A Brief Introduction to High Dynamic Range Lighting on the Xbox 360

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Outline

- High Dynamic Range (HDR) lighting
- The Xbox 360 graphics architecture
- The slow solution
- Bungie's solution
- Our solution
- Implementation details
Viva Piñata example
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Halo example
Halo example
Over-exposure: current situation
Over-exposure: ideal situation
The Xbox 360 graphics architecture
The slow solution
Bungie's solution

Game Data → Render, Shrink → EDRAM → Adjust, Stretch
Our solution

Game Data

Render, Compress

EDRAM

Decompress
Compression
Compression
Compression

The diagram shows a linear relationship between $f(x)$ and $x$, with $f(x)$ ranging from 0 to 511 for $x$ ranging from 0 to 255.
Compression

The diagram illustrates a function $f(x)$, where the x-axis represents input values ranging from 0 to 255, and the y-axis represents output values ranging from 0 to 511. The function appears to be a linear transformation, mapping each input value to an output value with a corresponding increase by 255 units.
Compression
Implementation details

Other considerations:
- Frame brightness
- Bloom post-processing
- Framerate
- Artist control
Implementation details

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Implementation:
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- Pixel and Vertex Shaders written in Microcode
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Implementation:
- DirectX 9.0 API
- Pixel and Vertex Shaders written in Microcode
  - Registers are \((x,y,z,t) / (r,g,b,a)\) constructs
  - Assembly-level instructions: add, sub, mov, cndge
Questions?

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