Film (Cinema) Perception

Film (Cinema) perception refers to the sensory and cognitive processes employed when viewing scenes, events, and narratives presented in edited moving-images. Dynamic visual media such as film and television have increasingly become an integral part of our everyday lives. Understanding how our perceptual system deals with the differences between these mediated visual experiences and the real-world helps understand how perception works in both situations. There are many differences between film and reality but this entry will focus on three:

1. Film creates the illusion of motion through the rapid presentation of still images.
2. Film creates the illusion of continuity across a cut.
3. Film represents scenes and events across edited sequences of shots filmed at different places and times.

While this list is not exhaustive these three differences are critical for understanding how we perceive film. This entry will provide a brief overview of these differences and current theories about how they are dealt with by our perceptual system.

Moving Pictures

Movies consist of a series of still images, known as *frames* projected on to a screen at a rate of 24 frames per second. Even though the frames are stationary on the screen and are momentarily blanked as a new frame replaces the old we experience film as a continuous image containing real motion. The two perceptual phenomena contributing to this experience are *persistence of vision* and *apparent motion.*

Persistence of vision refers to the continued perception of light – resulting in an 'after image' - after the stimulus light has been turned off. During film projection the light is obscured by the closing of a shutter as the film moves from one frame to the next. This creates an alternation between light (shutter open – frame projected) and darkness (shutter closed) 24 times per second. Persistence of vision "fills in" the dark interval, but only partially, because a shutter rate of 24 frames per second results in a noticeable flicker. Early film used shutter rates between 12 and 24 frames per second earning them the nickname 'The Flicks'. Modern film projectors eradicate this flicker by blanking each frame three times increasing the flicker rate above the *critical flicker fusion* rate of 60 Hz and ensuring that the perception of light is continuous due to persistence of vision.

The motion we perceive in film is *apparent* because it is based on static visual information not real motion. Apparent motions can be broadly classified as *long-range* and *short-range* according to the conditions under which they are perceived. Long-range apparent motions, such as *beta movement* are perceived when two objects are alternately presented at two different locations around 10 times a second. The two objects are perceived as a single object moving smoothly between the two locations. Because of the slow rate of presentation and the large distances covered by the apparent motion, long-range apparent motions are thought to be processed late in the visual system and require inferences based on knowledge of real motion and the most likely correspondences between objects in the image sequence.

Short-range motions occur when static images depicting only slight differences in object location are presented very rapidly (>13 Hz). Short-range motion processing occurs very early in our visual system, does not require perceptual inferences to

understand the motion and is the same system used to perceive real motion. It is commonly believed that the apparent motion perceived in films is beta movement. However, while beta movement, along with other long-range motion phenomena such as apparent rotations and transformations may occur during film perception they cannot account for the majority of motion perceived in film. The 24Hz presentation rate used in film is too fast for long-range motion and film frames are too complex, making the task of identifying corresponding objects in subsequent frames too difficult. Instead, apparent motion in film is due to the same *short-range motion system* used to detect real motion. Motion detectors in the early visual system respond in the same way to the retinal stimulation caused by real motion and by rapidly presented (>13Hz) static images that depict only slight differences in object location. This results in a sensory experience of film that is indiscernible from reality.

Editing and the illusion of continuity

In film, we perceive scenes and events as continuous even though they are presented across multiple viewpoints that change instantaneously across edits. This illusion is referred to as *continuity*. The mismatch between the psychologically perceived continuity and the spatiotemporally discontinuous nature of the visual information was first noted by the psychologist Hugo Münsterberg in 1916. Münsterberg hypothesised that some of these violations are acceptable because a cut away to a different viewpoint within a scene mirrors the attentional shift a viewer would naturally perform when observing the same scene in the real-world.

