

Designing Effects Workflows

The Thinking Behind Tool Development

Alen Lai
FX / Blue Sky Studios
alen@blueskystudios.com

Jon Barry
FX / Blue Sky Studios
jonb@blueskystudios.com

Nathan Sims
FX / Blue Sky Studios
nathans@blueskystudios.com



"Spies In Disguise" © 2020 Twentieth Century Studios. Blue Sky Studios. All Rights Reserved.

ABSTRACT

Using real production examples from Blue Sky Studios' *Spies in Disguise*, we demonstrate how to break down effects within the production, taking into consideration a variety of aspects from optimization to collaboration. We walk through our thought process on how to go about designing workflows best suited for the job and plan ahead to maximize efficiency and flexibility during shot work.

CCS CONCEPTS

• **Computing methodologies** → *Physical simulation; Procedural animation.*

KEYWORDS

effect, fx, tool, workflow, requirement-driven, performance-driven

ACM Reference Format:

Alen Lai, Jon Barry, and Nathan Sims. 2020. Designing Effects Workflows: **The Thinking Behind Tool Development**. In *Special Interest Group on Computer Graphics and Interactive Techniques Conference Talks (SIGGRAPH '20 Talks)*, August 17, 2020. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3388767.3407337>

1 REQUIREMENT-DRIVEN CATEGORIZATION

Volumetric effects are often very time-consuming, especially those occupying a large area. In *Spies in Disguise*, we had the challenge of creating highly-detailed volumetric effects, many of which were placed only inches from camera and spanned up to several miles. Managing complexity and optimizing for the available computational resources of such effects can be a tricky task.

Breaking down the requirements and considering the role each effect plays within the shot, enabled us to classify them into three

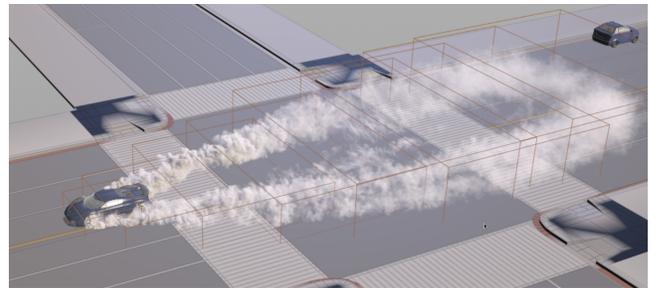
Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).
SIGGRAPH '20 Talks, August 17, 2020, Virtual Event, USA
© 2020 Copyright held by the owner/author(s).
ACM ISBN 978-1-4503-7971-7/20/08.
<https://doi.org/10.1145/3388767.3407337>

major categories. This way of working allowed us to weigh the pros and cons of several techniques and focus development to meet the particular needs of a specific category, rather than leaving a workflow too open-ended or too restricted.

Our design choices were centered on efficiency (being able to get a large number of shots done quickly) and flexibility (being able to address any kind of creative notes) in a complex, real production setting. We will discuss the characteristics of specific effects and the methods we utilized to achieve these requirements.

1.1 Hero/Foreground Effects

Hero effects are those which require an extremely high resolution to appreciate the intricate motion or interactions with animated characters. We relied heavily on clustered simulations to utilize parallelization as much as possible, breaking down a large area into smaller chunks.



"Spies In Disguise" © 2020 Twentieth Century Studios. All Rights Reserved.

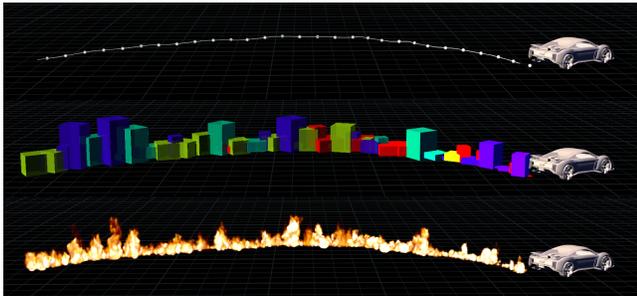
Figure 1: Cluster simulations for hero effects

For tire smoke and fire trails, our system optimizes clusters by analyzing the car's motion path. As user experience is very important in tool design, the tools provide instant feedback that allows artists to use these paths to control cluster distribution and to determine LOD resolution per cluster with ramps. However, even with a standardized workflow for hero effects, it's important to be aware of the limitations of such techniques, for example, a camera tracking closely with a car at a very high speed. With these

limitations in mind, the workflow is built to guide the artist but not restrict them.

