Intelligent Lighting for a Better Gaming Experience

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Visual design/presentation

- Camera (Placement, Angle)
- Character (Placement, Orientation)
- Lighting

Affect the perceived
- Visual attention
- Visual tension
- Character relationship
- Depth
How do designers design visuals?

- Camera orientation and position
- Characters positions and orientations
- Mood
- Dramatic intensity
Problem: unpredictability

- Camera orientation and position
- Characters positions and orientations
- Mood
- Dramatic intensity

⇒ Need to *redesign for every change*
Current Techniques

- Ambient Lighting design
- Static lighting design
- Dynamic lighting design

The next step – ELE:
- *dynamic lighting* + *intelligent control system*
- *general intelligent dynamic lighting* + *designer controls styles & design goals* (lighting style sheet)
Ambient Lighting

- Gives you the feel of a toy like environment
- But:
  - Not realistic
  - Flat
Static Lighting Design

Manually setting light layout (light maps)

Advantages:
- realistic
- Controllable

Disadvantages:
- Don’t adapt to variations in the environment
- Requires much memory

Images from Lightmaps (static shadowmaps) article written by Kurt Miller from: http://www.flipcode.com/articles/article_lightmaps.shtml

Image from Max Payne
Problems with Dynamic Lighting

Movie blade.avi
Problems with current methods

(a summary)

- **Static lighting**
  - Does not adapt to changes
  - Requires much time and effort to construct

- **Dynamic lighting**
  - Needs more intelligent control
  - Requires much time and effort to script
ELE – Expressive Lighting Engine

Build a lighting system that:

- **Intelligently** adjusts lighting in real-time to accommodate context and effect.
- Based on **cinematic theory**.
- Allow **artist** to **control** lighting at a **high-level**.
Lighting Design Goals

- Ensure visibility
- Conform to practical sources
Lighting Design Goals

- Establish visual attention
- Establish depth
Lighting Design Goals

- Parallel dramatic tension
- Provide mood
Conflicting Goals

Problem:
- Angles
- Colors

Depends on style, gameplay, and context
ELE (Expressive Lighting Engine)

The three subsystems: use optimization to find best solution given context, desired effects, state, and artists’ constraints.
Automatic light allocation

- find best allocation depending on:
  - Modeling
  - Depth
  - Visibility
  - Visual Continuity
  - Visual Focus
  - Low vs. high key
Lighting angle Selection

- Select azimuth, elevation angles

- Lighting designers specify goals:
  - Visual Continuity
  - Motivation of direction
  - Visibility
  - Modeling
  - Mood

- ELE finds best light angles to meet goals
Choosing Colors

- Color (Hue + saturation + intensity)
- Compose colors for different areas on the set
Choosing Colors

Adjust colors to accommodate desired:

– Depth
– Dramatic Intensity
– Dramatic focus
– low vs. high key setting
– Specific author-suggested
  ■ Hue, Saturation, Lightness, color Warmth for focus, non-focus, and background
  ■ Palette restrictions specifying style

+ maintain visual continuity and style
Dynamic Intelligent Cinematic Lighting can make a difference in games
Demo (Dynamic Lighting)

Movie with ELE
Demo (Static Lighting)

Movie without ELE
Use of color in the Demo

- **Red** means danger
- **Saturation** is the level of danger
- **Green** means health

**Dynamically** accommodating the interaction
Conclusion

- **ELE:**
  - *Intelligently* adjusts lighting in real-time to accommodate context and effect
  - Based on *cinematic theory*
  - Allow *artist* to *control* lighting at a *high-level*
  - Takes the artist 10% in the way (lighting style sheet)