AI Jump Start: A Reappraisal of Editing for Continuity and Discontinuity in Film and Video Games

Travis Anderson
BYU Department of Philosophy
travis_anderson@byu.edu

Dennis Packard
BYU Department of Philosophy
dennis_packard@byu.edu

Abstract
We reconceive editing for continuity and discontinuity, suggest how computers could be used to assist in such editing, and illustrate the artistic use of such editing in films and games.

Introduction
To integrate AI more effectively into film and video game production, and to better understand that integration, we need a more robust and nuanced understanding of editing for continuity and discontinuity. Unfortunately, most film histories have given us an inadequate understanding of this core aspect of film by focusing on the development of what film historian Barry Salt calls “continuity cinema”—films without jump cuts or other forms of discontinuity edits. Only a few histories, like Salt’s own, even touch on the development of discontinuity as a strategic device, and Salt mostly repeats the conventional wisdom that while intentional discontinuity between scenes began as early as the 1930’s, it didn’t begin in earnest within scenes until Godard’s 1960 Breathless. But discontinuity between scenes seems to have been used systematically and aesthetically as early as 1905 in An Interesting Story, by James Williamson, and within scenes as early as 1903 in Distressing Poaching Affray, by Haggar and Sons.

One result of overlooking the historical development of “discontinuity cinema” is that it blinds us not only to the vigor and inventiveness of many early films. But it also leads us to overlook the sophisticated advances in cinematography, editing, and narrative story-telling being realized in contemporary cinema and, especially, in video games. Recent art-house films like the masterful Open Hearts, by academy award-winning director Susanne Bier and her editor Pernille Bech Christensen, as well as mass-market action films like Luc Besson’s Transporter series, frequently use discontinuity devices for stylistic effect—to enhance viewer engagement while simultaneously reinforcing spectator distance. And while popular video games like Mass Effect 3 use discontinuity with stylistic abandon, especially in dream sequences, other games like those in the Assassin’s Creed series employ it to create a temporality only possible in imagined worlds. Since many of these applications experiment with temporal relocation and manipulation in ways unaccounted for by present film theories, the rationales for discontinuity provided by standard histories are inadequate to today’s films and audiences, which means that film theory is losing ground in an age when virtual-environment video games and narrative films cross-pollinate each other. Contemporary film historians and theorists simply need a better understanding of how both filmmakers and game designers are employing continuity and discontinuity, not only in narrative films but especially in user-interface virtual-environment games.

This paper will argue that film and new-media editing shouldn’t be understood as a tradition of continuity occasionally challenged by discontinuity innovations, which novelties are subsequently neutralized and re-integrated into ubiquitous forms of linear narrative. A new understanding of continuity and discontinuity for film and video gaming is called for, one that shows the two working simultaneously and synergistically, each only making sense in the context of the other. Such an understanding will open new doors for using AI techniques in editing films and games for continuity and discontinuity. In particular, integrating AI with pre-visualization programs like those used in the production of the recent award-winning “Gravity” could enable filmmakers, editors, and game designers to design and track continuity and discontinuity, and thus better serve the new world of artistic filmmaking and game-making.

Current Views
So-called classical continuity editing relies on a number of unifying techniques, like preserving screen direction
and avoiding camera moves “unmotivated” by character movement. Perhaps most to be avoided for the sake of continuity are “jump cuts.” In what is certainly one of the most insightful and influential analyses to date of film editing history, techniques, and their cinematic effects, Barry Salt defines the jump cut as a “cut which moves directly from one shot to another taking place at a later time” (Salt 1992, 325). In short, jump cuts show an abrupt temporal shift. David Bordwell, widely considered the authority on such general matters, says the following about the jump cut: “An elliptical cut that appears to be an interruption of a single shot” (Bordwell 2008, 479). The idea is that what may appear to be an interruption of a single shot could be two shots put together for that effect. So Bordwell’s understanding is generally consistent with Barry Salt’s contention that jump cuts are mechanically affected representations of suddenly elided time.

Salt distinguishes between what he calls soft jump cuts and hard jump cuts. Edits which jump from one time to another, but which also employ an uninterrupted sound track of dialogue or music or spoken explanations across that transition, or even a move to a new location, reduce the visual or narrative discontinuity experienced by the viewer and are labeled as “soft jumps” by Salt. He observes that during the 1930s and 40s, soft jumps in non-musical films were used only by the Europeans, and used sparingly at that—usually only once or twice in a film (Salt 2008, 217).

