Intelligent Lighting for a Better Gaming Experience

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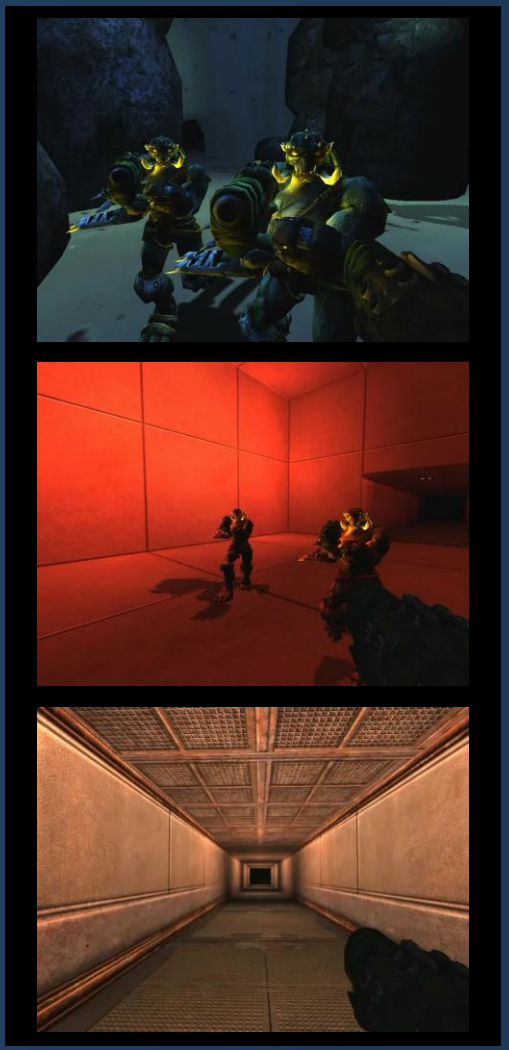


Visual design/presentation

- 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

} **depend on user**

⇒ **Need to *re*design 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

Image from the ***Sims***

Static Lighting Design

Manually setting light layout (light maps)

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

Advantages:

- realistic
- Controllable

Disadvantages:

- Don't adapt to variations in the environment
- Requires much memory

Image from ***Max Payne***

Problems with Dynamic Lighting

- Movie blade.avi

Problems with current methods

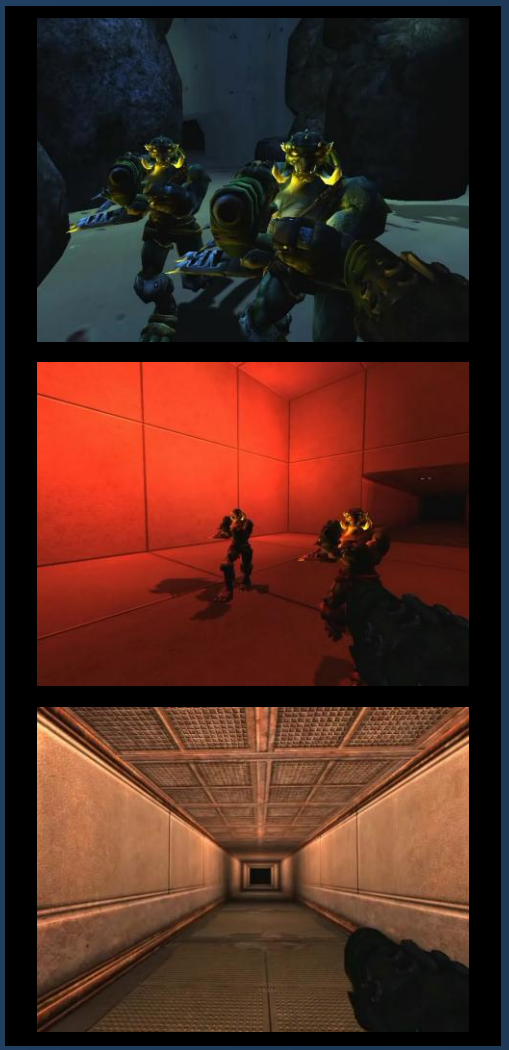
(a summary)

- 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 accommodate context and effect
- Based on ***cinematic theory***
- Allow ***artist*** to ***control*** lighting at a *high-level*



