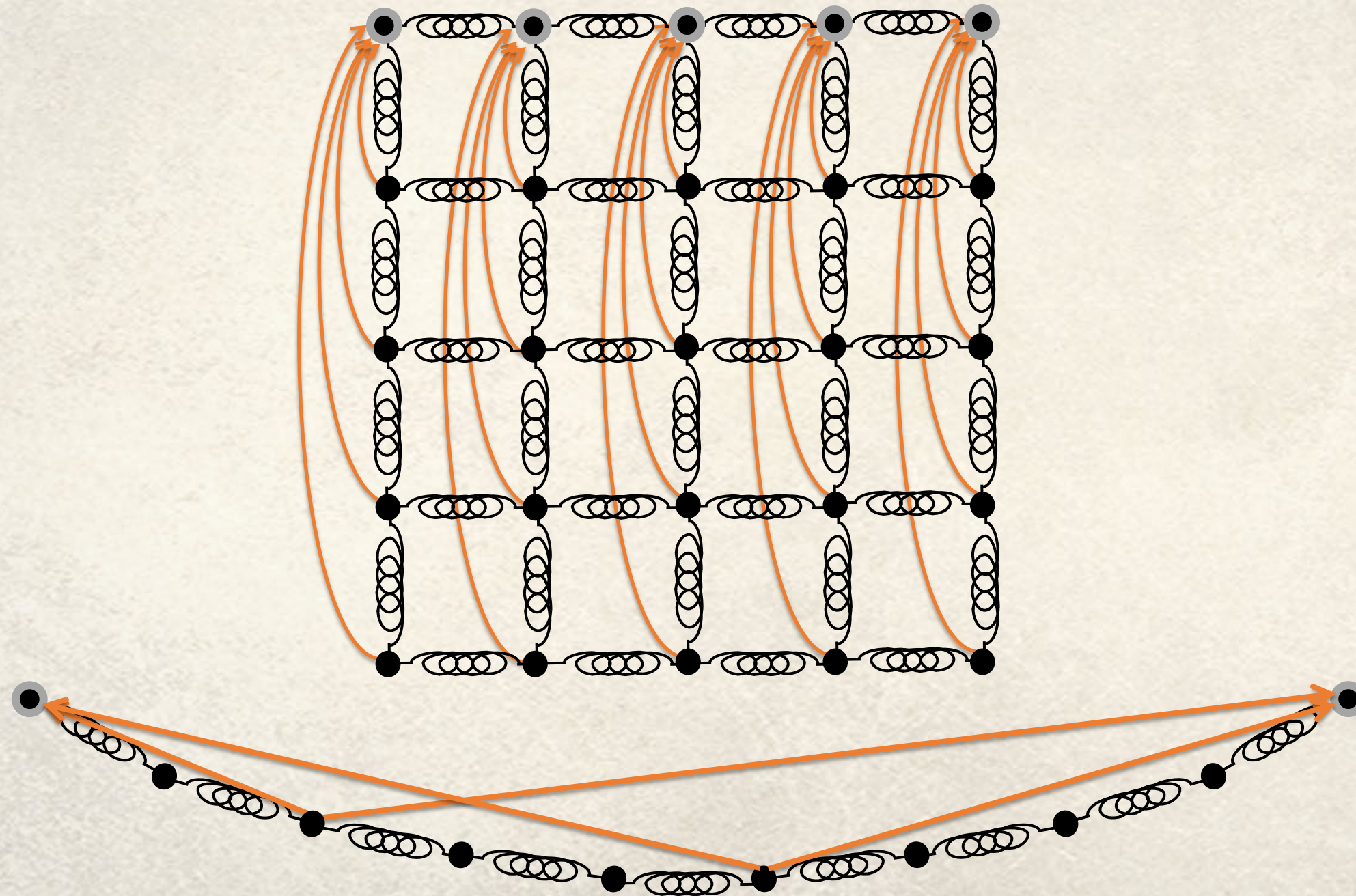








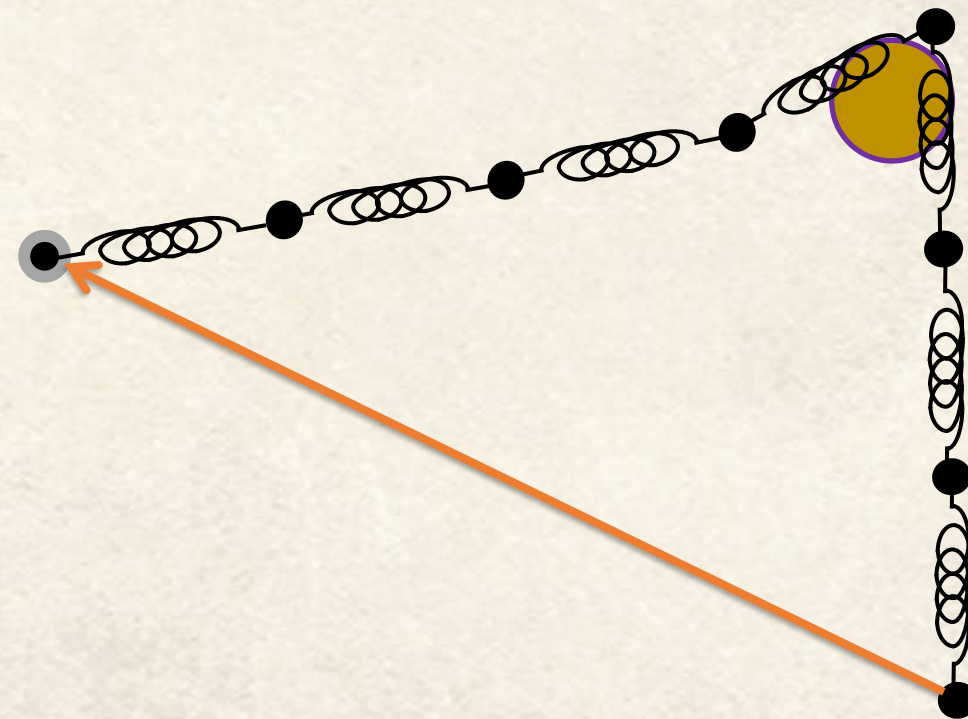
