Illusion Labs

On Mobile Computer Graphics

2009-11-24

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CREATING THE WOW EFFECT

Agenda

- About Illusion Labs
- iPhone graphics coding caveats
- Useful development tools
- Optimization tips and tricks
- Time for questions

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About us

- Computer Science at LTH
- Founded in 2007
- Located in Malmö
- 5 employees + 2 freelance
- Illusion Labs - Creating the WOW effect

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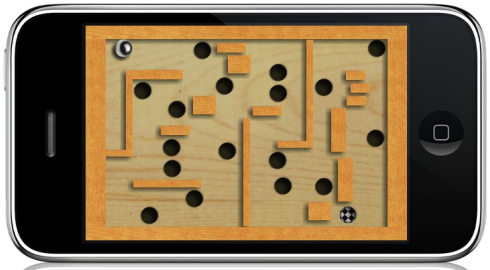
About us

- Labyrinth
  - First commercial game
  - Before the app store
- Ipint – Ad app
  - London agency
  - Cannes Silver Lion Award



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About us

- Touchgrind
  - High risk project, would people like it?
  - Released one year ago

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About us

- Sway
  - Platform game
  - Innovative controls

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About us

- Labyrinth 2
  - Will be released this week (hopefully..)
  - Added all the fun things we could think of
  - [show trailer]

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About us

- Games based on OpenGL ES 1.1
- Backward compatibility
- Support all devices (iPhone / iPod touch)
- Will probably use OpenGL ES 2.0 in coming productions

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Graphics coding caveats

- Keep number of draw calls down
  - Prepare on CPU (batch etc)
  - Precalculated or per-frame

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Graphics coding caveats

- No stencil buffer
  - Using depth buffer as stencilbuffer to prevent double shadow draws
- Don't make textures unnecessarily large to avoid cache misses.

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Graphics coding caveats

- VBO (Vertex Buffer Objects) are generally good to use, but they havn't done it for us.

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Graphics coding caveats

- When rendering to texture, ordering is important (deferred rendering)
  - Rendering to one buffer must fininsh before swapping can occur
  - For example when doing shadow mapping and special effects

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Graphics coding caveats

- Cheat as much as possible!
  - Geometric shadows in Touchgrind
  - Smooth shadows in Sway
  - Reflection mapping on ball in Labyrinth

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Useful development tools

- Shark
  - Profiling your code
  - See exactly how much time each function takes

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Useful development tools

- Instruments
  - Find your memory leaks
  - See how much texture memory the system allocates

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Optimization tips & tricks

1. Avoid alpha test and "discard"

Use blending instead.

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Optimization tips & tricks

2. Don't depth-sort opaque surfaces

But do

- Render opaque objects first
- Render objects with discard second
- Render sorted, blended objects last

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Optimization tips & tricks

3. Batch draws and minimize state changes

Batch as much work as possible into a single draw call

Group and draw by state:

- set state 1
- draw some objetcs
- set state 2
- draw some other objects
- etc

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Optimization tips & tricks

4. Use proper vertex data management

Align each vertex atribute and their strides on 4 byte boundaries (very important on the iphone)

Use smaller data types (short, unsigned byte)

Interleave vertex data

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Optimization tips & tricks

5. Use proper texture data management

Use texture atlases (group textures together)

Use compressed textures when possible (it's easy)

- Reduces memory bandwidth
- May give better quality (can use bigger textures)

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Optimization tips & tricks

6. Minimize memory footprint

Texture format (compressed, mipmapped)

Vertex format (minimal size)

Use 16 bit buffers instead of 32 bit if possible (color buffer, depth buffer etc)

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Optimization tips & tricks

7. Use GL to draw landscaped content

Do NOT use CALayer transforms to do landscape.

Use GL instead:

- Swap width and height on the viewport sizing
- Add a model-space rotation around z

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Optimization tips & tricks

8. Make your GL layer opaque

```
CAEAGLLayer *eaglLayer = (CAEAGLLayer*)self.layer;
eaglLayer.opaque = YES;
```

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Optimization tips & tricks

9. Draw only when needed (Save battery)

Limit frame rate

Stop drawing for a scene that's not changing

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Optimization tips & tricks

10. Write efficient shaders

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Thanks!

Any questions?

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