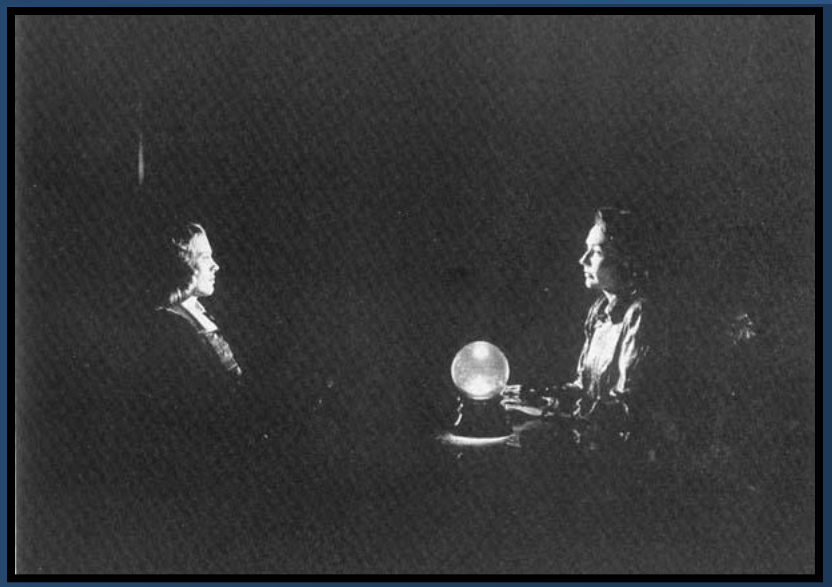
Lighting Design Goals

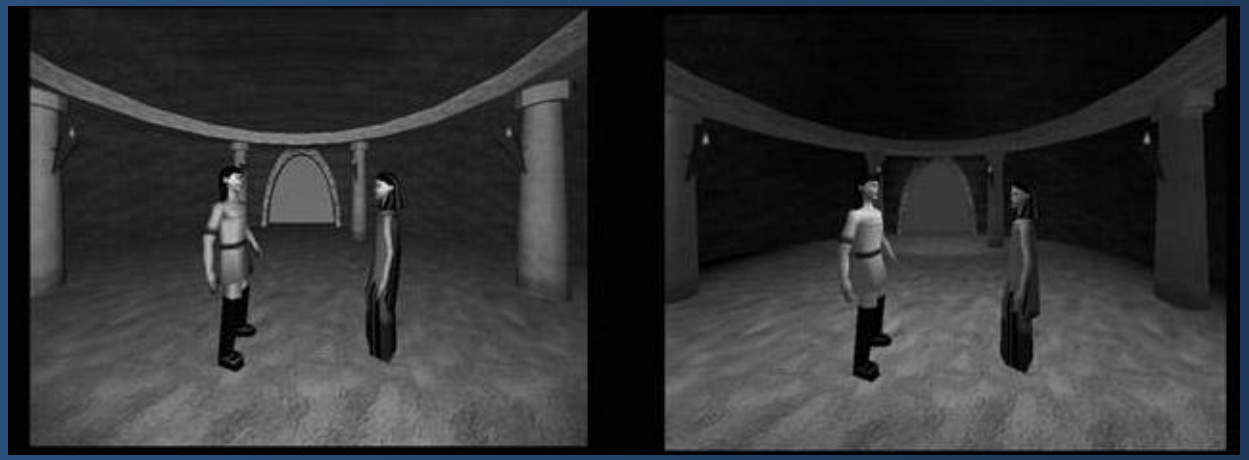
- Ensure visibility

- Conform to practical sources

Lighting Design Goals