What Salt calls “hard jumps” are edits in which a character or action is immediately transported by a straight cut from one time to a later time in the same location without any use of overlapping music or dialogue or other sound to mediate, soften, or otherwise neutralize the visual and narrative discontinuity created by the edit. Hard jump cuts are virtually unknown in the 1930s and 40s, Salt says, and didn’t become a common stylistic device until the 1950s and 60s (Salt 2008, 217).

As we have glimpsed, then, whether jump cuts are soft or hard is for Salt a function of the degree of visual or narrative discontinuity experienced by viewers in the jump: the more apparent and intense the discontinuity, the harder the jump. As Salt explains,

Just how soft (i.e. unnoticeable) this kind of jump cut is felt to be depends on how much explanatory and preparatory information has been provided before the cut. To take an obvious example, if we have already seen a series of shots of an actor running down different streets, another cut to a shot of him running down yet another street will be seen as a fairly soft kind of jump cut. Other factors involved in the softness or hardness of the jump cut are the relative positions and movements of the actor in the frames on either side of the cut. In the example just mentioned, if the cut is made with a good action match, it will be even softer, while if the cut changes the actor’s direction of movement to the opposite direction in the frame it will be a harder jump cut, just as is the case for ordinary cuts (267).

Salt cites as an example of soft jumps a series of shots from Hallelujah (1929) in which the protagonist travels home while singing and playing the banjo in different locations—first on a train, then in a wagon, and finally, as he is walking (217). So, ironically enough, it is precisely the continuity established by the music (in this case, diegetically provided by the hero’s secondary action of singing) which softens these jumps in time, according to Salt. Actually, however, the opposite would seem to be the case: the playing and singing (diegetic) accentuate and harden the jumps (non-diegetic). What Salt really seems to mean is that a “soft” jump is one in which the discontinuity is accompanied, or “softened,” by sound that is continuous. The criteria for identifying the hardness or softness of jump cuts, and by extension the very criteria for identifying continuity and discontinuity, clearly invites further scrutiny.

A More Adequate View

Jump cuts appear to depend as much on continuity for their identity as on discontinuity. In order to function as a meaningful jump cut, an edit must in the first place establish a narrative (diegetic) continuity across the cut and also establish some non-narrative (non-diegetic) discontinuity through the abruptness of the actual cut—as when a diegetic action is suddenly disrupted or a character (or group of characters) is suddenly relocated.

In general, then, continuity and discontinuity would appear to be the product of a match or mismatch between diegetic and non-diegetic elements. The disparity between an uninterrupted stretch of dialogue or banjo playing (diegetic) and a montage of interrupted shots of the journey (non-diegetic) heightens the mismatch between the diegetic and the non-diegetic and hence the discontinuity. A cut (non-diegetic) from a shot with one screen direction to a shot with an opposite screen direction of an uninterrupted scene (diegetic) creates discontinuity. A camera move (non-diegetic) shows continuity if it moves with a main character in a scene (diegetic). It shows discontinuity if it moves when the character is motionless or presumably if it remains motionless when the character moves. Cuts and camera moves will all have some degree of match and mismatch between the diegetic and non-diegetic; whichever is prioritized will determine whether the cut or move is considered one of continuity or discontinuity. Narratives edited with such a sensitivity to the diegetic and the non-
diegetic are like stories told by a narrator who may sometimes relate events with continuity and may sometimes jump back and forth, but in either case tells the story effectively.

With this fact in mind, continuity and discontinuity in films and games in production can perhaps be tracked by computer by comparing the diegetic and non-diegetic aspects of scenes. The diegetic and non-diegetic meta-data in a previz version of a film or game can be noted and compared across the production. Ideally, the result will show not just a variation of continuity and discontinuity, but a meaningful, artistic development supporting an overall theme for the diegetic and non-diegetic aspects of the film or game.