If an edit is to function as an analogue for an attentional shift the viewer needs to be able to anticipate the shift in viewpoint to update their mental representation of the

depicted scene. Such a *constructivist* account of film was advocated by Julian Hochberg and Virginia Brooks. They suggested that questions arising from the events depicted in the previous shot motivate a cut to a shot that answers the question and allows the viewer to conceptually link the two shots. For example, when filming the conversation depicted in Figure 1, a cut between shot B and C can be motivated by a sudden head-turn of the character in black, creating the perceptual enquiry: "Is he about to speak?". Recent evidence by Tim Smith and John Henderson has shown that when cuts are preceded by motion onsets viewers orient quicker to the content of the new shot and are less aware of the editing compared to cuts without such attentional cues. Smith and Henderson named this phenomenon *edit blindness.*

Editing conventions (such as the 180º rule depicted in Figure 1) rely heavily on our natural tendency to attend to social features of dynamic visual scenes. Tim Smith has shown that when multiple viewers are presented with videos of real-world scenes their attention will synchronize as they attend to people and track them over time. This *attentional synchrony* enables film editors to predict where multiple viewers will attend in order to replicate their attentional shifts through editing. Recent neuroimaging evidence has also indicated that this synchronization may extend to how the film is processed. Uri Hasson and colleagues used neuroimaging to record the brain activation of multiple viewers while watching feature films. They observed a high degree of synchronization in brain regions responsible for such processes as language comprehension, emotion, and face perception. While such synchronization does not necessarily indicate that we are all experiencing a film in the same way it supports the

idea that there is a high degree of consistency in the perceptual enquiries we employ when processing dynamic visual scenes.