- Establish visual attention
- Establish depth





Lighting Design Goals

- Parallel dramatic tension
- Provide mood

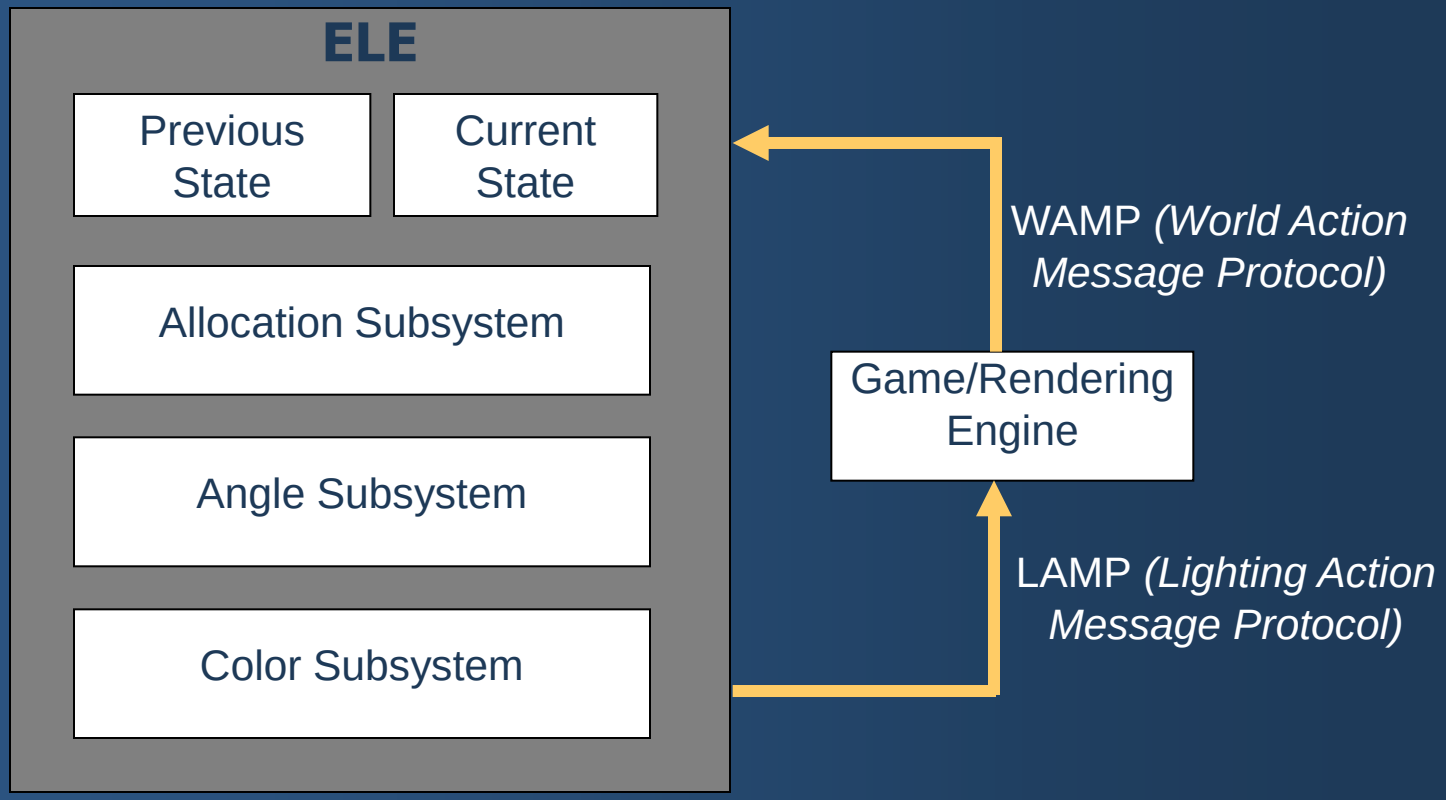
Conflicting Goals

Problem:

