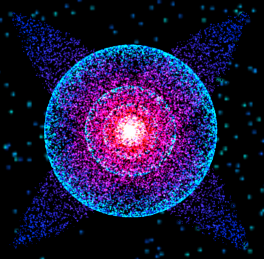
Stardust Studio Beta

A new Gravitational Physics Sandbox for Mac & iPad



App Layers:

Show or hide each independently, adjustable transparency

Particle Cloud Layer
- Rich tools for setting start conditions– relative motion, size, starting shape, rings
- "heat map" mode – particle color encodes velocity
- displays escape velocity
- exhibits shock waves & other emergent phenomena

Grav Layer
- Individual gravity objects: Building blocks –drag them to place, set mass, color, name
- Live display of velocity / acceleration vectors
- Change velocity by dragging its vector
- Camera follow
- Easily assign orbits

Trails Layer
- visualize particle & Grav motion by tracing their path
- select particles to trail – fastest, slowest, & more.

Telemetry Layer
- shows scale, coordinates, object vectors.
- measure distances, angles

The Scenario Library:

- Models of Solar System, Galilean moons, Gravity slingshot maneuvers, 3– body solutions, Ring Systems, Alpha Centauri system, and more

App Environment
- infinite zoom up / down
- vary timescale / speed
- velocity histogram (Mac)
- multiple gravitation models
- Real Mac / iOS Native, Built in SwiftUI

Performance:

- Animates 2 – 4 million particles/ sec:
  50k particles @ 50 frames/sec
  80k particles @ 30 fps, etc.
- even on mobile devices.
- No approximation. Complete gravitational calculation on every particle every frame, accuracy << 1%
- Fully interactive – add or change objects as it runs, see live effects

To Install the open Beta from Apple TestFlight:

1) If you don't have Apple TestFlight, download it free from the app store for Mac or iPad.

https://apps.apple.com/us/app/testflight/id899247664

2) Download & Install Stardust Studio Beta:

https://testflight.apple.com/join/em9a1ZDv

System Requirements:

macOS 14+ / iOS 17+
Apple silicon Mac or iPad (M1 or later)

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Experiments & Demos:

Explore -

- where would the moon orbit if the earth disappeared?
- can a moon have a moon? how many levels can you go?
- how do "gravity slingshot" maneuvers work?
- can 3 things mutually orbit?
- Dark Matter.
- how do ring systems behave?
- barycentric orbits

RoadMap:

1.0) Initial release

remaining to complete:

- Save Scenarios
- UI Cleanup
- More performance tuning

1.1) Orbital Mechanics Release

- Kepler diagram: equal time - equal area
- Plot orbits (not just trace)
  show periapse, apoapse, foci
- orbital resonances
- lagrange points
- Hill Sphere
- increase accuracy of secondary orbits

1.2) Metal GPU Implementation