
Zane EGGINTON

1 Introduction

The process of filmmaking has been carefully developed over the last 100 years into a complex art form consisting of many areas of expertise. To understand how to make an effective landscape visualisation we need to look at how a film is put together as a whole and not just the software tools being used. A typical production can be broken down into three major phases; preproduction, production and post production and over the years as films have become more and more technical the visual effects departments have become tightly integrated into each stage. For feature film visual effects techniques to be adopted into a landscape visualisation workflow we need to understand that integration and why it’s important. We will look at the major techniques along with some of the digital technologies used to create the spectacular imagery we’ve become familiar with.

2 Preproduction

During preproduction the entire project is planned out including; scripting, story boarding, shot lists, budgeting, locations, equipment and the organising of cast and crew. This is also when visual effect departments are briefed and it’s a time for them to work out how they can achieve the desired shots and feed back to the director/producer and their team as to what can or can’t be achieved.

As for a landscape architect this would be the time in which the design process takes place and could include the preparation of digital assets typically exported from CAD programs. Key aspects of the production are outlined (target audience, themes, issues, etc) and the overall intention for the finished production is identified. This may be as far as the landscape architect is involved in process, perhaps deciding to hand the project over to a production company to produce the finished product.

2.1 Script

For a typical production the script is either written specifically for the film, or is adapted from other sources, a novel for example. The script outlines the locations, characters, dialogue, action and sometimes very basic editing notes, e.g. fade to black, text added, and audio notes. For a visualisation project the script should tell a story that reinforces the underlying intent of the project. Translating your design process into a story serves another purpose; memory retention. By telling a story we reshape information into meaning making it easier for the viewer to understand and recall. The final script will act as the framework
that will navigate the audience through the project showing the reasons for the design and the process that the design went through to reach a conclusion. It should identify current issues with not only the site directly but also of the surrounding area and then show how these issues have been solved.

2.2 Genre

Genre can be defined as an empirical category that serves to name, differentiate and classify works on the basis of recurring configurations of formal and thematic elements they share (MOINE 2008). Genre is a very powerful tool to describe the underlying intent of a design, for example a visualisation of a skate park could use the action film genre which involves fast cuts, lots of close-ups, rapid movement, hand held camera movement, and fast paced energetic music. Genre sets up a framework to work within, so matching the appropriate Genre to a visualisation is very important.

2.3 Characters

The characters are a vital component when communicating with an audience via an audiovisual presentation. Trying to persuade by stating the features and specifications is meaningless until you add a human to the mix (DUARTE 2010). During social learning we witness the actions of another individual and the reward or punishment they receive. In the brain of the observer a representation of the action and its consequences is formed as if the observer had experienced the episode them self (PINEDA 2009). It’s this learning by observation that we are ultimately trying to achieve in a visualisation.

In a Hollywood blockbuster the characters are typically the most important element, often more significant than the story itself. Many people will see a film purely based on the characters. In contrast many landscape visualisation typically presents characters in the form of static human figures that simply serve to give scale to the scene. But who are the characters in a landscape visualisation and how can we use them?

We could think of the landscape itself as the lead character, it’s who we came to see, it’s the element we hope to relate to and want to empathise with. The existing site and to a degree it’s surroundings can be thought of as the actor playing the part. Perhaps the audience is already familiar with this actor, maybe they have a preconceived idea of who this actor is, similar to that of a famous Hollywood actor playing a part in a film. Are there stereotypes we need to address? How do we introduce our character? What is the journey/transformation that our lead is going through and what filmic techniques can we use to illustrate this?

Other characters we can utilise in a typical project are the users of the site, the client/council, the designer, and perhaps the builders & engineers. These characters can be used to tell a story either directly (through dialogue for example) or as a navigation device, both emotionally and physically. If we see a character walk through a gate and the next shot we see the character enter a garden we know how they got there, if they smile we know they approve and this emotion is transferred to the viewer.
2.4 The Shot

The way in which the camera is used to frame a shot is often misunderstood in visualisations. There are some basic techniques that need to be understood to produce a coherent film that communicates effectively with an audience. The most important shot is the establishing shot, this is often the first shot presented and is often a high angle wide showing where the film is located. Most shots have little or no moment allowing the viewer to study the shot. A dolly shot (where the camera moves slowly through a scene) gives an image depth as objects close to the camera move faster than those further away. Close-ups show detail and by tilting up or down we can give power to an object or make it look insignificant.