- Angles
- Colors

Depends on style, gameplay, and context

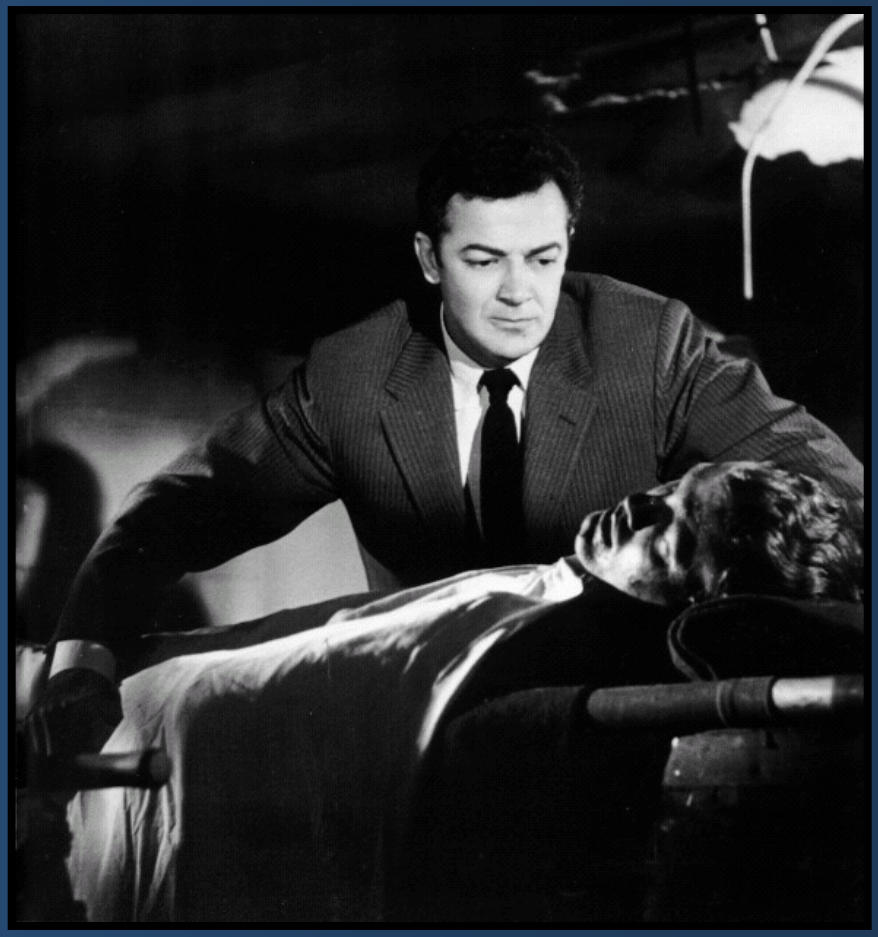
ELE (Expressive Lighting Engine)



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

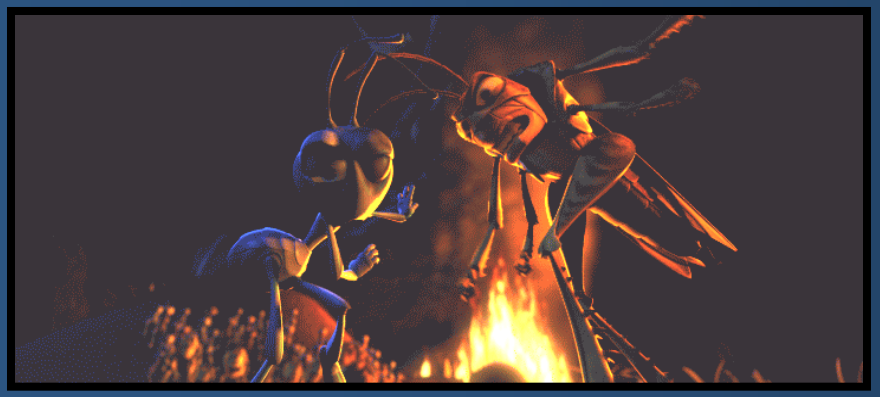


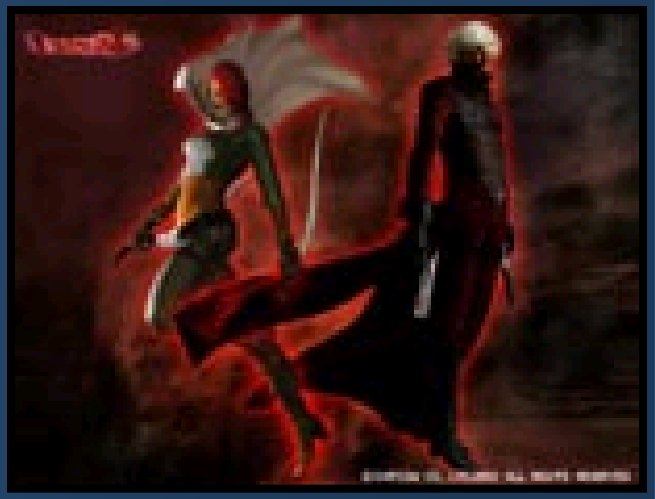
Lighting angle Selection

- 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***

Demos

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 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)