Here, for example, is a list of the jump cuts within scenes and non-jump cuts between scenes in Susanne Bier’s 2003 Dogme film *Open Hearts*. She most often uses jump cuts between scenes, with non-jump cuts as emphasis. And she most often uses non-jump cuts within scenes, with jump cuts as emphasis, the discontinuity starting out subtle and becoming stronger and stronger until we are experiencing uninterrupted dialogue over interrupted shots. We consider the artistry of *Open Hearts* and of several video games in the next section of the paper.

**Jump Cuts in Scenes from *Open Hearts***

2:00 under dialogue (proposal)
10:04 on pause
10:08 under dialogue (about accident)
13:41 on action (in scene)
13:41 on action
15:39 on action
16:44 on pause
17:58 under dialogue (his bitterness)
20:18 on action
20:44 on action
25:02 on action
28:18 on pause
28:37 on action
29:54 on action
33:56 under dialogue (her despair)
343:59 under dialogue (her despair)
34:03 under dialogue (her despair)
37:56 under dialogue (her effort to reach him)
38:30 on pause
42:47 on action
46:08 on action
46:11 on action
46:16 on action
46:18 on action
46:42 on pause
48:35 on action
48:43 on action
48:44 on action
48:49 on action
51:06 on action
58:35 on action
58:49 on action
1:06:08 on pause
1:21:06 under dialogue (their conflicted loving)
1:24:13 under dialogue (their conflicted loving)
1:24:17 under dialogue (their conflicted loving)
1:24:28 under dialogue (their conflicted loving)
1:24:40 under dialogue (their conflicted loving)
1:33:26 on action
1:33:35 on action
1:33:36 on action
1:33:39 on action
1:33:40 on action
1:33:44 on action
1:33:56 on action
1:34:19 on action
1:34:40 under dialogue (doctor’s despair)
1:35:04 on pause
1:36:24 on action
1:36:42 on action
1:36:51 on action
1:36:56 on action

**Non-jump Cuts Between Scenes in *Open Hearts***

14:00 (her going to see him)
51:32 (their going off together)
1:33:34 (his going into despair)

**Artistic Continuity and Discontinuity**

In sum, then, while individual filmmakers and editors have used discontinuity cuts in a multitude of ways, no doubt often guided more by intuition and inspiration than convention, film critics and theorists have typically assigned such cuts a much narrower range of possibilities—virtually all of them lumped under the label of jump cuts and understood simplistically as sudden truncations of time. As we have affirmed, abrupt temporal shifts are certainly one of the more conventional ways in which discontinuity cuts can function, but many films and games—especially during the last decade—have used discontinuity cuts in a strikingly different way.

In Susanne Bier’s film *Open Hearts*, for instance, visual jumps within scenes are not employed to indicate a shift in time, but to represent visually the cognitive discontinuity and psychological irruptions experienced during intense emotional exchanges and traumatic episodes. Visually these edits look like conventional jump cuts (and the sudden but subtle shifts in camera angle...
perfectly match Bordwell’s description of jump cuts). The problem is that there is no accompanying jump in time either manifest or implied, and the dialogue continues without interruption. In other words, the edits cannot be understood as time jumps; they are more akin to disorienting stutters or breaks in perception, the kinds of momentary lapses in consciousness that experientially accompany psychological shocks or traumas.

Elsewhere in the film similar discontinuity cuts seem to represent the imagined intentions or desires of the protagonist—and again, there is no overt or implied passage of time. In fact, such cuts often extend time, stretching out the diegetic moment, as happens in slow-motion shots. The difference being that while slow-motion accurately conveys experiences in which time seems to slow down and/or perception is heightened, discontinuity cuts distend time by over-saturating the moment with more images or events than it could in reality contain, and thus, they capture better those experiences in which either time or consciousness itself seems to fracture, replicate, produce contradictory sensations, or otherwise become discontinuous. If we read Bier’s film as a sustained artistic investigation of psychic trauma and its effects on human relationships, then her various forms of continuity editing can be conventionally understood as the means of syntactically structuring and connecting scenes and experiences of intense emotional confrontation or distress. But, her discontinuity cuts must be interpreted as a means of depicting that trauma and pain within the narrative itself, visually rendering the staccato breaks in consciousness and violent shifts in mood or perception that such experiences phenomenologically display. In short, Bier’s discontinuity cuts are not functioning as simply another structural articulation, not even as a discontinuous form of articulation; they are functioning as visual signifiers of meaning that an image alone cannot convey—that is, as supplements to the images, not as their connective tissue.

