Designing a Standardized Benchmark for OpenEXR

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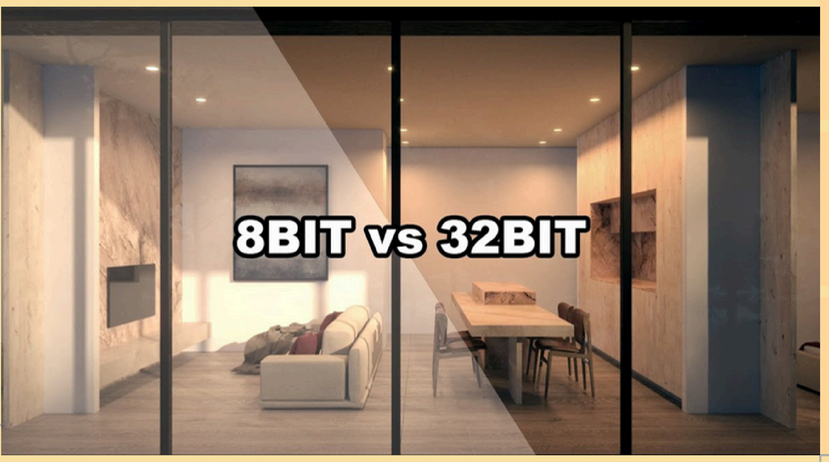
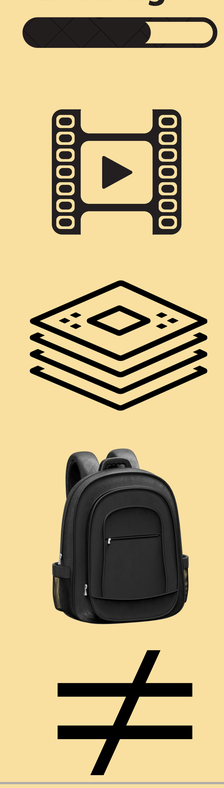
Introduction

- **OpenEXR:** Industry HDR format (16/32-bit floats) compared to PNG/JPG that are 8 bit format.
- **Current Gap:** No standardized framework to compare compression performance.
- **Objective**: Designing a benchmark for real world VFX workflows.



Source: https://www.youtube.com/watch?v=UnCyv10bWUw

Test Suites	Rationale	Test Procedure	Metrics
Simple Read	Baseline test for reading entire EXR into memory.	Load full image; measure total load time, memory usage, decompression overhead.	- Load Time (ms) - Memory Footprint (MB) - Decompression Ratio
Playback	Simulates daily review (“dailies”)	Repeatedly read a sub-rectangle for each frame; record sustained throughput.	- Frame Access Time - Playback Consistency - Throughput
Compositing	Reflects scanline-based access in compositing software.	Request scanlines in pseudo-random order to gauge partial reads.	- Scanline Access Time (ms) - Random-Access Overhead - Parallel Speedup
Rendering	Measures tile-based reads used by modern 3D renderers.	Load tiles at various MIP levels; simulate partial loading for camera view.	- Tile Access Time (ms) - MIP-Map Transition (ms) - Memory-to-Detail Ratio
Format Mismatch	Tiled vs scanline misalignment	Read tiled files as scanlines and vice versa; compare extra overhead vs. optimal layout.	- Mismatch Penalty (ratio) - Extra CPU/Memory Overhead



Methodology

- **Literature review:** Analyzed TPC-C guidelines and other papers to isolate key qualities: relevance, repeatability, verifiability, good metric.
- **Industry Expertise:** Collaborated with Academy Software Foundation (ASWF) OpenEXR project to identify real world use cases.
- **Synthesizing Real-World & Theoretical Insights**: Combined benchmarking practices with VFX-specific needs to define technical test suites and appropriate metrics.

Future Direction

- **Test Suite Implementation:** Develop test scripts for each use case.
- **Open Source Data Integration**: Using libraries (OIIO, Netflix data, etc.) to ensure reproducible tests.
- **Long-Term Evolution:** Periodically update the benchmark to reflect new VFX workflows.

Validation and Verifiability

- **Controlled Test Environment:** Plan to run each test suite under consistent hardware/software setups, repeating tests to monitor variance.
- **Open-Source Transparency:** Provide public access to scripts, datasets, and environment settings, enabling independent replication.
- **Statistical Rigor**: Use standard measures (e.g., standard deviation) to ensure observed performance differences are statistically significant rather than random.