Fast Simulation of Inextensible Hair and Fur

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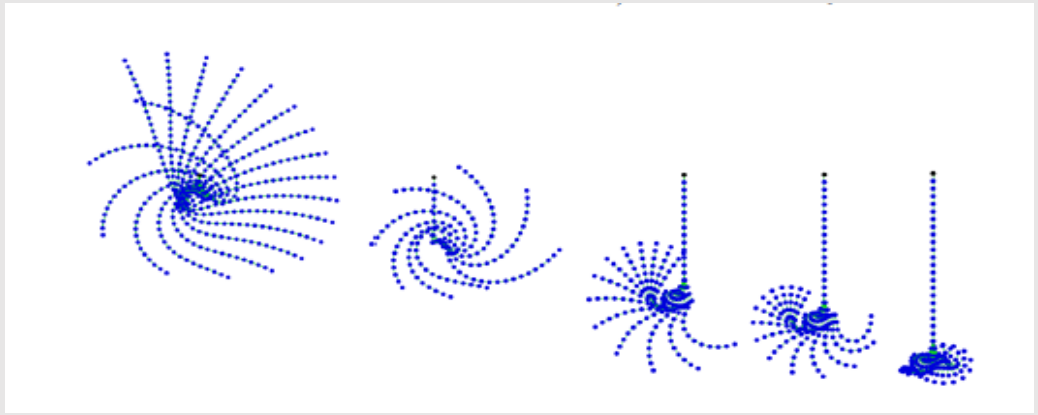
FTL 예측

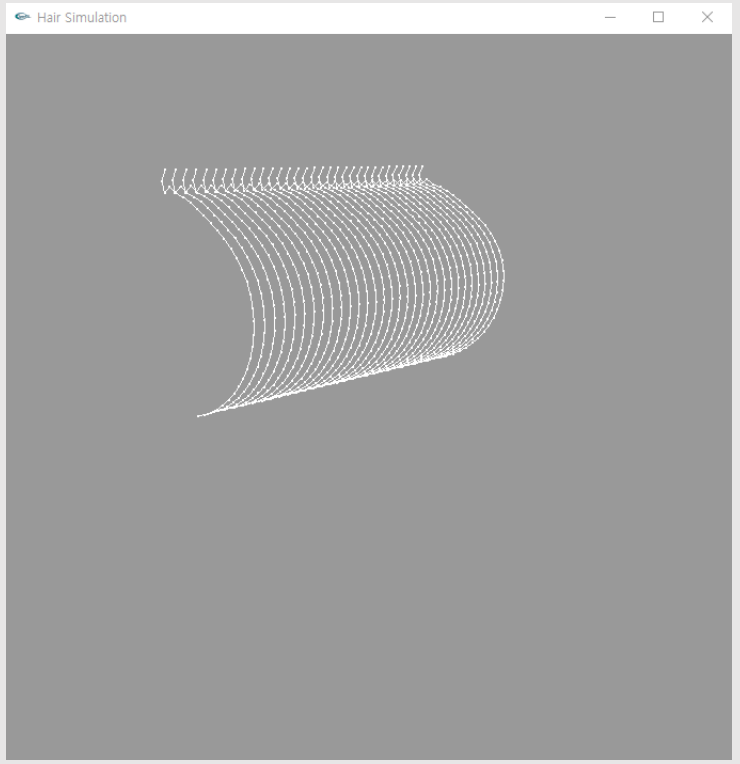
$$\mathbf{p} \leftarrow \mathbf{x} + \Delta t\,\mathbf{v} + \Delta t^2\,\mathbf{f} \quad (1)$$