1.2 Mid-Ground/Background Effects

Typically, mid-ground (MG) and background (BG) effects are primarily compositional elements, where their overall silhouette is more important than the internal motion of effects. We leveraged a system of instancing library simulations onto points. For fire trails, the overall performance was achieved by controlling the shape of the underlying control curves, which included properties such as time offset, speed, intensity (heat), rotation, and scale of each instance.



"Spies In Disguise" © 2020 Twentieth Century Studios. All Rights Reserved.

Figure 2: Instancing simulations for MG/BG effects

The volume retiming workflow we presented last year [Dwivedi et al. 2019] was developed with instancing library simulations in mind, so we can change the speed of simulations when necessary. Additionally, for methods such as this, fast visualization of the combined instances are important, as artists rely on that to iterate efficiently.

It is worth mentioning that there could be many post simulation manipulations employed to creatively avoid stamping or efficiently increase believability. The snow drifts in the mountainous opening sequence are a great example of this. We instanced a 1000-frame fluid simulation on points with time offsets and wind directions, scattered across the mountain. Next, we converted the voxel data to a point cloud and projected them down to the surface, then rasterized back to voxels to achieve the low-lying ground cover effect.

1.3 Run-up Effects

A classic example of run-up effects is fire that was ignited in previous shots, showing the chaos the car leaves in its path. Recalling our decision to drive the car-based effects using motion paths, we expanded the design to handle these effects with ease. Artists could draw custom curves that are fed into the system in addition to the animation-derived ones while creating all the necessary attributes, no matter the source. This established a seamless system without much additional work and gave artists tremendous control.

2 INTERDEPARTMENTAL COLLABORATION

When discussing an effects workflow, efficiency can be broadened to not just within the Effects Department, but across the entire studio

as a whole. It is important to take interdepartmental collaboration into consideration when designing these workflows and leverage other departments to deliver certain aspects of the effects, such as timing and placement.

2.1 Performance-driven Effects

In one particular shot, a small submarine is tossed around by a stormy ocean. For this, we worked closely with Layout and Animation for low frequency swells to influence the motion of the submarine and maintain a certain depth to preserve character readability. Additionally, the timing, size, and shape of splashes against the rocks was important to hit a certain rhythm and transition the shot.

2.2 Managing Complexity

In the climax of the film, there are hundreds of drones diving into the Lincoln Memorial Pool in Washington, DC, creating splashes and explosions everywhere. This was probably one of the most complex sequences in the film. The drones were a combination of hero-animated characters and crowd agents, so we worked closely with Animation and Crowds to develop a workflow extracting exact impact timing, speed, and orientation as they breached the surface of the water. We also collaborated with Lighting/Comp to use Mantra to render the pool, as well as the mist, spray, and foam. We built a suite of setups and shaders to seamlessly integrate the renders from two different renderers.

3 CONCLUSION

Identifying effects requirements and possible categories helps to guide decision making and problem solving. An effect in a shot could sometimes be split into multiple categories, with a certain portion being done in one technique, and the rest in another. It is beneficial to apply this kind of analysis early on to optimize production resources. Having a global view of effects helps design tools that are more coherent and flexible.

REFERENCES

- Ravindra Dwivedi, Jon Barry, and Sean C McDuffee. 2019. What Time is It? Efficient and Robust FX Retiming Workflow for Spies in Disguise. In *ACM SIGGRAPH 2019 Talks* (Los Angeles, California) (SIGGRAPH '19). Association for Computing Machinery, New York, NY, USA, Article 42, 2 pages. <https://doi.org/10.1145/3306307.3328152>