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Cinematography

The cinematography theory provides the basic principles and background for the creation of attractive and engaging visual representation for interactive stories. This chapter reviews some essential concepts of cinematography that are important for the development of the proposed video-based interactive storytelling system.

Cinematography can be defined as the “art of film making” (Brown 2011). The term was created in the film industry to describe the process of creating images on film, and it covers all aspects of camera work, including the creative process of making aesthetically pleasing images and the technical aspects involved with using cameras, lights, and other equipment (Newman 2008). More specifically, the cinematography theory describes a set of principles and rules to effectively use cameras, actors, illumination and soundtracks to visually tell a story. Cinematography involves taking the narrative ideas, actions, emotional meanings and all other forms of non-verbal communication and rendering them in visual terms. It provides ways to add dramatic emphasis where required, to communicate additional information, and ultimately to evoke emotional responses in the audience. The successful application of cinematography concepts results in a coherent and attractive visual narrative (Kneafsey 2006).

The first step to comprehend the basic concepts of cinematography is analyzing the structure of a film (Figure 3.1). A film consists of a linear sequence of scenes, where each scene is composed of several shots. A scene defines the place or setting where the action happens. A shot consists of a continuous view of the scene filmed by one camera without interruption (Mascelli 1965). Each shot consists of a linear sequence of image frames that compose the complete moving picture. The transition between one shot to another is known as cut.

The smallest element of interest in a film is a single frame, and for some filmmakers, each frame represents a masterpiece that is carefully planned and composed (Brown 2011). The combination of several frames filmed without

interruptions constitutes a shot. The type of camera angle used in a shot defines how much the camera, and therefore the viewer, engages with the event depicted in the shot (Kneafsey 2006). The camera may be stationary or it may employ simple or complex movements depending on the content of the scene and the mood that is to be established. The combination of a number of shots creates a scene, which is a single setting where a set of events take place during a particular time period. Independently of type of shot, camera movement or transition between shots or scenes, it is always important to keep the view's mind oriented in time and space (Mascelli 1965). The cinematography theory provides basic guidelines on how to position and move the cameras and actors, on how to perform cuts and transitions between shots and scenes, and especially, on how to keep the spatial and temporal continuity of the film.

