GDC 2016 **Visual Effects Artist** Roundtable Summary

Here are assorted notes from the 5th annual VFX Roundtable at GDC 2016. As always - there was fantastic conversation, great networking, inspiring tips and tricks, and all of it culminating in a *killer* party Friday night.

Huge thanks to David “DJ” Johnson for making the mixer happen! Not only did he get the sponsorship for free food & drinks, and organize the event, but he flew up to SF *just* to make sure everything went smoothly smack dab in the middle of busy times at work. Truly heroic. Give him high fives when you see him.

←Yeah, that’s right, this guy!

Other highlights included Fred Hooper’s most excellent talk **Free Reign: Building Visual Effects for Player Agency in 'Just Cause 3'**, the decision to pull the trigger on a **VFX Bootcamp** for GDC 2017, and lots of scheming around how to **grow our community**. The Facebook Group is 1000+ members and basically bursting at the seams. Keith Guerrette has been working on something special for us there so keep your eyes peeled.

Finally thanks to Jeremy Dale for help with these notes and for putting our conversation to visuals. Our theme for the week was “**Maximum Overdraw**.” Not sure if he is a protagonist or an antagonist. Probably both.

Each year we kick off the roundtable with questions to get a feel for the makeup of attendees. This year we had roughly:

50% identified as “artists”
30% identified as “programmers”
10% identified as “vfx artists”
30% were interested in VR
30% were using Unity
30% were using Unreal
30% were using proprietary engines.

About 30% of attendees were actively recruiting. A *tiny* fraction of attendees were actively looking for employment.

One thing we can do better next year is find ways to make sure the artistic side of VFX is well represented. There were a number of people who pointed out the roundtables tend to dive into technical topics quickly, and often never return to higher level questions like how to craft great visual effects with existing tools/techniques.

Physically Based Rendering and Lighting of VFX

Just like last year, Physically Based Rendering (PBR) and the lighting of FX came up again. Just like last year, there were no silver bullets.

- **Black Ops 3 Lighting.** One suggestion was to look for examples of how they used raymarched smoke. If anyone finds this please post. It sounds like one of the few examples of raymarching effects used in a shipping, high profile title.
- Some engines that seemed to rely on raymarched effects, were in fact just focused on supporting “**maximum overdraw**” instead - layering up enough traditional sprites to achieve visual effects similar to raymarching.
- Modern PBR based engines model light accurately on reflective/emissive surfaces (like the skybox) which means that you can have very large illumination values (lux) which do not play nicely with alpha blended particles. We had several conversation on how to solve this problem. How do you alpha blend smoke particles on top of a high lux skybox or other bright surface?
    - One suggestion was to have a half-res darkening particles behind the smoke particle to dim the skybox prior to the blend.
    - Another was to achieve a similar result (artificially dim the skybox) in a single pass particle shader.
    - No one had a simple solution for the desired effect. Intriguingly, the conversation led into a short exploration of what other blending possibilities are out there. If traditional alpha blending doesn’t work, then what will? Do we need to change our mental model of particle transparency to particle “translucency”? Instead of “alpha blending” do we need “alpha transmission”? Deep questions here.
    - Consider investigating the **bidirectional scattering distribution function** or BSDF (an analog of the BRDF). At the most accurate physical level, the behavior of the BSDF is what

we want to achieve at real time speeds, with artistic control.

Pertinent GDC Sessions

Look for these on the GDC Vault or shared elsewhere. They were all pointed out as being applicable to VFX artists.

- Building Obduction: Cyan's Custom UE4 Art Tools
- Animating with Math
- Technical Artist Bootcamp: Shaders 101: Foundational Shader Concepts for Tech Artists
- Making Compelling and Immersive Story at 90 FPS
- The Future of Lighting
- Free Reign: Building Visual Effects for Player Agency in 'Just Cause 3'
- Andy Lomerson's cancelled " VFX System of SuperChargers session" will be coming soon! He's going to do a custom recording of it just for us. Thanks Andy!

VFX Resources:

What are some resources to help students learn VFX or grow as a professional?

- Keijiro Takahashi puts an incredible amount of high quality Unity tools and effect solutions on git hub. Interested in music? Interested in GPU particles? You will like.
- The Unity Bitbucket.
- Usual suspects: tech-artists.org and Real Time VFX Group.
- From an artistic/timing perspective, one suggestion was to learn from Looney Toons. Read the Animator Survival Guide and apply the fundamentals of animation to your VFX. Squash and stretch applies to explosions the same way it applies to a bouncing ball. Jittering the timing of effect events by even a few milliseconds keeps them from feeling stiff and dead.
- **Software:**
    - Substance designer for map generation. Several people were big fans of incorporating substance into their pipelines, although no one had integrated substance directly into the engine. Instead they were using it as a texture creation tool.
    - Filterforge. Node based procedural tools for Photoshop. Seemed very popular and a great tool to consider for VFX texture authoring..