$$\mathbf{p} \leftarrow \text{SolveConstraints}(\mathbf{p}) \quad (2)$$

$$\mathbf{v} \leftarrow \frac{\mathbf{p} - \mathbf{x}}{\Delta t} \quad (3)$$

$$\mathbf{x} \leftarrow \mathbf{p}, \quad (4)$$





FTL 예측
Particle : 32 * 32
Time step : 0.01

FTL 속도 보정 예측

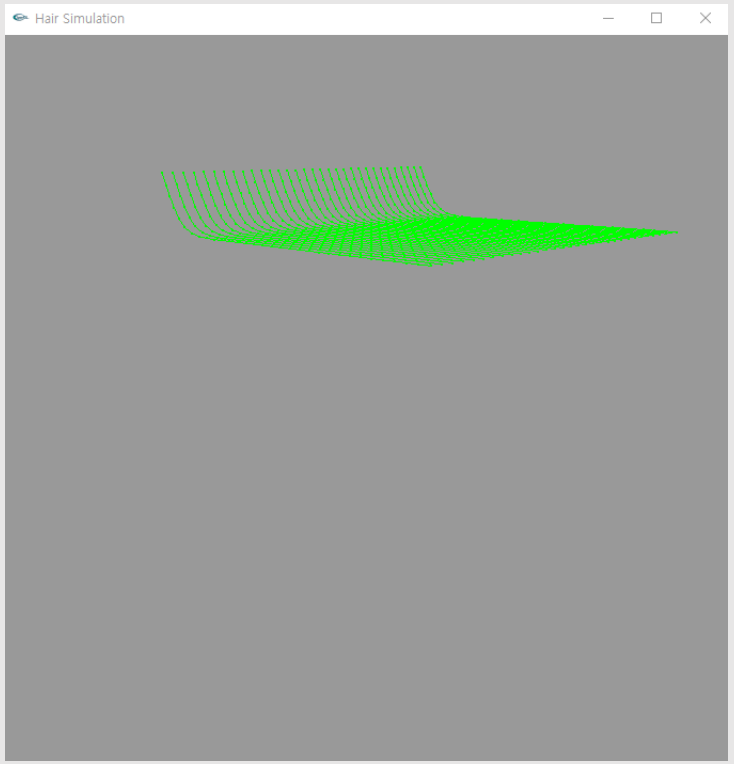
$$\mathbf{p} \leftarrow \mathbf{x} + \Delta t\,\mathbf{v} + \Delta t^2\,\mathbf{f} \quad (1)$$

$$\mathbf{p} \leftarrow \text{SolveConstraints}(\mathbf{p}) \quad (2)$$

$$\mathbf{v} \leftarrow \frac{\mathbf{p} - \mathbf{x}}{\Delta t} \quad (3)$$

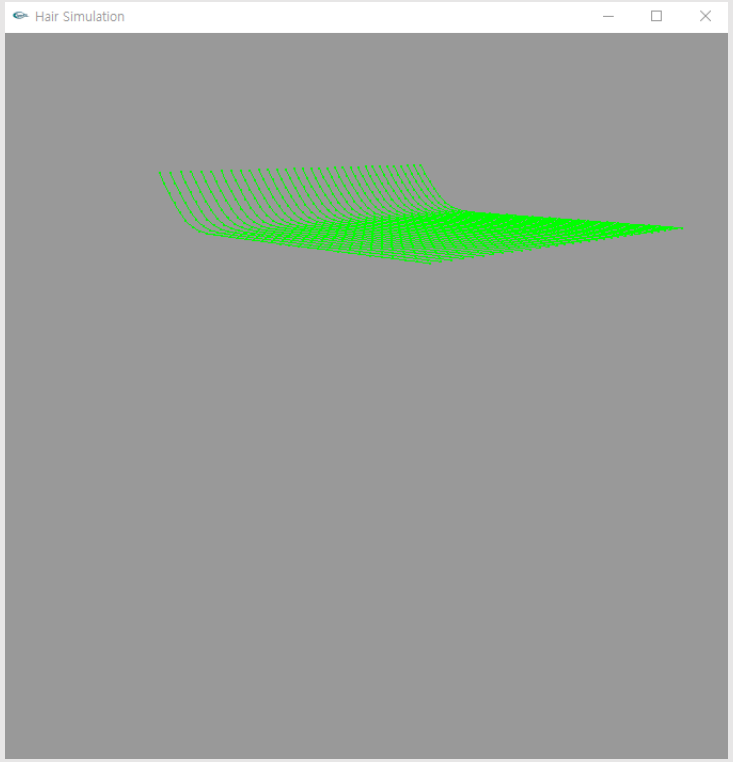
$$\mathbf{x} \leftarrow \mathbf{p}, \quad (4)$$

$$\mathbf{v}_i \leftarrow \frac{\mathbf{p}_i - \mathbf{x}_i}{\Delta t} + s_{\text{damping}} \frac{-\mathbf{d}_{i+1}}{\Delta t}. \quad (9)$$

