Visualizando partículas cósmicas em um domo imersivo com a Blender Game Engine

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Experience the Universe
Cosmic Sensation

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Cosmic Particles Detectors
+
30 meters Immersive Dome
+
Blender Game Engine
Science

- Radboud University Nijmegen
- Prof. Sijbrand de Jong
- Muons
- Barney Broomer
- Academic Yearprize
- Experiment
Why?

• "Science to the masses"
  – bringing to daily life events you wouldn't experience otherwise

• Exploring new mediums
  – realtime + fulldome
What?

- 3 days of Silent Disco
- generated music + DJ
- generated effect light
- generated visuals
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Immersive dome
Immersive dome

- Seamless field of view, 3D surface
- Domes are cool
- Unexplored medium
Blender Game Engine

• Realtime

• Open Source

• 3D Game Engine

• Dome compatibility
How?
Development Process

- “1 year project”
- Dome creation framework
- Art contest
- Blender 2.50
“It’s not what Blender can do for you, but what you can do for Blender.”

One year ago we had:
• blenderplayer not building and not working
• no proper interface for the BGE
• Bugs, bugs, bugs

BGE was not ready yet (stable/reliable)
Blender 2.56beta

Blender 2.49
one year before the event

... tests, tests and more tests ...

• Stitching tests
• OSC tests
• Performance tests
• Output tests
• Blender/BGE tests
• Content brainstorms
one year before the event

... tests, tests and more tests ...
two months before the event
two months before the event

- no more art contest
- finalized a few concepts for the visuals
two months before the event
one month before the event

“No man is an island.”
John Donne

“Less is more.”
Mies van der Rohe
ten days before the event

• entire team flew to Holland to collaborate on site.

• **artwork**: creation, production

• **coding**: optimization for this particular setup + small patches
the event
Part II: Code

“Previously at Blender Conference …”

– Multiple cameras
– CubeMap
– Stitching
Challenge: 4K x 1K @ 60fps
optimizations

• speed and resolution and no compromise
  – "to make the optimum geometry to accommodate the maximum of valid pixels"
  – performance is proportional with the number of render cameras

• FBO

• off-axis frustum

• pyramid solution - 3 cameras - 120deg.
Implemented Solution

Vertical F.O.V. x 2 = \cos (120)
buffersize = vertical F.O.V. / sqrt (2)
Part III: Logic

• Particle Sensors sends data to Isadora as MIDI sequence
• Blender reads the data from Isadora via OSC/Socket (Python)
• Blender emits a virtual muon for every muon the sensor detect.
• Also has manual keyboard control for 'Vjing' (adjustable parameters)
Part IV: Art

- Concept
- Production
- Graphic Techniques
- Extra: Mini-Game
Part IV: Art

- Concept
- Production
- Graphic Techniques
- Extra: Mini-Game
Concept

- make it look 3D
  - depth and perspective
Concept

- Invisible as Muons
- Visible as Muons
Concept

• limitations of the dome system
  – It has to be dark
  – scale
  – It is not a Fulldome
Concept

• Inspiration
  – Tron Legacy
    • neon lights
    • glossy dark glass effect
    • dark background
    • high-tech
Concept - Inspiration

Tron Legacy
Concept - Inspiration

Tron Legacy
Production

“Production is that part where we take all the plans and rip them in tiny parts to build something completely different.”
Production

• Iterative process

• the final product is quite different from the initial concept.

• some logic bricks, 1000 lines of python, 500 lines of GLSL shaders, no audio
Production
Graphics Techniques

- Platform
- Particles
- Water wave
- Post processing
Graphics Techniques

- Platform
- Particles
- Water wave
- Post processing
Platform

- Light Attenuation
- 3D Geometry
Graphics Techniques

- Platform
- Particles
- Water wave
- Post processing
Particles

• Stretch of particles along velocity vector

\[ \text{linV} = \text{Vector(obj.worldLinearVelocity)} \]
\[ \text{obj.alignAxisToVect(linV, 2)} \]
\[ \text{obj.localScale} = [1, 1, 1 + \text{linV.length}] \]

• Spiral particles

• Node based material
Graphics Techniques

- Platform
- Particles
- Water wave
- Post processing
Water Wave
(a.k.a. PS3 effect)
Water Wave

- Shader, Shader and more Shader
Graphics Techniques

• Platform

• Particles

• Water wave

• Post processing
Post Processing

• Hue
• Sharpness
• Brightness
• Saturation
• Gamma
Extra: Mini-Game

Le Grand Finale
Part V: Post Mortem

• Limiting performance with large number of object (particles)
• Amazing engine for rapid prototyping.
• It was an experiment and a learning experience.
• Made patches specific for this project, but probably will never be accepted in trunk (too hacky or too specific).
• Completely burnt out at the end of the project :(
You should read more
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“Mastering Blender Game Engine”
Mike Pan, Dalai Felinto
CENGAGE

To be released after Blender 2.6
Available for pre-sale
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