In many contemporary video games we see both continuity and discontinuity edits, as well as cinematographic techniques, being used in innovative and sometimes ground-breaking ways. (Thanks to Chris Anderson for his insightful assistance in analyzing these games with us.) Both the Assassin’s Creed series and Braid build their respective narratives primarily around temporal manipulations, so their edits are often as meaning-laden as are many of their “cinematic” practices. In the violent and visually crude Hotline Miami, the momentary flash of a static screen is used both to signal a cut and to signify an ellipsis in time, thereby shifting and collapsing time simultaneously. In Dishonored, Starcraft, League of Legends, and many battlefield and vehicle simulation games, the gamer can toggle at will between, say, cockpit views, overhead views, and behind/above the vehicle views—or employ some special power to move simultaneously from one spot to another or (e.g., from ground-level to rooftop) in order to gain some strategic advantage. Those perspective shifts (called “blinks,” “teleports,” or “flashes,” depending on the game) appear at first glance like jump cuts. And while they certainly can serve the meta-narrative function of most conventional cinematic jump cuts (jumping a character forward in time), because they can also interactively relocate the protagonist within the game-space they serve a narrative function not usually served by movie jump cuts—relocating a character in space but not in time. They can also transport the viewer from a first-person perspective to a third-person perspective. In Beyond: Two Souls, discontinuity cuts take editing a step further by moving the viewer not only in time and space, but from one persona to another. The gamer initially inhabits the character of Jodie, who is tethered to a dark energy force with whom she can communicate and to some degree influence. Cuts in this game can switch the viewer’s perspective from that of Jodie to that of her dark-energy protector, Aiden—who in turn can possess, strangle, and otherwise attack Jodie’s enemies. Additional cuts from color to greyscale signal shifts from real-time to “bullet-time,” wherein time moves slowly and allows for attenuated responses. Even greater temporal manipulations are possible in Braid, where different game levels entail progressively greater temporal parameters and abilities.

To summarize, these radical kinds of discontinuity cutting produce a degree of narrative (diegetic), not stylistic discontinuity—in fact, some of these cuts are barely noticeable and thus have minimal stylistic effect. But since relatively few of them signify simple temporal jumps or truncations, the kind of discontinuity they usually produce is different from that produced by a classic jump cut. It is a discontinuity perhaps better understood as a variety of multi-functional narrative discontinuity: as a fundamental break from the bodily perspective traditionally represented by the camera, as an instantaneous leap of imagination, as an interruption of the coherent if not linear fabric woven together by our familiar activities, as a moment in which primal emotions or repressed memories irrupt from unknown sources to trouble and tear apart the beautiful illusion of continuity woven into that fabric.

In conclusion, what is critical to recognize is that discontinuity cuts can serve both meta-narrative and narrative functions. Some edits for discontinuity clearly serve a stylistic or meta-narrative function: jump cuts, for example, typically do not operate in the service of the narrative (as do continuity cuts and classical cuts); rather, like montage edits they function as transgressive interruptions or supplementations of the narrative from a perspective outside the narrative. (Other meta-narrative devices like voice-overs, non-diegetic music which dominates or drowns out diegetic sound, and a uniform color palette can all disrupt the narrative from without in
similar ways—though they do so by forcibly establishing continuity rather than discontinuity.) And despite the somewhat deceptive meta-narrative continuity they exhibit of themselves, the primary function of meta-narrative discontinuity cuts is often to enliven the narrative and elevate it into something more than a mere story. But there are other kinds of discontinuity cuts—like Bier’s—which disrupt and inform the narrative from within, and thereby express diegetic meaning. These cuts don’t just splice together discreet sections of the narrative as do conventional cuts, they populate the narrative in much the same way as do diegetic images and sounds.

Accordingly, films like Bier’s *Open Hearts* and cutting-edge video games show the inadequacy of the conventional analysis and history of discontinuity. But they also open a way to integrate AI with pre-visualization programs like those used in the production of the recent award-winning *Gravity*, which could enable filmmakers, editors, and game designers to design and track continuity and discontinuity, and thus better understand the new world of artistic filmmaking and game-making.

**References**