The more realistic the camera movement the more believable the project will look. In a typical film/TV programme you’ll see a large number of shots being used in quick succession to describe a location, seldom will you see a camera flying around at pace as is often the case in visualisations (a fly through). This rapid movement does not allow the viewer any time to study a shot at their own pace.

The way in which the scene is presented (lighting, colour, tilt, pace, sound, etc) can influence how the viewer perceives these spaces; dark, grimy, and unpleasant or are they happy, relaxing, and tranquil? At this stage it’s important to work out what shots will be required and how they are to be achieved (i.e. rendered, real and composited, still images, etc). For many it means transforming oneself from a viewer of imagery to a presenter.

2.5 Story Boards

Story boarding is a way of visualising the film in sequence, much the same way as reading a comic book. It acts as a way to communicate the intention of each shot to the cast and crew. A camera operator will be looking at it to work out their framing, makeup will want to know who’s in the background and who will be in a close up. The visual effects supervisor will want to know when they need to be on set and so on. If the production isn’t making sense or telling the required story at this stage changes can be made without the need to reshoot, or in the case of a visualisation, re-rendered which can be very time consuming and often expensive. It will also dictate where detail will be required in digital assets. By concentrating on producing shots outlined in the storyboard time can be saved by avoiding modelling and rendering items that will not be ‘in shot’. For example low polygon models could be used for wide-angle shots and then separate highly detailed models of a specific object created for close-ups.

2.6 Previsualisation

A popular technique in modern productions is the development of a ‘pre-viz’ animation. This is a rough animated version of the storyboard and helps the director and crew make decisions by presenting an animated version of the shot they are trying to achieve in production and postproduction. Landscape visualization projects could easily adopt this practice as most CAD and 3D modelling applications allow the user to produce rendered animations of varying quality. Low quality renders (e.g. OpenGL renders) can be quickly produced and edited with stills, sketches and other media to give a rough version of the final product.
3 Production

Armed with a script and storyboard we enter the production phase of a project. It’s during this phase that all of the material needed for the film is captured. This includes footage on location and/or in the studio, location audio, dialogue, and perhaps still photography. It can be argued on whether or not rendered material is considered part of production or if its postproduction, it really depends on the project. Generally speaking if the rendered content is intended to augment a project/shot then it would be classified as post production (e.g. compositing a large mountain into a background), however if its an animated feature (e.g. Pixar’s Toy story) then the rendered components would be thought of as being included in the production phase. Due to the significance of the rendered components in a landscape project it should be considered as part of the production phase.

3.1 Cinematography

During production one of the key roles is that of the Director of Photography (or DoP). The DoP is primarily the head of the camera and lighting departments and as a whole is responsible for Cinematography. It’s the DoP’s job to get the ‘look and feel’ of the film as dictated by the Director. Even though many visualisation jobs do not use ‘real’ footage, or have the budget to artistically light a location it’s rules and conventions are perhaps the biggest key to producing a successful project. Lighting, colour, shot composition and camera movement are key for any visualisation (also see section 2.4, ‘The Shot’). Therefore the person creating the rendered shots for a visualisation could be considered as a virtual DoP and for those that are interested in producing high quality renders, a study of cinematography is vital.

3.2 Audio

Emotion, story, atmosphere and materiality can all be communicated audibly to an audience although its use in visualisations is often limited to a single music track or even completely non-existent. There are two main categories of audio, diegetic and non-diegetic. Diegetic sound is related to what we see on the screen, footsteps, dialogue, atmosphere (i.e. wind, rain, etc), non-diegetic sound is added audio such as music (unless it’s in the shot, e.g. a busker), voice overs and sound effects (e.g. the notorious stabbing audio in Alfred Hitchcock’s Psycho).