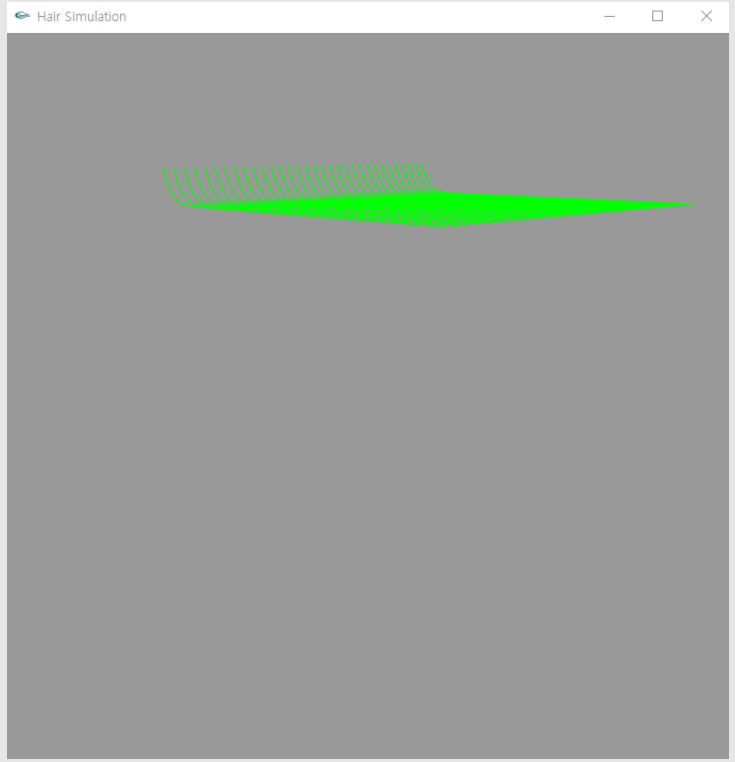


FTL 보정 예측
Particle : 32
Time step : 0.01
sDamping : 0.9

FTL 속도 보정 예측

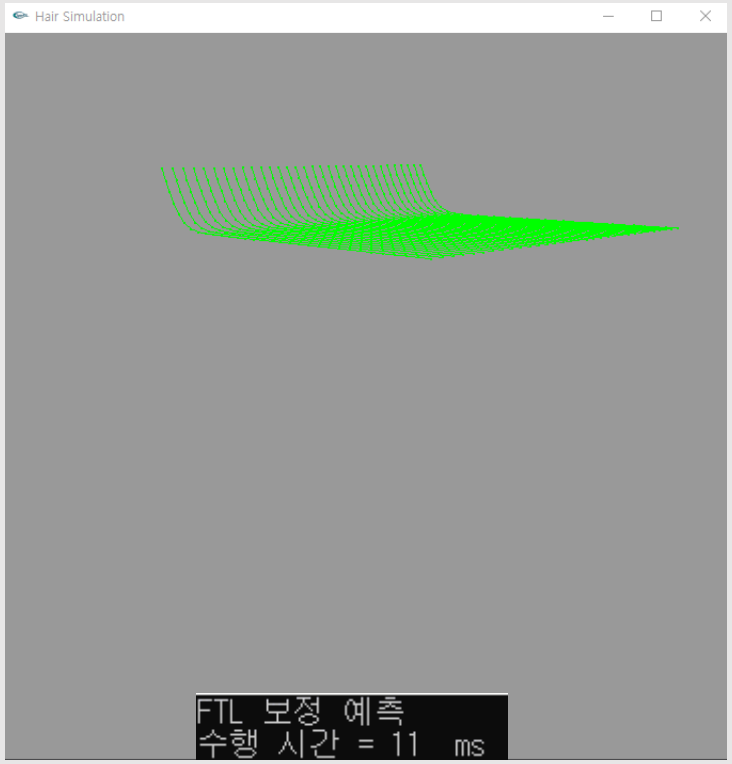


FTL 보정 예측
Particle : 32
sDamping : 1

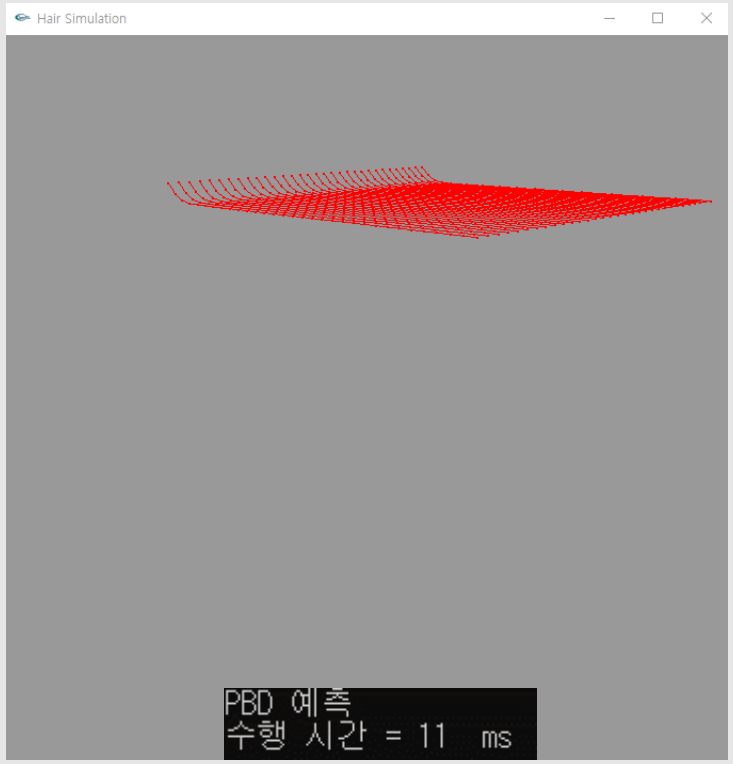


FTL 보정 예측
Particle : 32
sDamping : 0.8

FTL 보정 예측 VS PBD 예측

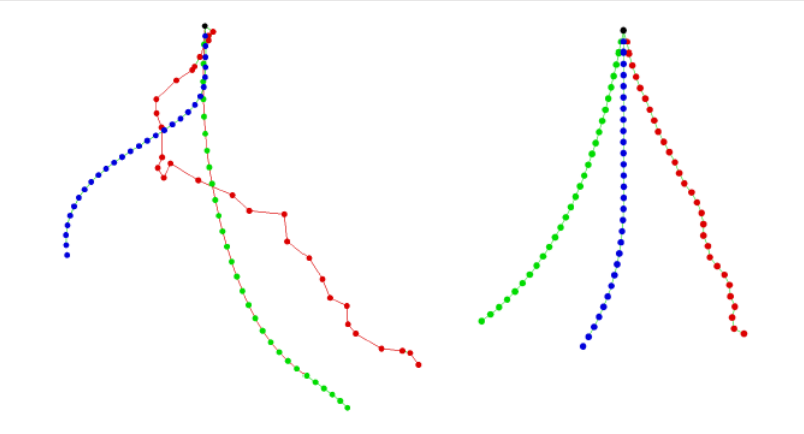


FTL 보정 예측 시간