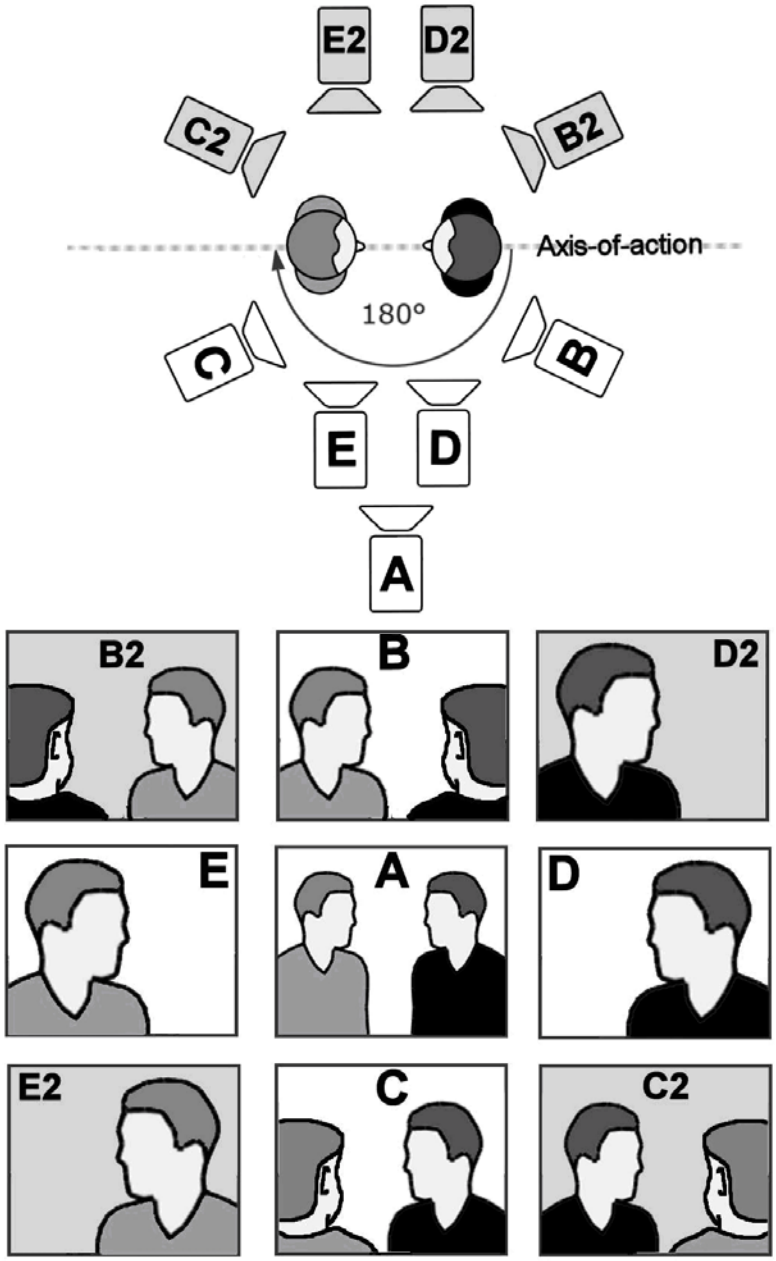

Figure 1: The 180° editing rule. Once the space of the scene has been established by camera A all other shots must be taken from the same side of the "axis of action". A cut across the line (cameras B2, C2, D2, or E2) would create a "discontinuity".

The perceptual construction of space

One of the assumed benefits of adhering to classical editing conventions is that they aid viewer comprehension of the depicted space. For example, the 180 rule states that when filming a scene all shots should be filmed from the same side of the *axis of action,* e.g. the line joining the characters involved in the conversation. Any sequence which crosses the line (e.g. a cut from a white to a gray camera; Figure 1) is believed to confuse the viewer and lead to disorientation. This hypothesis has received support from an experiment conducted by Uta Frith and Jocelyn Robson. Children were presented with simple films that either adhered to or broke the 180º rule. They found that the children who saw the conventional version were able to reconstruct the film more accurately than children shown the unconventional version. Hochberg & Brooks explained such an effect as evidence of the viewer's inability to construct a coherent spatial representation of the scene because A) crossing the line removes landmarks such as background features which would normally be used to identify the relationship between shots and B) violates viewer expectations about the location and direction of objects on the screen such as the left-right relationship of the conversational partners in Figure 1.

However, recent evidence from Dan Levin & Dan Simons has questioned the degree to which we attend to, encode, and monitor details within a film. Participants were shown a video depicting two people having a conversation. Every time a cut to a new shot occurred at least one continuity error was inserted such as the disappearance of a scarf. When participants first watched the film without being told that there might be a change, 90% failed to spot any continuity errors. In another video depicting a woman getting up from a desk in the first shot and answering a phone in the second, 66% of

viewers failed to notice that the actress changed across the cut. Levin & Simons interpreted these findings as indicating that, rather than maintaining a highly detailed and coherent representation of the depicted scene viewers only encode a small amount of the depicted visual information. Instead, continuity of space and time is assumed and perceptual inferences about the location and form of minimal details such as people and their movements are monitored to test the validity of the continuity assumption. If this inferred continuity hypothesis is true, the role of the editing conventions may be to facilitate these perceptual inferences and ensure that they can be satisfied following a cut.

One important condition for continuity seems to be the location of objects on the screen. d'Ydewalle and colleagues recorded viewer eye movements while they watched videos edited with or without violations of the 180 rule. They observed a peak in saccadic eye movements (i.e. attentional search) following cuts which violated the rule. They concluded that viewers anticipate the screen location of objects and when these expectations are violated (e.g. a cut from B to C2 in Figure 1) viewers have to repair their representation, leading to a break in perceived continuity. The critical nature of attentional shifts across cuts for the inference of continuity was formalized by Tim Smith as the *Attentional Theory of Continuity Editing*. Viewer attention throughout a film specifies which visual features are represented in memory, how perceptual enquiries are formulated and tested and whether continuity can be inferred from the satisfaction of minimal expectations across cuts.

Modern cinema and television are an integral part of our everyday lives. However, except for a few theoretical and empirical pioneers, the big questions of Film Perception

have received very little psychological attention. With new psychological methods such as eye tracking and neuroimaging at our disposal perhaps now is the time for Münsterberg's 1916 declaration of film as the domain of the psychologist to finally come true.

Dr. Tim J. Smith

University of Edinburgh

See also **Art and perception, Attention, Change detection, Depth perception in pictures/film, Event perception, Motion perception**

Further Readings and References

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