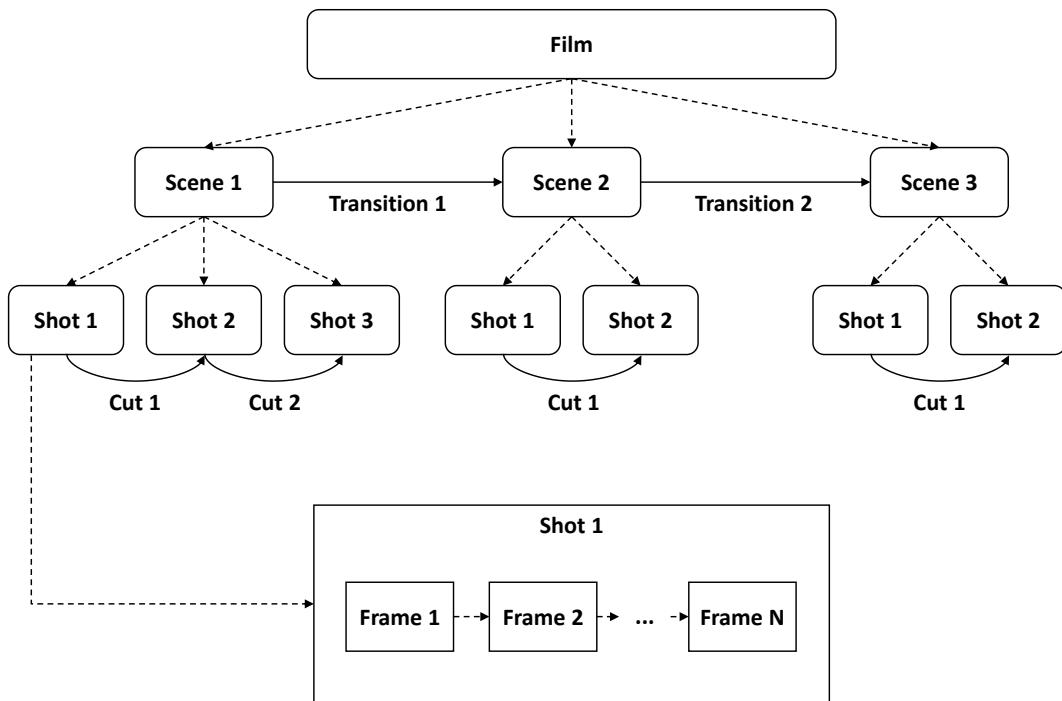


Figure 3.1: The structure of a film.

3.1. Shot

Bowen and Thompson (2009) define a shot as the smallest unit of visual information captured at one time by the camera that shows a certain action or event from a specific point of view. A shot creates a continuous visualization of a situation and it is characterized by position, orientation, and movement of the

camera and of the participating characters and objects of the scene (Hornung 2003). Each shot requires placing the camera in the best position for viewing characters, setting and action at that particular moment in the narrative (Mascelli 1965). According to Brown (2011), camera placement is a key decision in storytelling. More than just “where it looks good,” it determines what the audience sees and from what perspective they see it.

A shot can be described by three main characteristics: (1) camera angle, which determines the viewer’s point of view (objective, subjective or point-of-view); (2) shot type, which defines how much of the scene and the subject will be visible in the shot; and (3) camera height, which defines the height of the camera and, consequently, influences the viewer’s psychological relationship with the scene characters.

The camera angle has a strong effect on the dramatic impact of the story. A more subjective camera angle places the viewer into the scene, while a more objective angle provides a general view of the scene (Mascelli 1965). The type of shot determines the size of the subject in relation to the overall frame and also has dramatic effects on the story (Mascelli 1965; Kneafsey 2006). Scenes are often opened with establishing shots (extreme long shots, very long shots or long shots), which helps viewers to understand the situation that will be presented (Brown 2011). When more detailed information is required, median shots are used to bring the audience closer to the action, and close-ups are used to add dramatic emphasis to the facial expressions of characters. Figure 3.2 illustrates the most common types of shot.

The height of the camera can also be manipulated to add dramatic and psychological overtones to the narrative. According to Mascelli (1965), eye-level camera angles are best for shooting general scenes that should be presented from a normal eye-level. High and low camera angles are usually chosen for esthetic, technical or psychological reasons. High camera angles put the audience into an elevated and powerful position, making the subject seem smaller and weaker. Low camera angles create the opposite impression, showing the might and power of the subject.