3.3 HDRI Domes

High dynamic range images (HDRI also known as HDR images) are images that contain a larger than normal exposure range. Typically these are created by taking multiple images at different exposures settings then saved in a specialised file format (e.g. .hdr, .exr, ima). This information can be used to create an image that has extra detail in both the shadowed areas as well as the highlights. For example a typical photo of the sky would have the same pixel value for all white objects including the clouds and the sun even though the sun is much brighter, in an HDR image the sun would have a higher pixel value than the clouds. These images can be used to adjust the image in software at a later stage or used to create a new image with reduced contrast using various methods.
An HDRI Dome is a 180/360 degree HDR image created with specialised hardware or generated from multiple HDR images. In the film industry these images are most commonly used to recreate the lighting of a particular location within rendering engines and compositing software. This can be a powerful tool in landscape as we can produce 3D renders of a design using the lighting from that location (fig. 1). This would have huge advantages in areas that have very complex lighting, urban spaces for example often have tall buildings with different surfaces. These surfaces can have very different properties, some scatter the light, others absorb, some surface may be mirrored and reflect light. At night the light sources can be incredibly difficult to reproduce in a digital model with perhaps hundreds of different light sources illuminating a scene. However it’s important to keep in mind that all though this technique gives a realistic lighting model it is not necessarily an accurate model and should not be used to calculate shadow lines.

3.4 Keying

Is the process of algorithmically extracting an object from its background and combining it with a different background (OKUN et al. 2010). This process is easily achieved by shooting a subject in front of a green/blue background then importing the footage into one of many software applications. Most editing programmes can achieve this however more control can be achieved in specialised compositing applications (section 4.5). Attention to detail is very important at this stage of production. Lighting conditions, framing, props, etc must all be carefully dealt with so that it matches with the background and foreground elements added during postproduction. This process is used extensively in Hollywood blockbusters and its use in landscape visualisations brings life and scale into a scene.

4 Post Production

All of the images captured during production are manipulated in some form and edited into a finished product. Most of the visual effects in modern feature films are created at this stage.

4.1 Workflow

The workflow in an effects heavy film can be very complicated, utilising a large number of specialized software packages and sources of material. In Fig. 2 a simplified diagram represents the major data paths from acquisition to final output. Each node represents a set of digital tools and nodes that have been grouped together represent the possibility of a
single tool performing the combined task. For example many compositing packages include tracking tools or have 3rd party plugin options available however in most cases motion capture is performed with a specialised application (e.g., SynthEyes or PF Track).

Fig. 2: Simplified digital workflow for a VFX production

4.2 Matte Painting

Matte painting has it’s roots in theatrical productions where painted scenes were used as backdrops. In the 1930’s Cinematographers modified this technique by using back projected footage of scenes shot on location with the actors performing in a studio environment (THOMPSON & BORDWELL 2003). This technique was most commonly used for shots in moving cars. Later on this technique would be performed in postproduction using optical printers and is now achieved with specialised compositing software (see section 4.5).

Modern matte paintings utilise many different methods to create them. Some of these are still derived from paintings and drawings that are typically modified with digital tools (Photoshop for example). However they can also be created from physical models or more commonly 3D rendering software such as e-on software’s Vue (Fig. 3).

4.3 3D Modelling and Rendering

Many of the software packages used in the film industry aren’t completely unfamiliar to landscape architects however the way in which they are used can be. In landscape and architectural visualisations there is a tendency to use a single software application to model and render a design, perhaps using Photoshop to modify it in some way. Some may go as far as using a 3rd party plugin renderer or exporting a CAD model into a separate application for further modelling, animation, texturing and rendering (e.g. 3DS Max, Maya, Lightwave, etc). In the VFX industry 3rd party renders, either as a standalone product or as a plugin are very common, in fact many VFX houses modify or even create their own rendering engines (Pixar’s Renderman for example). From the renderer separate ‘passes’
are generated and then composited in a separate application. These ‘passes’ are images (or sometimes separate layers) that when combined create a finished image. These passes typically include; colour (diffuse), shadows, reflections, refractions, specular highlights, etc and often other useful information such as depth maps, object masks, XYZ normals, etc. The major advantage to this technique is the ability to edit each pass in post without the need to re-render, for example to reduce the sharpness of a shadow. It also aids in the compositing process when including material from other sources. We could use an object mask, a tree for example, to clip a shot of someone walking through a scene to make it appear as if the have gone behind it, something that would be very difficult to do with a ‘flattened’ render.