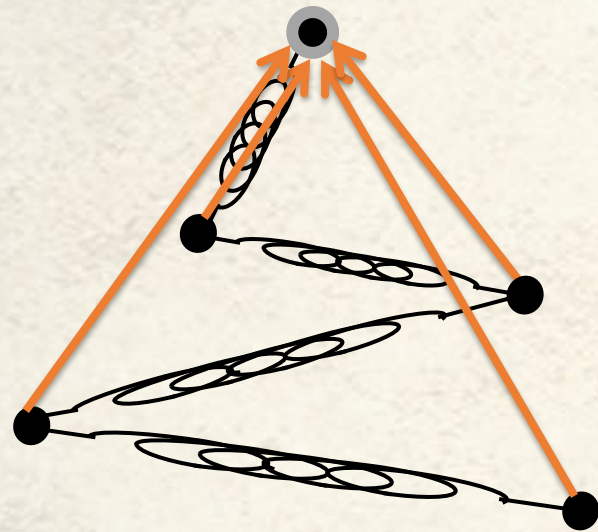
# CLOTH - ANCHORS



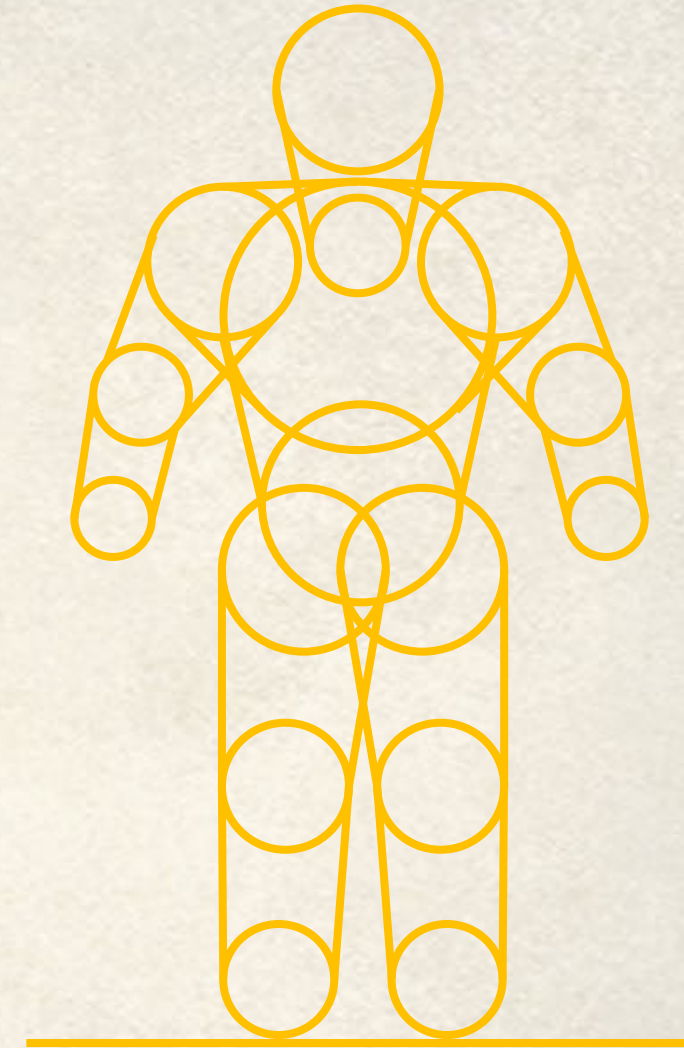