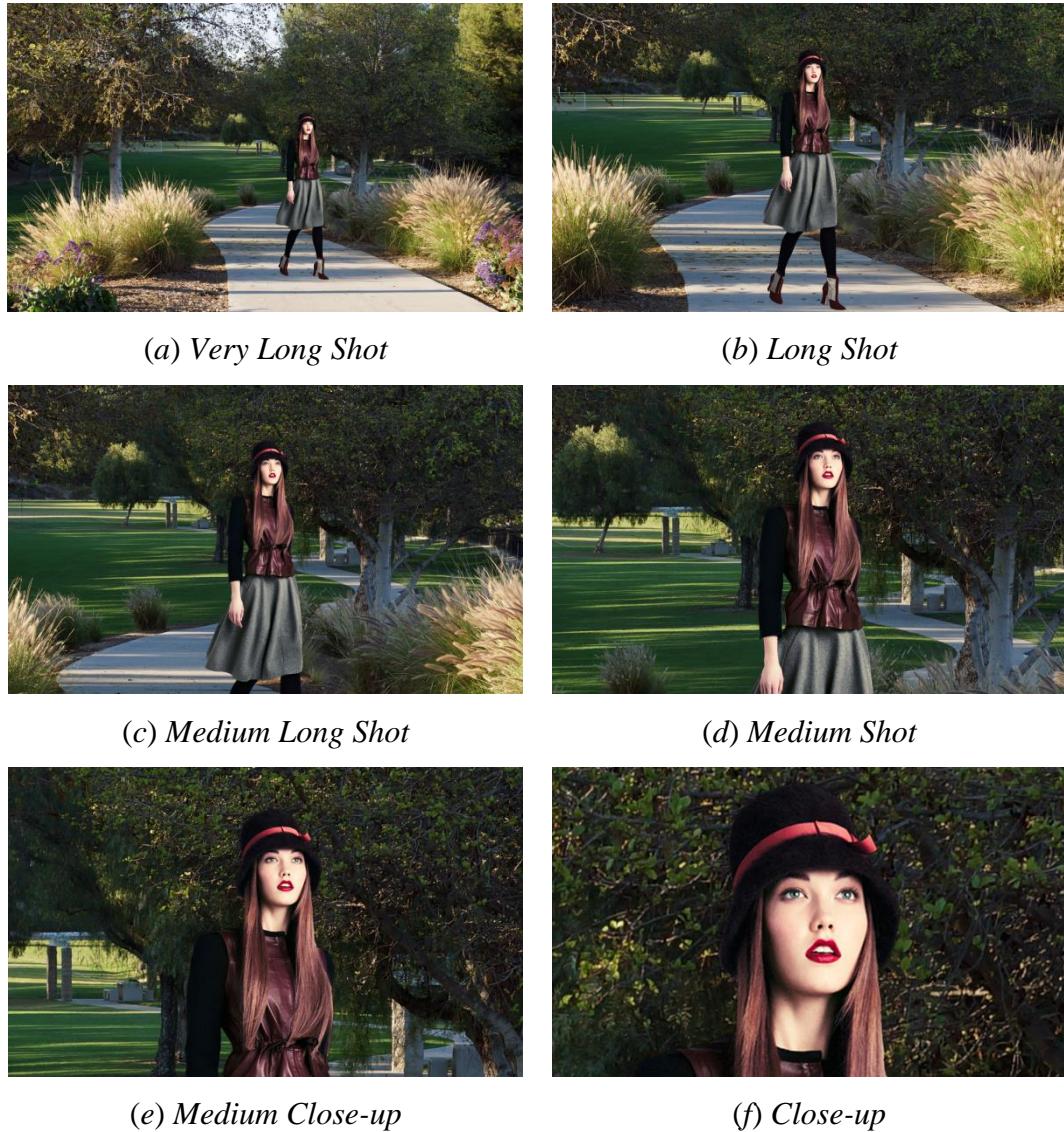


Figure 3.2: Shot types.

3.2. Camera Movements

Motion is the primary aspect that differentiates film from photography and painting (Hawkins 2005). All characteristics of the camera movement (style, trajectory, pacing and timing in relation to the action), contribute to the mood and feel of the narrative. According to Brown (2011), camera movements can enhance the scene and add a layer of meaning beyond the shots themselves. They can add an additional emotional content, a sense of energy, joy, menace, sadness, or any other emotional overlay. There are several basic camera movements, and combinations of these movements can create more complex shots.

Brown (2011), Katz (1991) and Hawkins (2005) classify the camera movements in four fundamental types: (1) pan, which consist in the movement of rotating the camera on a vertical axis; (2) tilt, which is the movement of rotating the camera on a horizontal axis perpendicular to direction in which the camera is pointing; (3) dolly, which consist in the movement of the camera along the horizontal plane; and (4) crane, which is the movement of the camera along the vertical and horizontal planes.

3.3. Continuity

A film can create its own time and space to fit any particular storytelling situation. Time may be compressed or expanded; speeded or slowed; remain in the present, go forward or backward. Space may be shortened or stretched; moved nearer or farther; presented in true or false perspective; or be completely remade in to a setting that may exist only on film (Mascelli 1965). Independently of all spatial and temporal awkwardness a filmmaker may purposely create in a film, it is always important to keep the viewer's mind oriented in time and space.

