

MEGAMIND – Lighting Metro City at Night

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1 Introduction

In the Dreamworks Animation film Megamind, our main visual goal for the sequence where Roxanne is kidnapped by Titan, is for the audience to experience first hand the grave danger that she is going through. To achieve this goal, we needed to make sure that everybody could relate to what a city looks like. Given that the lighting is such an important visual component of what defines a city at night, we paid special attention to the lighting to ensure it was tangible and believable.

2 Visual Challenges

In studying the look of a city at night, three observations can be made. The first is that buildings are mostly defined by their interior lighting (fig.1). The second is that cities are defined by their street's lighting (fig.2). The third is that the lighting in the streets is fairly soft due to the multitude of lamppost and light sources. With traditional techniques such as spot lights, we were facing the “many light” problem. Additionally we needed to come up with a soft lighting solution which presented us with yet another challenge.



Figure 1: Interior lighting

Figure 2: City streets.

3 Lighting Approach

To solve the complexity of building interiors, a shader was created that mapped a cubic environment map, representing the interior of a room, onto the window geometry with the appropriate perspective. This solution offered great visual results, good control and was very efficient from a rendering standpoint. However, efficiently lighting the exteriors of the buildings and the city streets presented a larger challenge. A full global illumination approach was unsuccessful due to the size and complexity of the set. A simpler approach, combining several lightweight passes (occlusion, noise, and gradients) was not satisfying visually. The best result came from choosing a hybrid solution. Different components of the lighting were split into separate Point Base Global Illumination files (PBGI) cached on disks. Each one of these files contained different types of data (occlusion, static direct lighting, and dynamic direct lighting). The passes were then combined together at shading time (fig.3). This allowed us to create a fairly standardized lighting rig shared throughout the sequence while providing the creative control required. We were also able to split the city point cloud file into separate neighborhoods files using our procedural city system further allowing a level of detail management and optimization.

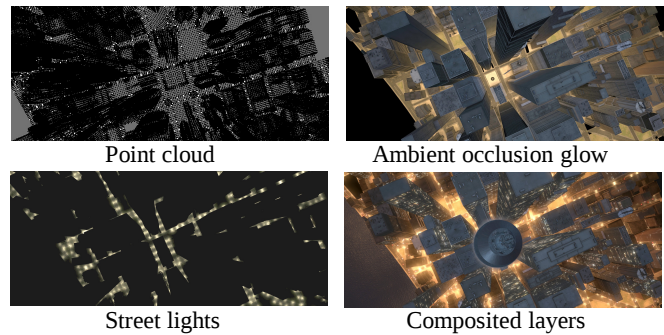


Figure 3

4 Compositing

The most impactful lighting passes were the PBGI-based ones such as: sky fill, street fill, car light contribution, car lights, and street lights. These provided the bulk of the look. Various mattes (Z, Y, cars, buildings, and occlusion) were used to affect specific areas of the city. Separate reflection and ambient passes were used to control the look of the buildings' glass and interior lighting that was so prevalent in our reference. Using these various passes, real-time interactivity was achieved while still allowing the VFX Supervisor and Art Director to direct a very shot-specific look (fig.4).



Lighting pass.
Figure 4



Compositing pass.
Figure 5

5 Conclusion

Achieving a believable cityscape at night was our main goal and the biggest challenge was to achieve a result that would not only work from afar, but also up close. Additionally, the solution needed to be fairly interactive and fully customizable from one shot to another. Deliver finals in a reasonable amount of time and yet keep control of the creative side was our main constraint. Our in-house PBGI lighting tool and the ability to procedurally divide up the city into neighborhood, combined with a lightweight compositing approach, helped us achieve our lofty goal and deliver “Metro City at Night” on time.