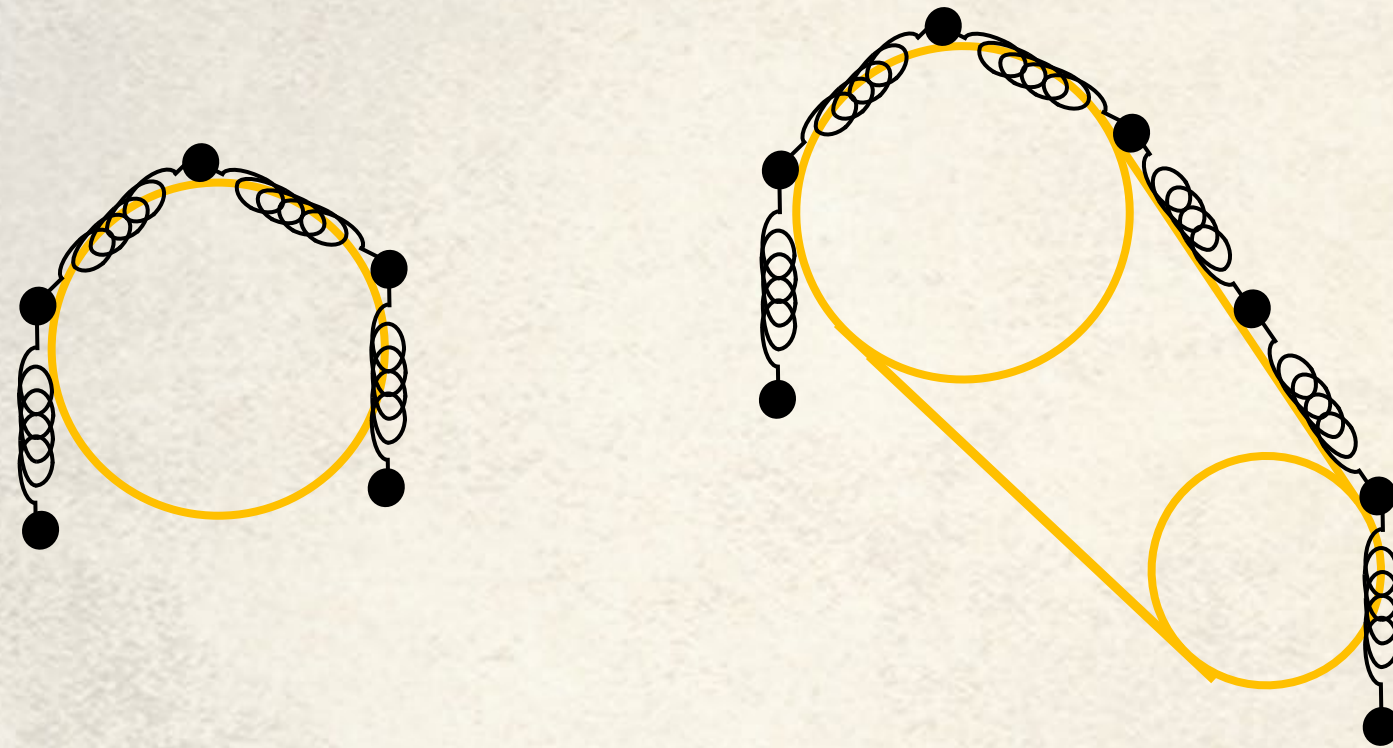








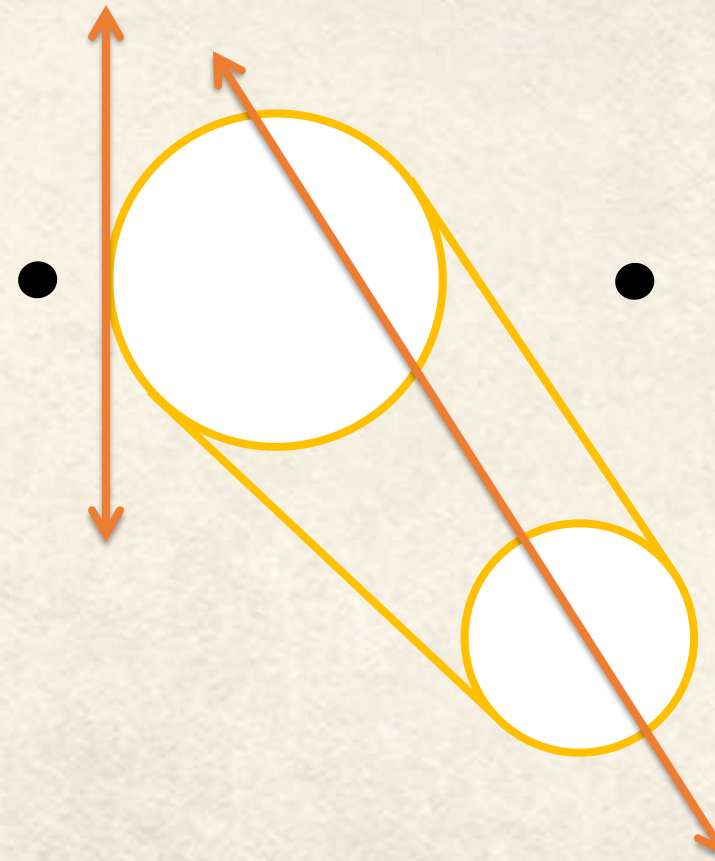