Continuity, with respect to motion pictures, refers to the logical consistency of the story, dialogs, position and movements of cameras, characters and objects present in the narrative. According to Brown (2011), when the audience becomes aware of continuity errors, they simultaneously become conscious that they are watching a movie, which breaks the storytelling illusion. Over the years, film directors and cinematographers have developed several rules and principles to maintain the basic spatial and temporal continuity of a film. Some of these rules can be applied when the film is being shot and others during the editing process. Mascelli (1965), Thompson and Bowen (2009) and Brown (2011) describe the following main rules to maintain the film continuity during the shooting process:

1. **Line of Action:** for each scene, a line of action must be established. The line of action or action axis consists of an imaginary line connecting the most important elements or directing the focus of the action in a scene. The audience unconsciously observe these lines and cinematographers use this phenomenon to help establishing narrative meaning and shot

composition, and to reinforce spatial relationships within the film space. The line of action is also used in the 180 degree rule to preserve a consistent screen direction and spatial continuity.

2. **180 Degree Rule:** the rule determines that when shooting a scene, the camera must be placed only at one side of the line of action. The placement of the camera in different angles for new shots of the scene must occur only within the 180 degree arc. The 180 degree rule helps to maintain the lines of attention, the screen direction and the visual continuity of consecutive shots, which prevents the audience from getting confused about where someone is in the scene.
3. **30 Degree Rule:** the rule determines that when shooting two consecutive shots of the same subject from inside of the 180 degree arc, the camera angle for the new shot must be at least 30 degree from the angle of the previous shot. In this way, the two shots can be considered different enough to avoid jump cuts, which is an undesirable effect that causes visual jumps in either space or time of the film. The same rule applies when using zoom to produce the new shot – it must have at least 20% of difference relative to the previous shot.
4. **Reciprocating Imagery:** the rule determines that when shooting two separate subjects with single shots in the same scene, some characteristics of the camera must match in both shots. Changes in the camera height, type of the lens, focal length and illumination may compromise the film continuity.

A well-defined line of action for each scene is a key factor to maintain the spatial continuity of the whole film. According to Kneafsey (2006), for moving subject the line of action is usually defined by the motion path of the subject at a given instant. In this way, the subject will always be moving towards the same side of the screen. For stationary subjects, the line of action is often drawn in the direction the subject is facing. For two or more subjects, the line of action is defined by a line connecting the two most important characters of the scene. The continuity will be maintained as long as the camera remains within the 180° horizontal arc of one side of the line of action during a cut (Brown 2011). However, this rule only applies when one shot ends and the next one begins.

During the same shot, the camera can freely move and cross the line without breaking the film continuity because the audience can observe the movement and the spatial relation of the subjects.

3.4. Filming Methods

The sequence of shots that produce a scene is one of the most important elements in the process of creating visually aesthetical images and conveying consistent visual interpretations that do not contradict the intended narrative meaning (Hornung 2003). These shots can be filmed in several different ways depending not only on the style of the cinematographer but also on whether or not the action is controllable and can be repeated several times for multiple takes (Kneafsey 2006). The cinematography theory describes several ways to film a scene. The three most common filming methods are the master scene, the triple take (overlapping) and the plan-scene (in one).

According to Mascelli (1965) and Brown (2011), the master scene is the most common filming method used in narrative films. The method involves filming the entire scene with a master shot (a shot that includes the whole film set and uses a view angle that is different from other cameras) along with coverage shots (shots that reveal different aspects of the action). In this way, the editor has always two shots of each scene. If a continuity problem is detected in the coverage shots, a new shot of the same action can be extracted from the master scene. Furthermore, this method gives to the editor the freedom to creatively cut and alter the pacing, the emphasis, and even the point of view of the scenes. Filming a scene with the master scene method can be done using a single camera or multiple cameras. If filmed with a single camera, the action is repeated several times to obtain the coverage shots and the master shot. If filmed with multiple cameras, the coverage shots and the master shot are filmed simultaneously.

