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CHAPTER TWENTY-FOUR

Embellishment & Effects

Seduction by Style

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For nearly 40 years, researchers have sought to understand how graphics in videogames and computer games impact users—ranging from whether some types of visual images displayed on a screen help to make educational games more fun to how different types of avatar graphics impact players (with Malone [1980] as one of the earliest attempts). A key concept in such work is that of *embellishment*. Consider the game *Limbo* (2010), in which environments are rendered in minimalistic black and white graphics resembling shadowy silhouettes. Such graphics feature minimal embellishment. In contrast, other systems might feature much more detailed, full-color, more painterly or photorealistic images—hence more embellishment. Figure 24.1 depicts this contrast using the example of the player character in *Limbo* contrasted with the painterly player character in *Braid* (2008). As such, while it refers to levels of detail, embellishment is no mere matter of extraneous graphical details. Rather, as it is used here the term "embellishment" is inextricably linked with notions of visual style in a more holistic sense.

A second important aspect of graphics in videogames and computer games are their "effects,"—or changes to the game's graphics over time (e.g., animations). For instance, consider *Mortal Kombat*'s (2002) character Sub-Zero who can freeze to ice and shatter a defeated opponent, a series of multiple sequential effects. On the other hand, in *DotA 2* (2013), the faint glow of green signals that a health potion was recently consumed, adding an aesthetic quality to an important feedback component. These features can perhaps be understood as *seductive details* of these digital bodies, enticing both our aesthetic sensibilities as well as our sense of ludic dynamics associated with game events.

Figure 24.1. Player-character in *Limbo* (left) versus that in *Braid* (right).
(Source: Playdead and Number None, Inc., respectively, reprinted with permission)

Prior work has suggested myriad ways that embellishment and effects (again, more holistically understood as style) in digital games may impact users' experiences, from learning to engagement. This chapter focuses on perhaps one of the most important, but underconsidered, areas of visual embellishment and effects: *avatars*' degrees of graphical embellishment and effects—i.e., the level of detail, aesthetic style, and visual feedback.

JUICINESS AND INSTRUMENTALITY

Let us start by looking at effects. Graphical effects—even those seemingly secondary such as blood expelled by avatars—can impact players' behaviors in game (Ballard & Wiest, 1996). One study—taking place in *Mortal Kombat: Deadly Alliance* (2002)—compared four different levels of blood; when avatars expelled the most blood, participants had increased hostility, arousal, and weapon usage (Barlett, Harris, & Bruey, 2008). A graphical effect like blood spurting—for all its potential vulgarity—can play an important role in some violent games as a form of feedback indicating, for instance, that an avatar is near death and needs to be healed. It also raises a question. Can we account for the impacts of graphics on players in a more general way?

We can view graphical effects in games as *aestheticized feedback*. Viewing such feedback as both informational—e.g., what is the current state of the game?—and aesthetic—e.g., what is visually pleasing, vexing, or otherwise engaging?—can be a useful spectrum in thinking about effects. Many effects are both informational and aesthetic in function. The graphical effects of videogames have been described in the literature using the evocative, if somewhat colloquial, term: "juiciness" (e.g., Gray, Gabler, Shodhan, & Kucic, 2005). While juiciness has sometimes been defined as excessive positive graphical feedback (Juul, 2010), here we draw upon definitions that describe juiciness as the sensory quality of a game that "feels alive" and "responds to everything you do—[providing] tons of cascading action and response for minimal user input." (Gray et al., 2005, p. 3) Examples of "juiciness" abound—"bouncing through a room full of coins, blinging with satisfaction," *Mario Bros.* (1983), and "enemies exploding and flinging blood to an almost unjustified extent" (*Alien Hominid*, 2004; Gray et al., 2005, p. 3). Effects can be mainly instrumental or aesthetic in nature ("juiciness" often represents an ideal merger of the two). Some effects are virtually wholly aesthetic. Consider the *DotA 2* "courier"—an aesthetic item without instrumental utility in the game—that sold for $38,000 USD for its then-rare particle effect. Or consider the *Team Fortress 2* (2007) graphical elements "hats," avatar headwear that are purely cosmetic items with no impact on gameplay. One such hat sold for nearly $20,000 USD, presumably because of its *burning flames* effect. These types of effects—which are rare *and* visually pleasing to players—command the highest premiums (see Robinson & Calvo, this volume). On the other hand, effects can be a primary mean of instrumentally communicating feedback—e.g., taking damage, status effects, healing, etc. Effects that communicate feedback should be designed with several aspects in mind. Deterding (2015), for instance, suggests a set of feedback *design lenses* which provide general principles in creating feedback: e.g., immediate (feedback immediately after the action), glanceable (feedback without visually obstructing the view), and juicy. Effects that represent feedback are often obscure—lines of motions created by characters communicating different ambiences, e.g., delicate and dynamic (curved) in *Journey* (2012), or slow and peaceful (straight uprights and horizontals) in *Superbrothers: Sword & Sworcery EP* (2011).