For landscape architects one application stands out for rendering highly detailed digital environments; e-on software’s Vue (as seen in Fig. 3). Models can be easily imported from CAD software and textures can be swapped out for materials that utilise fractal algorithms that are resolution independent (as opposed to image based texture that are made of pixels). In fact Vue utilises fractal math to generate terrains and plants, which allows for an almost limitless amount of detail.

4.4 Motion Capture

One of the biggest challenges in creating a VFX shot is dealing with the camera movement. Moving the camera however is a powerful cinematic tool. It can show where objects are relative to each other by panning (see section 2.4 ‘The Shot’) or we can give our shot depth by using a dolly shot which moves elements in the foreground differently on screen than those in the background. This gives the viewer a much better understanding of the scene than a still shot. For example let’s say we need a shot similar to that in Fig. 3 but with a handheld styled camera movement. The easiest solution is to use a ‘locked off’ shot, meaning that the camera does not move, composite our sculpture over the plate (background image) and then shake the entire frame. However the problem with this is the lack of parallax. If we move to the left we expect to see more of the left side of the sculpture. The result would look more like a faulty television than actual camera movement. We could film the background on location with a handheld camera but that would require us to move our rendered sculpture in exactly the same way by moving the virtual camera in the rendering software. This is where 3D motion tracking software enters our workflow (Fig. 2).

Motion tracking software primarily performs two functions, tracking the movement of the object(s) and/or determining the movement of the camera. The art of motion tracking could easily fill an entire book however let’s look at our above example. What we need to do is work out how our camera is moving in a 3D space then send this data to our rendering
program and use it to create a virtual camera that mimics the real one. Once we have the rendered footage we can composite the rendered footage over our background footage and if all goes well the two should look seamless. Of course it is a little more complicated than that to get a real looking shot however this is the basic workflow. Modern motion tracking software goes one step further though. Not only can they determine the movement in a shot they can recreate the depth in a shot and even build a textured 3D model from the footage.

4.5 Compositing

In 1857 Swedish-born photographer Oscar G. Rejlander combined the imagery from 32 different glass negatives to produce a single, massive print titled *The Two Ways of Life* (Brinkmann 2008). This image represents one of the earliest forms of compositing. Compositing in the film industry consists of the combining of imagery acquired during the production phase along with other imagery and data (e.g. digital renders, matte paintings, motion capture data, etc). Compositing in landscape architecture is typically referred to as ‘photoshopping’ an image. However one of the major problems with Photoshop is its linear and inflexible workflow, an image is opened and a step by step work flow leads your to a final product. In the film industry this task is handled in a very different manor due to the complexity of working with moving images, large teams, many sources of image production and their many iterations. The workflow needs to be flexible and reusable and in most productions a ‘Pipeline’ is designed to handle the flow of data throughout the postproduction phase. Most of the leading compositing software used for visual effects shots utilise a ‘Node’ based approach, which resembles a flow diagram where each step of the processes (including the inputs) can be modified (Fig. 4). The workflow can be used for multiple frames of an animation or other similar shots therefore providing a very efficient and flexible workflow.

For a landscape visualisation this has some very big benefits. A well setup pipeline can accommodate changes to the original design and the entire postproduction workflow can potentially regenerate high quality finished shots with little effort. For example if an image has been created from a CAD model and the client asks for changes to the design, the alterations can be within the CAD software, the existing 3D model is replaced and fed into the rendering software which generates new rendered passes that update images being utilised in the compositing software which can produce new finished shots.