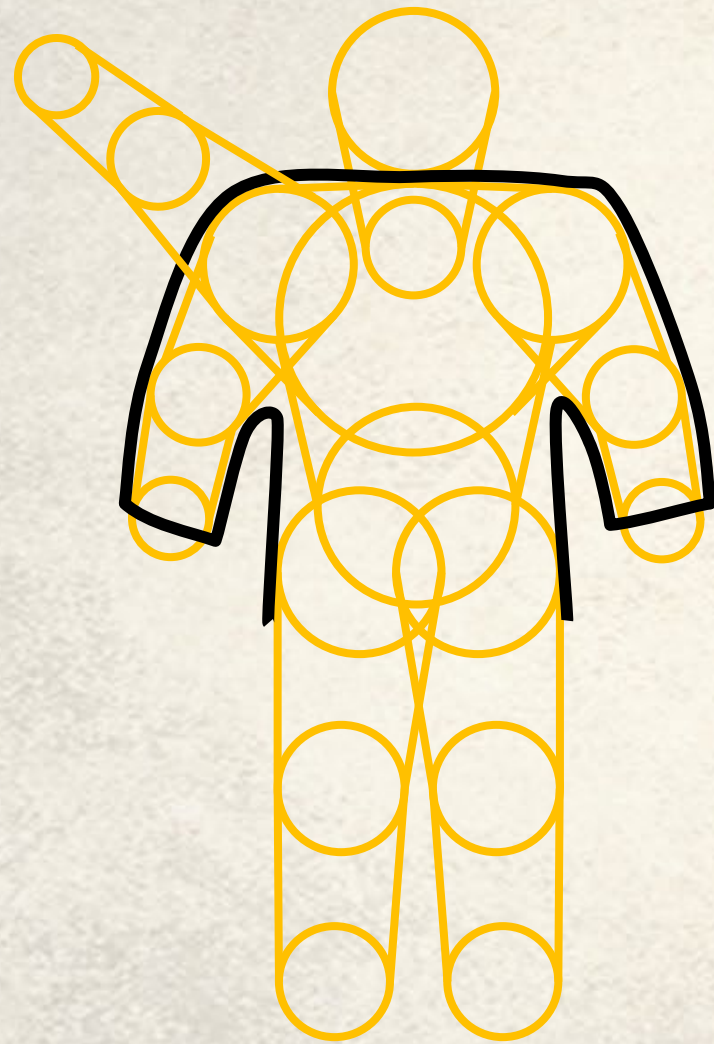




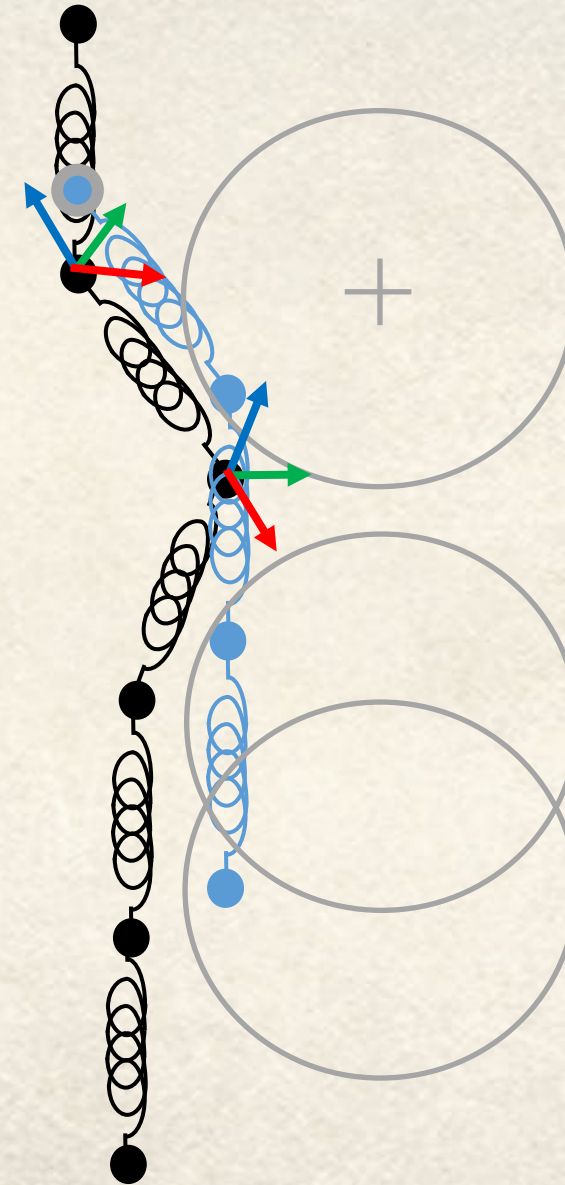