3.5. Editing

Films, especially narrative feature films, are made up of a series of individual shots that filmmakers connect in a formal, systematic, and expressive

way (Sikov 2009). Editing a film involves more than just assembling the shots one after the other. It involves the creative process of organizing, reviewing, selecting, and assembling the various picture and sound elements captured during production process so that it creates a coherent and meaningful visual presentation that comes as close as possible to achieving the goals behind the original intent of the work (Thompson and Bowen 2009). According to Mascelli (1965), only a good editing can bring life to a motion picture.

The most common editing method is called continuity editing (Mascelli 1965). It is described by a set of editing practices that establish spatial and temporal continuity between shots and keep the narrative moving forward logically and smoothly, without disruptions in space or time (Brown 2011). Continuity editing is used to join shots together to create dramatic meanings. With an effective editor, the audience will not notice how shots of various frame sizes and angles are spliced together to tell the story. The best editing is usually the unobtrusive editing (Mascelli 1965), that is, the one in which the audience does not notice that the editor joined the shots.

Each cut must always be unobtrusive and sustain the audience's attention on the narrative (Mascelli 1965). One way of complying with this editing principle is by avoiding jump cuts. A jump cut is often regarded as a mistake in classical editing (Butler 2002). It usually occurs when two very similar shots of the same subject are joined together by a cut, producing the impression that the subject "jumps" into a new pose. A jump cut produces a disorientation effect, confusing the spectators spatially and temporally. The best way to avoid jump cuts is respecting the 30 degree rule in consecutive shots during the shooting process. However, a good editor must always check the final sequence of shots to ensure that no jump cuts occurs.

Another important cinematography principle used by conventional editors to join and maintain the continuity between segments of videos is the use of adequate scene transitions. There are four basic ways to transit from one shot to another (Thompson and Bowen 2009):

1. **Cut:** Consists of an instantaneous change from one shot to the next. It is most often used where the action is continuous and when there is no change in time or location.

2. **Dissolve:** Consists of a gradual change from the ending of one shot into the beginning of the next shot. The dissolve is correctly used when there is a change in time or location, the time needs to be slowed down or speeded up, and when there is a visual relationship between the outgoing and the incoming images.
3. **Wipe:** Consists of a line or shape that moves across the screen removing the image of the shot just ending while simultaneously revealing the next shot behind the line or shape. The wipe is correctly used where there is a change in the location and when there is no strong visual relationship between the outgoing and the incoming frames.
4. **Fade:** Consists of a gradual change from a fully visible image into a solid black screen (fade-out) and a gradual change from a solid black screen into a fully visible image (fade-in). The fade is used at the beginning/end of a film, scene, or sequence.

Each one of these four scene transitions carries with it its own meanings (Thompson and Bowen 2009). The cut is the most frequently used transition, and, when it is made at the correct moment, it is not consciously noticed by the audience. The dissolve is the second most common scene transition, and unlike the straight cut, it attracts the audience's attention on purpose. Dissolves are more often used to indicate the passage of time (few seconds or many years). Other common uses of dissolves include: flashbacks, flashforwards, parallel actions and dreams (Barbash and Taylor 1997). Fade transitions are similar to dissolves, but they tend to be more emphatic, and usually express a more substantial rupture of time, space, theme, or plot. Wipes were very common in early films to indicate change in place, but nowadays they are rarely used. Some directors, however, are known for their extensive use of wipe transitions, like George Lucas in his Star Wars films (Caldwell 2011).

