# Pulldownit! : Next Step in Dynamics for VFX



## What is Pulldownit?

 **Pulldownit! is a brand new dynamics solver which allows for the creation of fractures as well as massive rigid bodies simulations. By using its technology digital artists are able to simulate fast and easily scenes made of thousands of objects and collapse buildings, bridges or any kind of brittle material.**

## Features

### Shatter it!, Voronoi-based pre-cutting

The current pre-cutting tools in most 3D platform consist basically in clipping planes and fill holes modifiers; this could be enough for modelling purposes, but definitively quite poor for dynamics where you would like to pre-fracture an object in hundreds of shards to obtain believable results when simulating.

Shatter It!, the new pre-cutting tool by Thinkinetic, is designed thinking in dynamics needs; it is Voronoi-based because this scheme has showed to be the best mathematical pattern for brittle fracture, its workflow is surprisingly easy, just select a polygonal object from the viewport, input

the desired number of fragments and hit *Shatter It!* button, concavity or holes are not an issue anymore; Its technology is able to pre-fracture a high resolution model with fine detail in seconds. In addition, UV mapping is also supported.

Shatter It! introduces different cutting styles, *Uniform*, *Path based, Pivot based* and *Radial* the last one is well-suited for breaking-glass-like effects and the first for stucco or concrete materials, path based style allows for the creation of long cracks and Pivot based for located damage; but you can combine all of them at your pleasure by continue cutting the generated shards until achieving the desired look.

Although Shatter It! can be used independently of the rest of the plug-in, Its mayor advantages comes when simulating the prefractured object with the Pulldownit solver; the shards created plug easily in dynamics, also knowing Voronoi scheme generates mostly convex shards, Pdi takes advantage of this fact to speed up the computation of fracture.
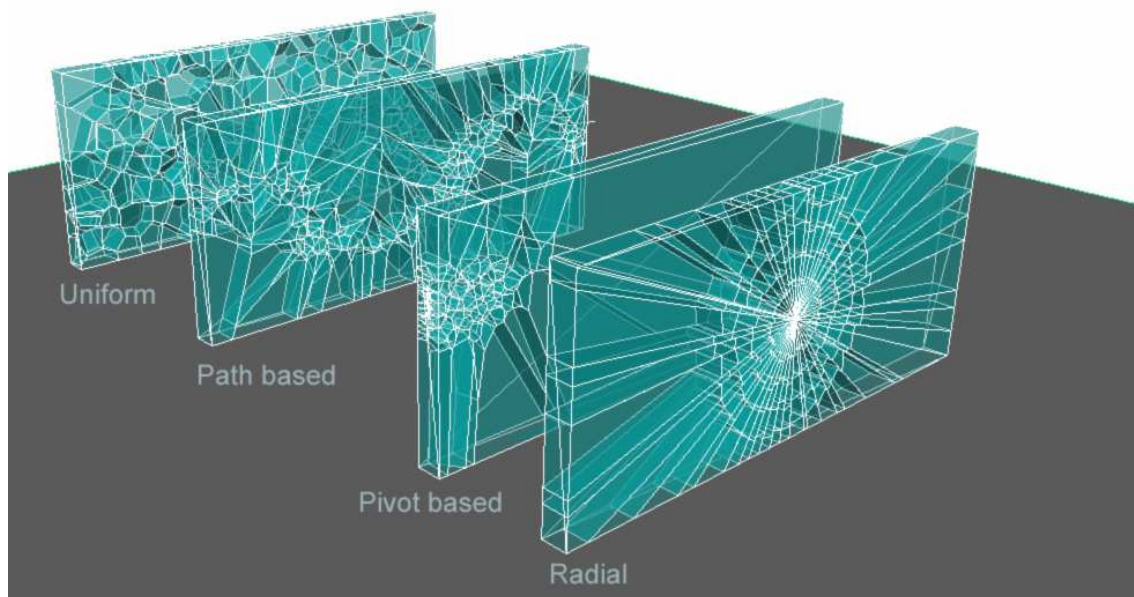


## Fast, accurate rigid bodies solver

The rigid body solver inside Pdi! is designed to resolve massive simulations, that means thousands of objects in contact. Speed is the first requirement for such a goal; we have improved over the fastest methods in the literature for both mesh and convex detection, Pdi! computes in real time for scenes made up to 100 objects and take only minutes to simulate thousands of contacts. In addition Pdi! counts with group tools allowing to set up and manage big scenes.

Pdi! solver is built upon two principles, conservation of energy and compute physically correct friction(PCF). Along these years working in dynamics for production, too many times we have seen simulations in which at any instance an object fly away surprisingly, after fixing it by damping energy or any other trick, sadly another different object explode its motion. It is very difficult to fix stability issues; our approach has been going at the heart of the matter, and we are proud to say that Pulldownit! guarantees mathematically conservation of energy even in stacking situations, adding the correct computation of friction the result are stable, nice and realistic simulations.

One of the major issues in other rbd solvers is the need to maintain a gap between objects before simulating; this is especially annoying as it forces to set up the scene in an artificial

manner, having to modify the already working objects away from its original purpose which is animation. In Pdi! there is not necessary a gap anymore; the solver logic fixes internally interpenetration problems and computes plausible motion in almost any case. As a consequence of this, users have the ability to stop the computation at any time, make changes and resume simulation.