Marketplaces

Some attendees were actively creating content for stores like the Unity asset store and the UE4 Marketplace. Highlights:

- No, before you get your hopes up, it doesn't make a lot of money.
- Piracy can be a serious problem - marketplaces don't generally have DRM.
- It can lead to contract work as people request unique content from marketplace content.
- It's an amazing way to learn as a student. Buy assets and reverse engineer them.
- It's an amazing way to learn as a professional. Creating content for marketplaces allows you to work on your own schedule with very few creative constraints, and often in a totally different engine. In a creative rut? This is worth a try!

Community & Education

Probably the hottest topic of the roundtables was community & education. How do we nurture and grow the community without losing track of the amazing connections we have already? How do we advertise real time visual effects to students and set them off on the right track? This point was hammered home when we did the show of hands to find out who's looking for positions. Such an embarrassingly tiny fraction of

fresh talent is coming in right now.

In some ways, it feels like the old days of Technical Art before we had the tech art bootcamp and tech-artists.org. Now the technical artist community is thriving and we, the VFX community, have some catching up to do.

Proposed solutions:

- **VFX Bootcamp @ GDC 2017.** This is in the works and with the help of all of you I'm sure it will be awesome. There are a number of people taking the lead on this already (thank you, you know who you are!) and we'll work with the right people to get on the GDC schedule. Details very much TBD.
- **A new online community.** We've outgrown Facebook. Which is not to say the facebook group will go away, but we need a better way of archiving our conversations and making them accessible to new people. Everyone was equally excited about the prospect of having VFX contests like other communities have. Top people are exploring a solution for this!
- Slack? The tech artist slack channel is growing fast and people have nice things to say about it. Something to keep in mind.
- **Reaching out to educators.** We all agree that VFX is the *perfect* way to help show students that math, programming, and technology in general can be awesome. Most of us didn't care about dot products, cross products, or matrices until we realized it could help us make explosions! Participating more directly in education will be great for our industry, but also just great for students in general. We're in a unique position to help math/programming education be genuinely fun.

Production

Tips and tricks for improving productivity and dealing with unrealistic expectations.

1) Being asked to do things you aren't equipped for? Feature doesn't exist? One great solution was to make the simplest scene possible demonstrating the lacking feature. Make it obvious, and then show it to someone who can allocate resources. Specific anecdote: One engine had no support for even moderate overdraw. By creating a test case showing how 4 full screen quads will tank framerate, they were able to get engineering resources allocated to fix the problem and a 3x increase in overdraw.
2) Consider **daily smoke tests/performance profiling** with detailed logging. That way you can track performance progress as assets go into the game and quickly identify when you're development is going in a good direction, and when you may be accidentally backsliding due to bad content, bad shaders, bad gameplay scripting, etc…

VR

Day 3 of the Roundtable was reserved for all things VR. If VR continues to grow, it means good things for us! Entire new techniques, styles and approaches will need to be generated. New ways of creating effects that captures their true 3D nature will open up entirely new avenues of exploration. Oh, and there will be twice as many jobs to fill - I'm talking to you, students!

Billboards. How do billboards look in VR?

- Billboards actually hold up surprisingly well, provided they are small or very far away. Large billboards work in the distance - beyond the range where head movement reveals their "flatness". Tiny dust motes can work if they're right up in your face. In fact many teams are sprinkling small particles all over the place because those hints of parallax seem to increase the feeling of presence

users get in VR. This phenomenon was first shared at Oculus Connect 2, but has come up many time since then. It's a technique that's used extensively in Tilt Brush, as an example.
- Billboards can also work well if the texture is "isotropic". I.e. a soft circle texture doesn't have enough texture detail to show it's "flatness" to your brain, and the circular silhouette revealed as you move around it is roughly correct for a 3D sphere.
- One technique presented was to have billboards face the center of the viewer (between the eyes) so that each eye sees a perspective correct image.

Ok, so we're still using some billboards. How?

- Flow maps seem very promising for getting nice subpixel (90FPS!) animation out of billboards in VR.
- Watch out for traditional flip books in VR. High probability the lower frame rate will be noticeable, and those additional texture details will expose the flatness of the sprite. That said, this is theoretical. Few people (anyone?) had actually tried it.
- **Multi-Sprite.** We half-jokingly coined this term for the concept of a particle that is itself composed of multiple sprite components. So each time the particle gets rendered, it already has multiple layers of depth carefully constructed to reinforce the optical illusion of being truly three dimensional.
- **Parallax Maps.** People were curious what would happen if we applied parallax mapping techniques to billboards in VR. Perhaps there's a clever way of capturing the illusion of depth this way.

Animated Meshes. An alternative to billboards is to use geometry and animated meshes. This seems incredibly promising. Prepare yourselves for, possibly, maybe, saying goodbye to billboards and hello to particle meshes and animated meshes in their place. One attendee pointed out that the effects in Guilty Gear made heavy use of animated mesh sequences. Interesting related talk from GDC 2015 here.

HDR. Brief conversation about how incredibly awesome it will be when we no longer author VFX for a constrained, 24bit frambuffer like those used in current VR headsets and monitors. Soon, we will have true access to HDR displays which means your eye will do the tone mapping (like it was designed for) and we get to make spectacular lighting and effects that are truly HDR. Not quite sure when this will happen… but it's coming. HDR Displays were already on display at the Dolby Booth at GDC.

See you next year!