3.6. Matting and Compositing

Compositing is the process of assembling multiple visual elements from different sources into a single piece of motion picture (Lanier 2009). The goal of a

digital composite is to create the illusion that all the visual elements always existed in the same location or scene. The matting process consists in the extraction of the visual elements from the background so they can be used in the compositing process. According to Sawicki (2011), chroma key (also referred as green screen or blue screen) is the most common matting technique used in the film industry today. The chroma key involves shooting the visual elements in front of a green or blue screen, then using an algorithm to remove the colored screen from the shot and replace it with the substitute background during the compositing process (Aronson 2006; Foster 2010).

Early film productions traditionally used blue screens for the background. The main reason for this choice was because blue is complementary to the skin tone, and its wavelength can be isolated while still getting a fairly acceptable color rendition for faces (Sawicki 2011). However, green is currently the most popular background color. According to Foster (2010), this occurs because the image sensors of modern digital video cameras are most sensitive to green, due to the Bayer pattern, which allocates more pixels to the green channel. In addition, the green color requires less light to illuminate the background, because of its higher luminance and sensitivity in the image sensors. Green and blue are the most common colors used for backgrounds, but in theory any color can be used. Red is usually avoided due to its prevalence in normal human skin pigments, but can be used for other objects.

Figure 3.3 shows an example of compositing process using a green screen background. Initially, the wolf is captured in front a green screen and then composed with the actor and the background. The compositing result creates the illusion that both wolf and actor were in the same place.

Matting and compositing techniques can also be used to add computer generated images and 3D objects to the scenes, merging virtual and real worlds (Wright 2010). These objects can constitute the whole environments or other components such as character, furniture or other elements. Another example of element that can be added to the scenes are matte paintings, which are a painted representation of a landscape that allows filmmakers to create the illusion of fantasy environments or to represent scenarios that would be too expensive or impossible to build or visit (Okun and Zwerman 2010). Figure 3.4 shows an

example of scene where the green screen background is replaced by a matte painting of mountains and sky.

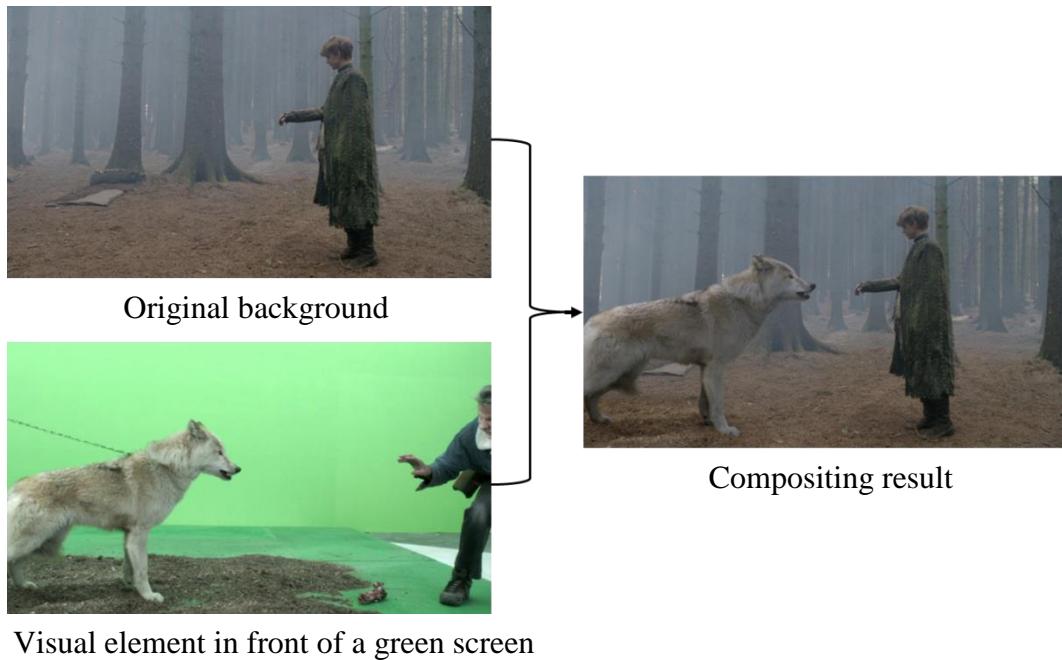


Figure 3.3: The compositing process using the chroma key technique. Source: (ArtOfVFX 2013). Copyrighted images reproduced under “fair use” policy.