![Fig. 4: Example of a node based compositing software, Apple Shake](image-url)
4.6 Editing
Editing is more than just a process of combining shots into a film. The pace, angles, and montage of shots communicates with the audience in a language that most understand very well however the process can in fact be very complicated. There are four major categories of editing: (1) chronological editing (2) cross-cutting or parallel editing (3) deep focus and (4) montage (HAYWARD 2000). The simplest and most commonly used of these is chronological editing where we focus on the order of events one after another. This is often seen in Hollywood features however we may occasionally see the crosscutting or parallel technique employed as a flashback or shift in time/space.

Deep focus editing tends to have much longer shot lengths with a lower number of cuts and is less common in feature films. It’s this style of editing that could be used to represent a more realistic view of a landscape. Perhaps we want to show the contemplative qualities of a particular site, to achieve this we could show very long shots of features within the site. This allows the viewer to observe the scene in a more realistic manor, with little manipulation by the filmmaker. Montage on the other hand is perhaps one of the most manipulative editing styles. It’s not so much about the content of each shot but the interactions between them. If we see an environmentalist smiling and then a shot of a courtyard we assume our design is environmentally friendly without actually saying so. Montage works like language by describing a scene with images rather than words.

It’s these editing styles that give the editor the ability to warp time and space and put a spin on almost any shot. Most productions will use a combination of these styles when appropriate and how these styles are used make the art of editing a powerful tool in storytelling.

4.7 Colour Grade
Colour grading is where the edited project is given a particular ‘look and feel’. This could be giving the shot a warm tone to invoke a sense of romance or perhaps a cold de-saturated contrasting look to make something seem undesirable or menacing. It’s also where each shot is manipulated to match closely with the surrounding shots. This stage of the production is highly manipulative on an emotional level. A well graded production not only looks better but it has the ability to influence the emotion of the viewer. If you have a redesign for an existing site you might want to suggest that the current site is dull, boring, perhaps almost toxic looking, and that the redesign is warm, inviting and soft. To achieve this the opening would be heavily de-saturated with lots of grain and contrast, then the redesigned site would have well balanced colour with a soft focus, lightened shadows and an overall subtle orange/red hue.

4.8 3D
One trend that has occurred in recent feature films is the use of 3D cinematography (also known as stereoscopy). 3D films are nothing new, the first 3D movies were created in the early 50’s (MENDIBURU 2009) but the technology used to create and deliver these films has advanced significantly in recent times hence it’s gain in popularity. The use of 3D technology enhances the user experience by offering a far more immersive product. The extra dimension also invokes a ‘Wow’ factor, which can put a positive spin on almost any
project. The creation of 3D imagery is entirely achievable for landscape visualisations, as the technology simply requires a separate left and right eye image. It can complicate the compositing process, but the tools to achieve this task do exist and is currently an area of rapid development. Most 3D modelling applications have built in tools to help produce these images however it can also be achieved by rendering from two cameras positioned slightly apart (known as the inter-ocular separation). One aspect that needs to be considered when choosing 3D over 2D is the introduced complexity to deliver the finished product. Unfortunately (at time of writing) the software required to encode 3D Blu-ray disks is very expensive however it is possible to deliver 3D content via Youtube or digital files. This technology is very dependent on the viewer’s own hardware and experience so presently it’s most suited for an organised presentation.

5 Conclusion

Rapid advances in the visual effects seen in modern feature films have lead to the creation of worlds and vistas that have become so realistic it may seem impossible for a typical landscape visualisation to replicate. However the techniques and the technology required to achieve these shots are available to the landscape profession, and have been for some time. What is required to increase the effectiveness of these visualisations is an understanding not only of the technical aspects but also the subtleties of filmmaking. It is these persuasive mechanisms that act as a tool to independently manipulate a viewers perception in ways that no other medium is capable of. In fact its here that we may need to consider the shift from portrayal to propaganda. Is what we are presenting to an audience a fair representation of the project or is it manipulating perception to a point that distracts from reality.

References