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# Animating Explosions

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# What are Explosions?

## Energy

- Sudden burst of energy from mechanical, chemical or nuclear source
- Causes discontinuous jump in pressure, density, and temperature along the wave front

## Shock Waves

- Shock waves reflect, diffract, and merge, allowing them to exhibit a wide range of behavior
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# Modeling Explosions?

## Before Graphics

- Using miniature models
- Full scale in real world

## Using Graphics

- Heuristics
- Physics based simulations
- Analytical function or Recorded data

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# Key Ideas

- Using fluid and particle based system
- Model explosions as compressible, viscous flow
- Includes two way coupling between dynamic objects and fluids

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# Progress

## Particle System

- Radial explosive motion
- Reflective properties on interaction with non reacting surface

## Fluid System

- Pressure wave
  - Viscous Flow
  - Density and temperature based colouring
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# What Next?

## Coupling

- Merge Fluid and particle model to get more realistic shock wave results

## Fluid Behaviour

- Directionality in flow
  - Conservation of momentum
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# What Next?

- Dust Clouds
  - Realistic Colouring
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# References

## Libraries Used

Basic Algebra Classes (<https://github.com/sidch/DGP>)

OpenGL

## Other Sources

For Lighting and Camera

(<http://perso.uclouvain.be/vincent.legat/teaching/meca2170/opengl/9900/cao18/masexp-c>)

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# References

## Theorey References

[Animating Explosions](#), Yngve, O'Brien, Hodgins, SIGGRAPH 2000

Particle Engine Using Triangle Strips

([http://nehe.gamedev.net/tutorial/particle\\_engine\\_using\\_triangle\\_strips/21001/](http://nehe.gamedev.net/tutorial/particle_engine_using_triangle_strips/21001/))

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# Demo

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