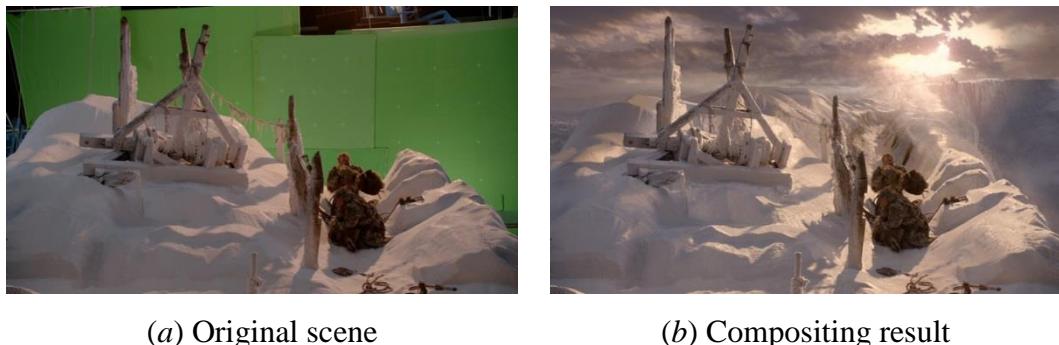


Figure 3.4: Example of scene created using the chroma key and matte painting techniques. Source: (ArtOfVFX 2013). Copyrighted images reproduced under “fair use” policy.

Matting and compositing techniques are crucial operations in visual effects production, allowing filmmakers to create a world of fantasy by combining live action and visual effects (Foster 2010). The term visual effect is used to describe

any imagery created, altered, or enhanced for a film that cannot be accomplished during live-action shooting. In other words, it refers to the process of adding and modifying the visual content of the film during the post-production phase. According to Okun and Zwerman (2010), there are three main reasons for using compositing techniques and visual effects: (1) when there are no practical ways to film the scenes required by the script or the director; (2) for safety reasons, when the scene could be done practically, but may cause personal injuries; and (3) for cost efficiency, when it is more economical or practical to use visual effects than filming the real scene.

Compositing techniques are also useful to reduce the number of actors required to represent complex scenes such as war sequences, which are known in the film industry for requiring huge investments in terms of money and manpower. By using compositing techniques, it is possible to multiply the numbers of actors, animals or other objects during the actual shot into as many as necessary to fill the screen. Figure 3.5 shows an example of war sequence, where the few actors present in the original scene were multiplied during the post-production phase in order to create an army.



(a) Original scene



(b) Compositing result

Figure 3.5: Example of scene created using the chroma key techniques. Source: (ArtOfVFX 2013). Copyrighted images reproduced under “fair use” policy.

3.7. Light and Color

Light is one of the most important elements to create the mood and the atmosphere of a film (O'Brien and Sibley 1995). Scenes with a lot of darkness and shadows increase the impact of emotions such fear and foreboding. Horror or

thriller films use low-key lighting to increase the sense of fear in the audience (Sullivan et al. 2008). A high-key lighting is more calming, it can evoke beauty, innocence, tranquility, and romance. Scenes with bright light increase the sense of well-being.

Color is an important aspect provided by light. It can affect the psychological perception the audience has of the scenes, change its mood and transmit emotions. Color is a powerful storytelling tool and an important factor to express emotions through images (Brown 2011). According to LoBrutto (2002), colors can be very subjective, but particular hues and palettes do represent, indicate, and communicate narrative messages to the audience. Warm colors tend to represent tenderness and humanity. Cool colors represent cold, lack of emotion, and distant feelings. Hot colors represent sexuality, anger, and passion. A monochromatic palette is a limited range of colors that can establish a colorless world, sameness, masked emotion, or a sense of simplicity.