## Fracture capabilities

Fracture has been a challenge for VFX along the years, creation of cracks and collapse of structures are still in the domain of practical effects. Models are nice to see at, but expensive to build and scale issues make them useless in many dynamics situations. Breaking apart a real model lacks always of repeatability and when collapsing big structures the security norms become a major issue.

In this first release Pdi! makes possible to overcome all of this issues by digital simulation. It is able to break apart any kind of brittle material as stone, glass or stucco. The set up is very easy, just build a structure by blocks or pieces of any shape, select all of them as a fracture object and hit play, this procedure also makes the setting of texture coordinates easier. Once in simulation Pdi! will compute all the stress forces that create cracks and finally makes the objects collapse. Fracture objects can be static as a building or dynamic as a meteor, you can create as many fracture objects as you want, and make them impact each other.

Control is always an issue in dynamics simulation, in this sense the powerful stress tools of Pdi! allow to define the start of the cracks and the way of propagation just by setting fracture frames, in which the crack will begin, and visually select regions of the object with different hardness.
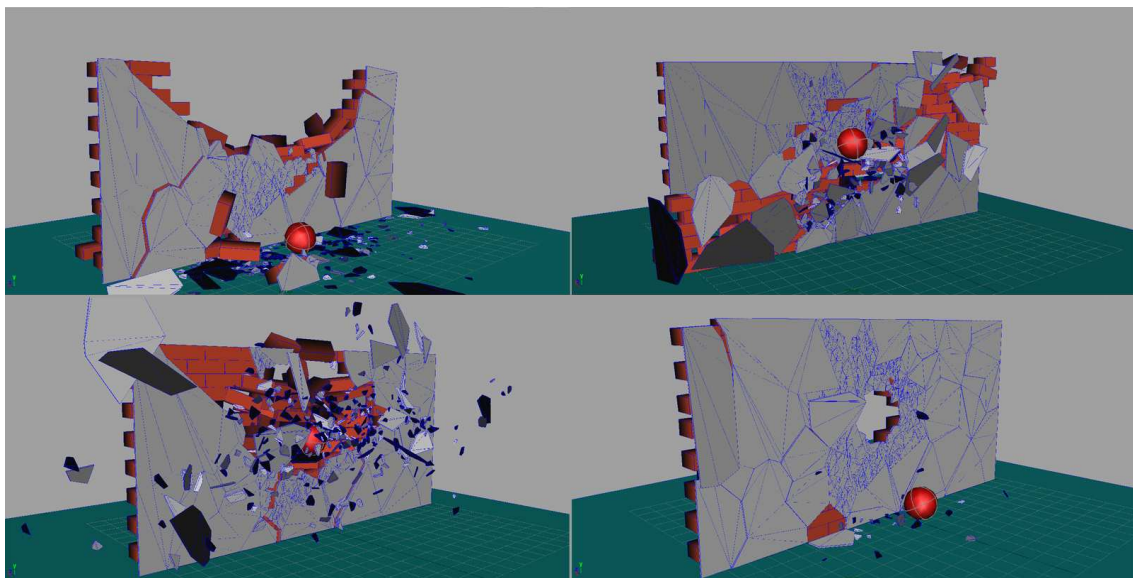
## Animation friendly

We realize that dynamics for VFX is just a necessary step to animation keys that are extremely difficult to obtain by hand. Many times we have wondered why usually dynamics solvers demand hard constraints in the way simulations must be set, forcing animators to modify their scenes in an awkward fashion that lead to collateral issues. Being aware of this, our aim is to fit in the animator's workflow never the opposite. Pdi! takes the geometry from the viewports "as-is", special care has been taken with parenting relationships, mesh modifiers and pivot offsets as we know they all are frequent source of problems.

The natural unpredictability of dynamics simulation makes necessary to play with the parameters back and forward until reaching the desired result, Pdi! not only allows to reset simulation an start again as many as needed but also pause it at any frame, tweaking parameters and resume computing. Force fields as wind, turbulence, attractors or custom fields are supported and interact with pdi objects seamlessly.

Finally as it is usual to have scenes in which animated characters interacts with their environment in a physically believable way, Pdi! allows dynamic response between key framed objects or deform meshes and the simulated ones.

## Pulldownit! Professional

Pulldownit! Professional is intended to be used in heavy production projects; it includes all the features of the standard version plus advanced capabilities as interaction with force fields and tools controlling the creation and propagation of cracks. Its computation core is fully multithreaded and the software can be licensed to be used in network environments. The license agreement includes support, fixes and updates. Optionally clients can profit of custom development and simulation services.

| Pull Down it! features | Standard | Profesional |
|---|:---:|:---:|
| Hard bodies dynamics | ✓ | ✓ |
| Massive rbd tools | ✓ | ✓ |
| Keyframed objects collision | ✓ | ✓ |
| Animated meshes collision | ✓ | ✓ |
| Basic fractures | ✓ | ✓ |
| Advanced fractures | | ✓ |
| force fields | | ✓ |
| Multithreading | | ✓ |
| Shatter it! | | ✓ |
| support | | ✓ |
| fixes and updates | | ✓ |

## Technical Specifications

**Operating systems:**

**Microsoft Windows 32, 64 bits all versions ( Xp,Vista, win7).**

**Apple MAC OS X 10.5**

**Platforms: Autodesk 3D studio Max, Autodesk Maya.**

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