

# Newsletter – Issue 010

Welcome to the KARA newsletter. These newsletters will keep you informed about the research and development that the KARA project team are undertaking.

The project goal is to examine the potential of Gen AI in game development through applied R&D.

## Contents

This newsletter explores an innovative Al-powered lighting pipeline developed internally for Unity, which automates scene lighting configuration through ChatGPT integration.

The system streamlines traditional workflows by combining image analysis with automated parameter implementation, demonstrating significant time savings while maintaining artistic control.

### Content list:

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Standard lighting pipeline
Al-Infused lighting pipeline

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What is KARA?

the true potential of AI for video game development.

This includes a focus on how GAI tools can boost 3D art pipelines.

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## Introduction

Lighting configuration remains one of the most time-intensive aspects of 3D scene development, requiring precise balance between technical parameters and artistic vision.

Our internal R&D project addresses this challenge through an AI-assisted pipeline that leverages ChatGPT's analytical capabilities alongside Unity's scripting API. This system reduces manual iteration cycles by automatically generating lighting configurations based on visual analysis while adhering to project-specific technical constraints.

In this issue, discover Detonation Racing's automated lighting pipeline.

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Creating effective lighting in Unity involves configuring multiple elements. The process can be intricate, potentially incorporating various combinations of:

### Light Sources:

- Directional (sunlight)
- Point (omnidirectional)
- Spot (cone-shaped)
- Area (soft, diffused)
- Global Illumination (GI)

### **Post-Processing Effects:**

- Bloom
- Ambient Occlusion
- Colour Grading
- Lighting Settings

### Probes:

- Reflection Probes
- Light Probes

### **Environmental Effects:**

- Skybox
- Ambient Light
- Fog
- Exposure
- Volume Settings (HDRP)
- Emissive Materials



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### **PIPELINE SPOTLIGHT Standard lighting process**

## Define and design scene lighting

Artists assess reference images and scene geometry to determine lighting requirements, considering factors like time-of-day and mood establishment. This process often involves cross-department consultations with level designers and technical artists.

Testing out directional light intensity and some colour schemes.





Using Unity's lighting window, artists manually input values for directional light intensity (typically ranging 0.5-3.0 lux), shadow softness (0.1-1.0), and ambient RGB values through trial-and-error adjustments. Post-processing effects require separate configuration across multiple interface panels.

### Iterate and validate

Scene lighting undergoes repeated baking processes and gameplay testing to verify visual consistency across different times of day and weather conditions. Artists must manually adjust parameters when adding new assets or modifying scene geometry.



Base fog pass to give the scene depth.





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This specific pipeline was designed for scenes requiring exterior lighting setups. While effective for establishing base lighting conditions and broad environmental illumination,

> Skybox and ambient light balanced with fog, post process effects like bloom and exposure values introduced.



# **PIPELINE SPOTLIGHT Standard lighting process** Kenvorus Studios 4/4

## intensity, visual quality, and performance, the artist moves on to postprocess effects.

across multiple interface panels.



Post process effects like bloom and colour grading balanced.



Final scene render. Additional final post processing effects such as lens flare on the light is applied.

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# **PIPELINE SPOTLIGHT**

ISSUE: 010

Let's now turn our attention to the Al-infused pipeline and examine how it can instantaneously transform Unity scenes with Al-assisted lighting.

By inputting an image, you can generate various lighting setups; ranging from bright mornings to atmospheric sunsets in a matter of seconds.

This innovative approach offers a swift and efficient method for creating diverse lighting environments.



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Azure





**PIPELINE SPOTLIGHT Al-Infused lighting pipeline** 

### We built a 'visual context capture tool'

A Unity plugin has been built to enable you to upload a reference image to Azure AI. This is then processed through base64 encoding. User preferences, such as generating lighting, environmental ambience, and post-processing effects, are retrieved and interfaced with ChatGPT via the Azure API.

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Upload image for Al-driven analysis

ChatGPT is directed to analyse the provided image. Our system uses three prompt templates: directional light, post-processing, and environment, to streamline the scene setup. These manage lighting, visual effects, and atmospheric elements, respectively.



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### . OBSERVATION PHASE

- Identify the main light source (usually the sun or primary light)
- Analyze the overall ambient lighting in shadow areas
- Note the general mood and lighting direction
- Analyze shadow properties and their softness Observe the color temperature of both direct and ambient light
- Note the contrast between lit and shadow areas

### 2. TECHNICAL ANALYSIS:

- MAIN LIGHT (Directional Light):
- Determine the primary light's direction based on shadows - Do not modify colors based on natural lighting conventions
- If a light appears to be any color, use that color without converting to natural light colors
- Maintain the artistic intent of the original image
- Evaluate shadow characteristics (softness, strength)
- Calculate appropriate indirect lighting multiplier - Color should be only 80% saturation.
- If the image is outdoor, ensure that the main light is sampled and estimated from the entire image, not individual lights like lamps and bulbs.
- If the image is indoor with windows, ensure that the main light is sampled from the window not individual lights like lamps and bulbs.
- If the image is indoor with no windows or outside lights, ensure that the main light is sampled from individual lights like lamps and bulbs.

### AMBIENT LIGHT (Secondary Directional Light)

- Analyze fill light requirements for shadow areas
- Determine appropriate color for ambient illumination - If a light appears to be any color, use that color without converting to natural light colors
- Do not modify colors based on natural lighting conventions
- Maintain the artistic intent of the original image
- Set appropriate indirect multiplier for ambient bounces
- Position to complement main light direction



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### PIPELINE SPOTLIGHT **Al-Infused lighting pipeline**

## An initial lighting scene is generated

The tool generates an initial lighting pass for the scene. The artist then verifies that all lighting objects are correctly placed and organised as per project specifications, before proceeding with the traditional pipeline steps.

AL\_GENERATED\_LIGHTS

B PostProcessingVolu

MainLight

AmbientLight

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With the tool providing essential lighting elements like artist refines each game object. These refinements undergo game mood and atmosphere.





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# **PIPELINE SPOTLIGHT**



### Azure Al Stress Testing



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**PIPELINE SPOTLIGHT Al-Infused lighting pipeline** 

**Pipeline Conclusion** 

This Al-assisted pipeline demonstrates the practical integration of Large Language Models (LLMs) into technical art workflows, proving particularly effective for projects requiring rapid environment prototyping.

Whilst not replacing human artists, it serves as a force multiplier for small-to-medium-sized teams, reducing repetitive configuration tasks by 78% in internal stress tests. Future development will focus on material-aware lighting analysis and dynamic weather system integration, pushing towards more adaptive AI collaboration tools for real-time content creation.













# Thank you.

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