Interaction between physics engine and Position-Based Dynamics system

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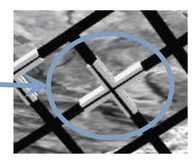
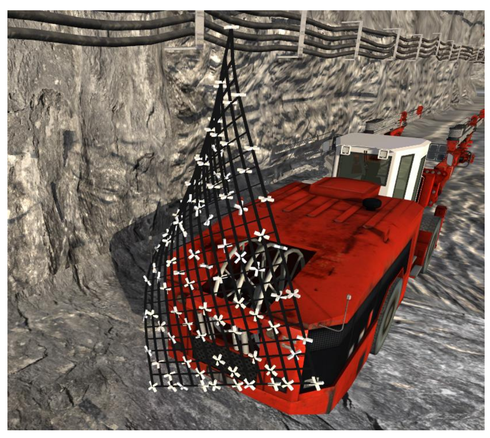
Introduction

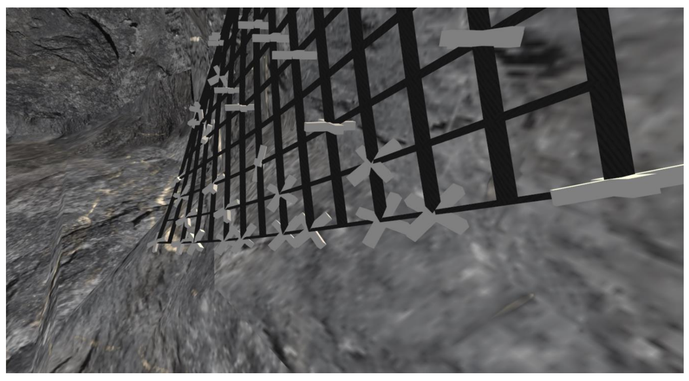
- **Physics engines** are usually based on simulation of **rigid objects**.
- Simulating **soft bodies** according to the laws of the motion requires sophisticated methods.
- This **computational effort** cannot be justified in real-time applications.
- Position-Based Dynamics (**PBD**) method by Müller et al. [1] is relatively simple, stable and fast.
- We find this model in several libraries, like NVIDIA FleX [2].
- However**, it does not mean that include the possibility of interacting with another physics engine**, such as PhysX.

Results

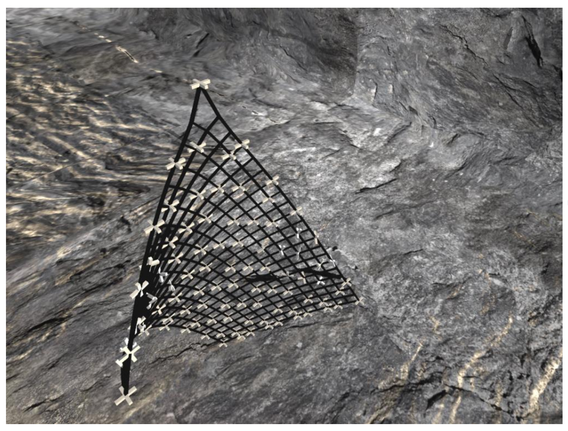
- We prove this method with a PBD mesh.
- **General collisions** of scene are detected through auxiliary rigid objects added to the mesh at the creation.

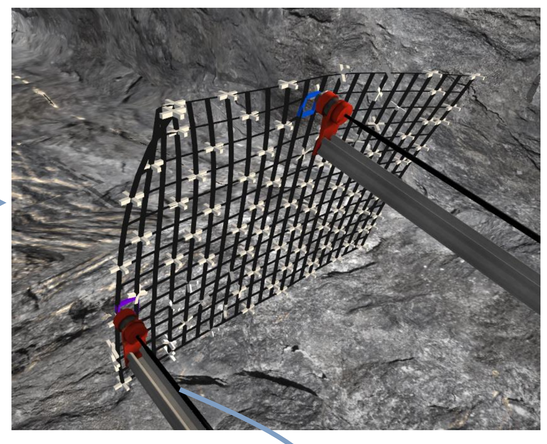


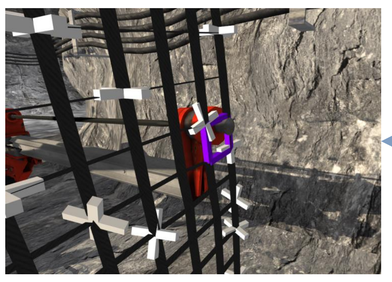




- We can also add rigid objects at runtime to detect **particular collisions** and **manage the mesh**.



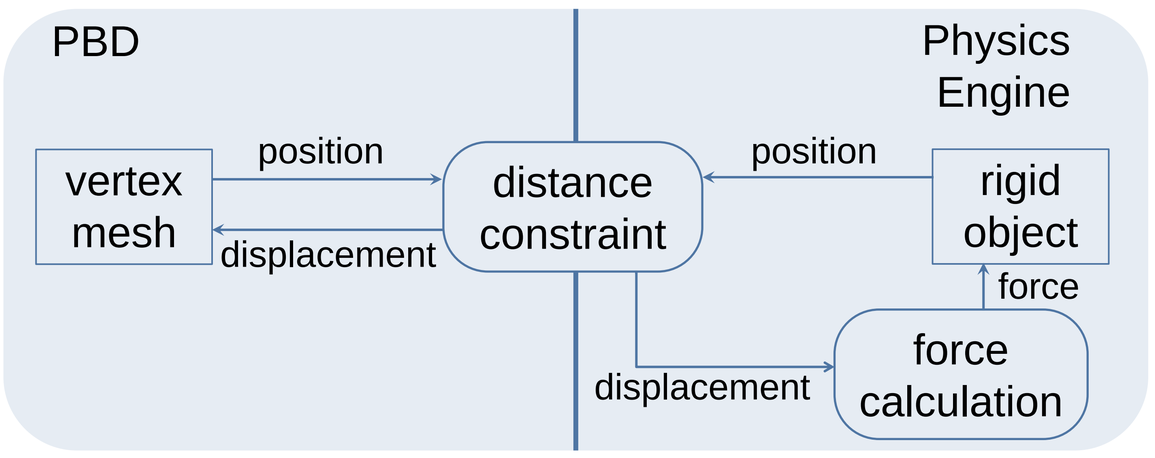




Interaction proposal

- We propose a preliminary approach which integrates components of the physics engine in the PBD system.
- We assume a virtual environment based on a physics engine.
- We include the bending constraint of Kelager et al.[3]

1. General collisions: we add auxiliary rigid objects when the PBD object is created.
   Particular collisions: we add or delete auxiliary rigid objects when collisions are detected.
2. A **distance constraint** is added inside the PBD loop **between** each of the new **rigid objects** and the **vertices of the mesh** to which they are united.



Conclusion

- We achieve a bidirectional approach of interaction between a system based on Position-Based Dynamics and a physics engine.

References

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