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Perceptual mechanisms in movies

Abstract

We discuss three perceptual mechanisms that are commonly used in movies, saccadic movement, occlusion and motion perspective, using examples from the movie "The Rock" produced by Michael Bay.

Perceptual mechanism 1: Saccadic movement

Imagine you are reading and a sudden movement in your periphery catches your attention. You shift your gaze in order to see a person walking by. It seems as if instantaneously your eye and focus has moved to the distraction in the periphery. Within 40ms your eye has reached a speed of 500 degrees per second and then halted on the new target. This movement is called a saccade [R1].

Movies consist of cuts, which separate camera shots from each other. Shots and cuts are combined to form a scene. To create a comprehensible scene, it is critical to select the right cuts and shots in the right sequence [R5]. The presence of cuts causes discontinuities in the flow of information, especially since the majority of cuts in movies are short [R2]. Intuitively one might think that discontinuities lead to confusion because we are used to seeing continuous scenes in the real-world. However we are able to follow complex movie scenes, consisting of many cuts, without difficulty. This is partially due to saccades. While everyday scenes in our environment seem continuous, they are really made up from many 'cuts' as our gaze moves within our surround [R1].

An example can be observed towards the end of 'The Rock". General Hummel is faced with a potential mutiny. Six of his men stand in a circular pattern pointing guns at each other. Two opponents are observing the scene from an adjacent room. Since each character has at least one line to speak, the camera position changes continuously, a total of 80 times in thee minutes. The full view of the scene is only shown once; thereafter each shot is a close-up of the person speaking. And yet the scene is comprehensible. We are able to follow the story because we are accustomed to 'cuts' in the visual information of our environment [R6]. During the same three minutes we tend to experience approximately 900 saccades [R5].

Figure 1: Mutiny scene from the movie "The Rock" consisting of 80 cuts

Perceptual mechanism 2: Occlusion

Close one eye and observe a scene with only the other eye. Although you may feel that the scene has lost some depth you are still able to judge the position of objects in space. This is due to 'monocular depth cues' which help us to estimate position of objects from two dimensional images [R7]. One such depth cue is occlusion. When one object partially hides another object from view, the partially hidden object appears to be further away from the observer [R6].

In movies, one of the most common techniques to create a sense of depth is the use of occlusion. It helps to provide an understanding of the position and orientation of a scene [R6].

In "The Rock", Goodspeed is chasing Mason through a large hotel kitchen. Throughout the scene the characters are partially occluded by shelves and other objects in the scene to create a sense of depth and orientation [R6].

Perceptual mechanism 3: Motion perspective

Imagine you are driving a car on the highway. Gradually move your gaze from the horizon towards objects closer to the car and eventually to the road right ahead of you. Although you are moving at a constant speed, objects far away appear to be moving slower than objects close to you.

This mechanism is referred to as 'motion perspective'. To a stationary observer, close objects will appear to move faster that objects moving at the same speed in the distance. Their velocity is inverse proportional to their distance to the observer, meaning that objects twice as far will move half as fast [R5].

Motion perspective and frequent cuts are commonly used to make movie scenes appear 'faster'. In one scene of "The Rock" a yellow Ferrari chases a Hummer through San Francisco. In many shots, the camera moves along a static foreground with the cars passing in the background at a faster speed. This creates the appearance of the car having a higher speed than they actually did during filming. The same scene observed from a bird's eye perspective would appear much slower [R5].

Figure 2: Close objects (e.g. fence) moving slower than distant objects (e.g. car) increases perceived speed of the car.

References

R1: Melcher and Colby. “Trans-saccadic perception”

R2: Zacks and Magliano. “Film, Narrative, and Cognitive Neuroscience”

R3: Rensink. “The Dynamic Representation of Scenes.”

R4: Levin and Simons. “Perceiving stability in a changing world: Combining shots and integrating views in motion pictures and the real world.”

R5: Cutting. “Perceiving scenes in film and in the world.”

R6: Director and producer Michael Bay, official website http://www.michaelbay.com/

R7: Saxena, Schulte, and NG. “Depth Estimation using Monocular and Stereo Cues”