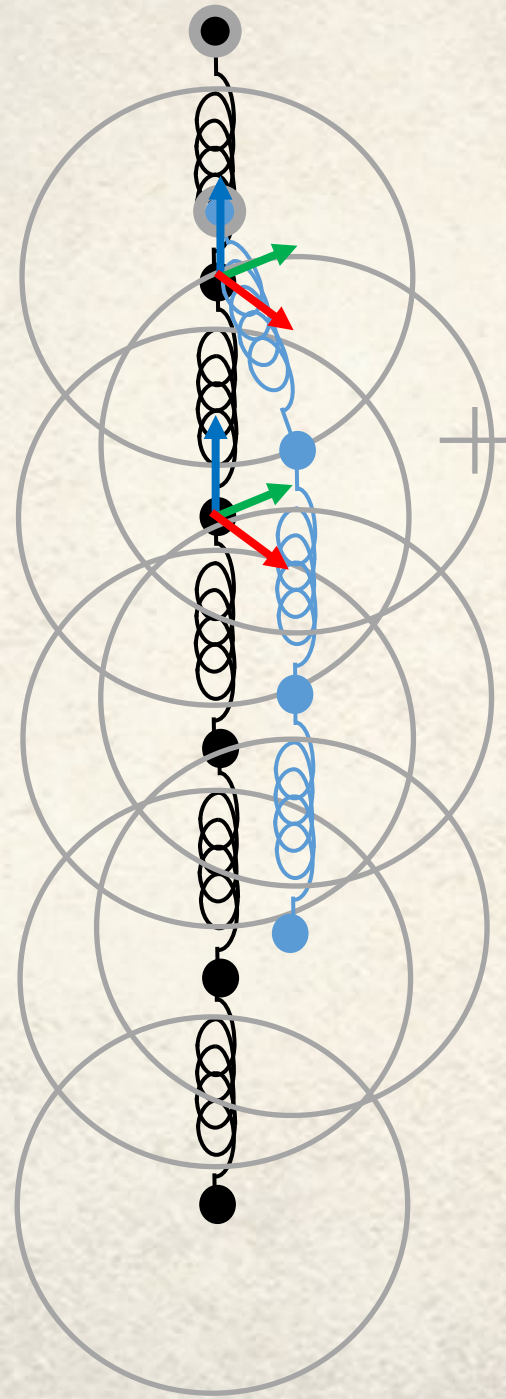


















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