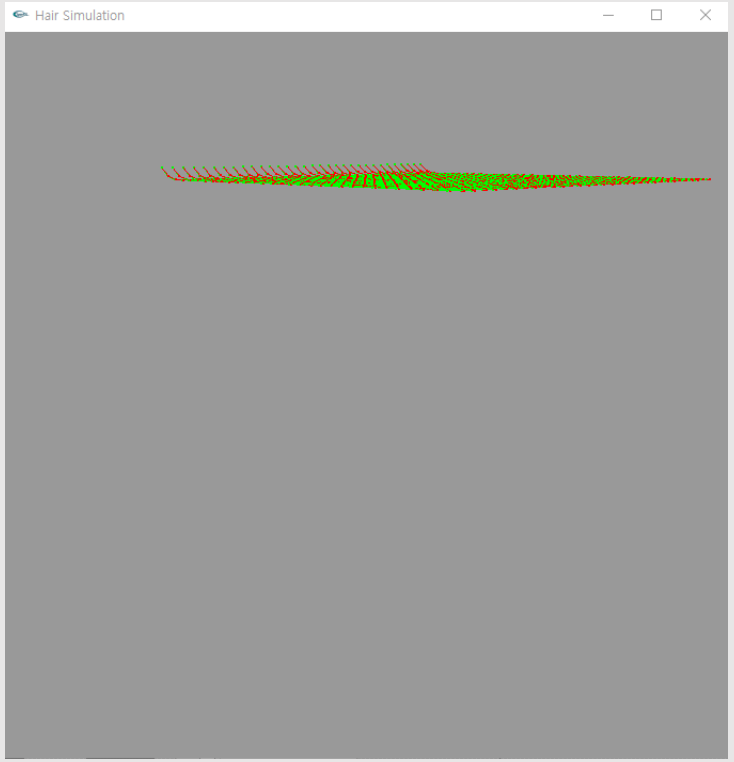


PBD 예측 시간

FTL 보정 예측 VS PBD 예측

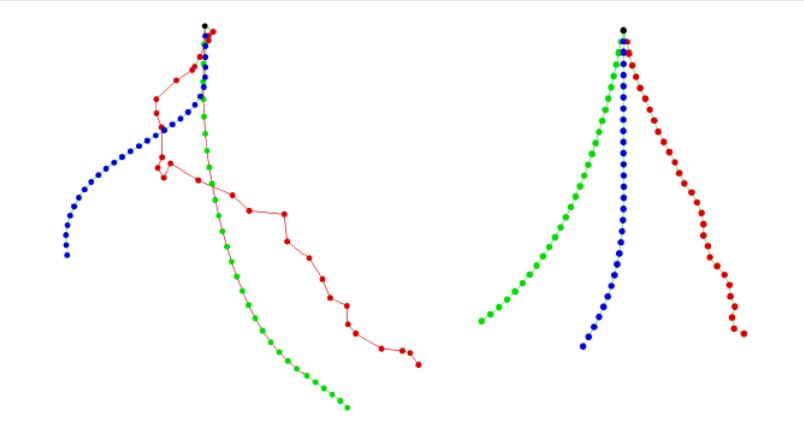


Particles = 32 * 32
l0 = 1 / 16 m
sDamping = 0.9
PBD mass = 100 / l0
PBD solve iteration = 2
FTL method iteration = 2

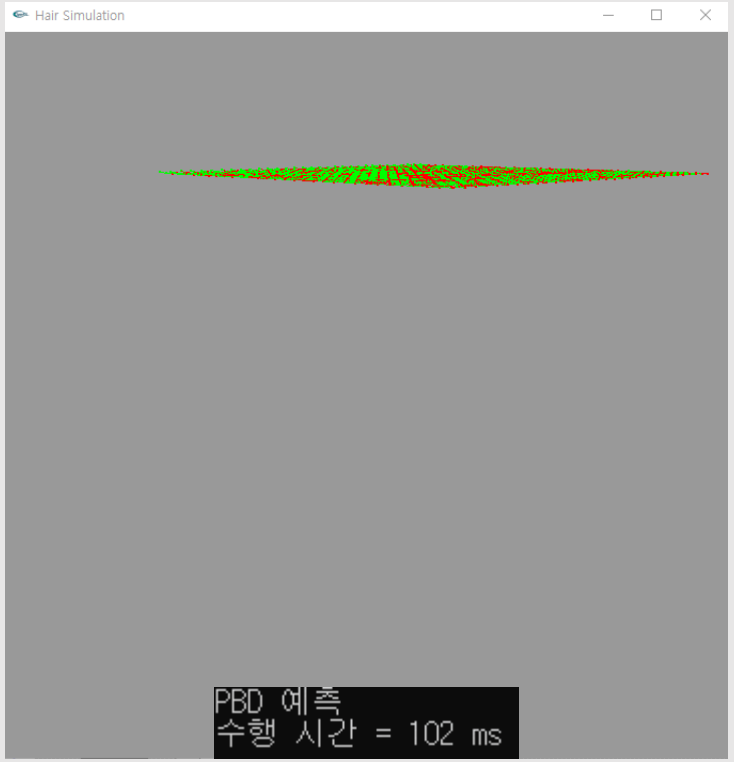


FTL 보정 예측 vs PBD 예측

FTL 보정 예측 VS PBD 예측



Particles = 32 * 32
l0 = 1 / 16 m
sDamping = 0.9
PBD mass = 3000 / l0
PBD solve iteration = 25
FTL method iteration = 2



FTL 보정 예측 vs PBD 예측

발생한 문제점

FTL 보정 예측에서 발생한 오류

$$\mathbf{v}_i \leftarrow \frac{\mathbf{p}_i - \mathbf{x}_i}{\Delta t} + s_{\text{damping}} \frac{-\mathbf{d}_{i+1}}{\Delta t}. \qquad (9)$$

각 머리카락의 질량을 damping 상수를 이용하여
구현한 것이기 때문에 발생하는 문제라 추정됨