3.8. Music

Music also is a powerful tool to express emotions. In a film, music can change the feel of a scene, bring out the emotions and enhance the reaction of the audience. According to Davis (2010), music is a fundamental element of a film. It creates the connection between the emotional content of the narrative and the visual events presented on the screen. Music is a communication tool, and it represents and communicates the narrative in a non-verbal way, filling the narrative gaps by being able to say more than the visual image can, particularly in terms of emotions (Ferreira 2012).

Several characteristics have been suggested that might influence the emotion of music. According to Gabrielsson and Lindstrom (2001), major keys and rapid tempos cause happiness, whereas minor keys and slow tempos cause sadness, and rapid tempos together with dissonance cause fear. The choice of instrumentation, whether soothing or obnoxious, will have an effect. Music can set the stage and place spectators in a different world, a different country, or a different time. Music is primarily designed to create a certain atmosphere or feeling for the scenes. It can create a dark and mysterious world, adding tension

and desperation to reinforce the seriousness of a situation. Music can express emotions and feelings so successfully because it works beneath our conscious level. It can cue us as to how to respond to the film or to a particular scene of the film without taking up additional screen time or space (Miller 1997). As music can enhance a scene, it can also ruin a scene. Incorrect type of music during a particular scene can nullify the emotions expressed by the actors.

3.9. Film Crew

Producing a film involves several professionals, and each member of the crew has specific roles and tasks in different phases of the production process. LoBrutto (2002), Kodak (2007) and Zettl (2012) describe the principal professionals and their main roles in the creation of a film:

- **Screenwriter (or Scriptwriter):** is responsible for creating the original story, or adapting a book, or other form of narrative for use as a script for the film. He/she must create a compelling and coherent story, and decide how to structure the narrative for presentation as a film;
- **Director:** is responsible for translating the script into a visual presentation. He/she controls the overall aspects of the film, including the content and flow of the narrative events, the performance of the actors, the organization and selection of the locations in which the film will be shot, and the management of technical details such as the position of cameras, the use of lights, and the content of soundtracks. The director is responsible for the artistic and dramatic aspects of the film. He/she must visualize the whole script and guide the technical crew and actors to fulfill his/her vision of the narrative;
- **Director of Photography:** is responsible for the visual quality and the cinematic look of the film. The director of photography transforms the screenwriter's and director's concepts into visual images. Using his/her knowledge of lighting, lenses, cameras, colors, and emotions, creates the

- appropriate mood, atmosphere, and visual style of each shot to evoke the emotions that the scene must express;
- **Camera Operator (or Cameraman):** is responsible for the general operation of the camera. The cameraman works very closely with the director. He/she helps the director to translate his/her vision of the narrative onto film by suggesting possible camera placements, lens, movements, lighting and composition;
 - **Editor:** during the post-production phase, the editor is responsible for selecting shots from the raw footage, and combining them into sequences to create a finished motion picture. The editing process is often called "the invisible art", because when it is well-done, the audience become so engaged in the narrative that they do not consciously notice the editor's work;
 - **Compositor (Visual Effects):** works with the visual effects team and is responsible for compositing live action videos, computer-generated elements, and other resources from different sources to create the final image of the film. He/she is responsible for the aesthetic integrity and technical quality of the composed scenes.
 - **Music Director:** during the post-production phase, the music director is responsible for combining music with the visual media of the film. Using his/her knowledge of music, the music director creates the mood and atmosphere of each scene based on the emotions and feelings that the scenes must express. He/she must have a wide knowledge of music and must know the effects that music has on the audience.

3.10. Conclusion

This chapter presented a brief overview of some important concepts of cinematography that are essential for the development of a video-based interactive storytelling system. The next chapter will present the proposed video-based dramatization model and will discuss how cinematography theory must be applied to maintain the film continuity and preset the story events in an attractive and engaging manner.