The concept of juiciness inherently raises several questions. Should we add effects to everything? Should we "juice" every interaction? There's good reason to believe that adding more effects will—up to a point—increase engagement, while minimizing effects will increase performance. Seductive details and juiciness can positively impact player engagement and negatively impact player performance (Kao & Harrell, 2017). For instance, imagine we have two versions of *Super Mario Bros* (1985). One version is the "juiced" version: get a coin? Fireworks. Kill an enemy? Explosion. Break a block? Screen explodes. Engaging, *but distracting*. The second version is "instrumentalized" (Zimmerman, 2011) to provide players with

maximal clarity. In this instrumentalized version, screen elements such as Mario, coin boxes, and so on are each depicted as single, solid, colored boxes against a white background. The notorious enemies called goombas are graphically mere black squares with legs. Jumping on them results in uniquely identified simple sounds. There is no rich animation in this version. Defeated enemies simply disappear. This version would be very unambiguous, *but dry*. We can imagine that games that carefully manage embellishment can provide high levels of both performance and engagement (see Kao & Harrell, 2017).

TOWARD EMBELLISHMENT: EFFECTS AS SEDUCTIVE DETAILS

This dichotomy between juiciness and instrumentality is particularly relevant in the learning sciences. For decades, researchers have found that embellishing instruction with seductive details that add up to fully realized styles with fantastic themes (Fullerton, 2014) improves instructional efficacy. Games are touted as moving beyond the "content fetish" (Gee, 2004)—the all too common view that any subject is a body of information, and that learning is the teaching and testing of that information—and immersing players in an experience where there are *intentional* inefficiencies and imperfections in game mechanics. Instead of trying to rush toward "instrumentalized" games, it is specifically in the embellished ambiguities (aesthetics that may obscure instead of reveal) that create opportunities to explore (Fullerton, 2014). But this is opposite what some researchers in the learning sciences would postulate—that such embellishments would constitute *seductive details* that impede educational efficacy as they lure attention away from the tasks at hand (Garner, Gillingham, & White, 1989).

Researchers describe three concerns related to *seductive details* as follows: *distraction* (taking attention away from the relevant and moving it toward the irrelevant), *disruption* (making it harder to create correct mental schemas), and *diversion* (priming prior knowledge that is unhelpful; Harp & Mayer, 1998). One example is in instructional media, where seductive details are known to both distract and create ambiguity (e.g., line sketches vs. 3D graphics; Butcher, 2006). Yet some researchers argue that seductive details have motivational affordances (Fullerton, 2014)—that is, graphical effects may actually *encourage* students to engage in game-based learning. For instance, one study compared three different visual themes—changing only the textures of the background and UI elements—and found that the more embellished, and more ambiguous, visual themes thwarted performance (and self-efficacy—or the belief in one's ability to succeed at a task), but *improved* engagement (Kao & Harrell, 2017). In performance-related contexts such as education, this is crucial, since higher performance and self-efficacy can influence people to choose STEM-related careers (Pajares, 1996).

AVATAR EMBELLISHMENTS AND THEIR (IN)EFFICIENCIES

In understanding the impacts that graphical features may have on gameplay outcomes in general—and educational outcomes in particular—the notion of *embellishment* provides a useful framework. For us, embellishment is more than seductive details. We refer to a type of holistic embellishment that refers to the overall degree of specificity and detail in creating graphical images for a system. In this way, embellishment is intertwined with notions like visual style and theme. Embellishment is any type of additional level of detail beyond the "bare bones" instrumental forms required for a system. When considered through this framework—from simple, functional forms variably embellished toward greater perceptual realism—three key dynamics emerge related to play performance, influence, and immersion as follows.

Simple Avatars Perform as Well as Embellished Ones

It is often implied in the games industry that added embellishment gives interactive, computer-based experiences a greater sense of realism and immersion (i.e., that the depiction is true-to-life and overtakes the senses; Lombard & Ditton, 1997). But embellishment, with respect to performance, can have its downsides. For example, a virtual reality user's confidence in stepping off a high ledge is no different when you have a simple, line-drawn avatar compared to a full-body, gender-matched avatar. However, having no avatar at all made users believe they could comfortably step off high ledges (Bodenheimer & Fu, 2015). Furthermore, both a robot avatar and an avatar made only of yellow cubes forming a human shape induced a higher feeling of digital body ownership, compared to human-like avatars (Lugrin, Latt, & Latoschik, 2015). Moreover, people who use a simpler avatar when performing virtual tasks have a similar task performance when using complex, realistic avatars (Linebarger & Kessler, 2002). In an educational context, players using simpler avatars (such as shapes) have been shown to outperform players using "likeness" avatars that bear players' resemblances (Kao & Harrell, 2016). Abstract/non-figurative avatars might provide a means of "outcome dissociation"—a greater indifference to the outcome of the virtual task, whether successful or not—via the user being less attached to them (Kao & Harrell, 2016) and less distracted via less-embellished avatars (Kao & Harrell, 2017). Furthermore, as they contain very few salient identity characteristics, abstract avatars might mitigate "stereotype threat," the notion that broader stereotypes in society affect performance at the individual level simply by *thinking* about them (Steele & Aronson, 1995)—more embellished avatars being one potential avenue of reminding users of those stereotypes.

This last point, mitigation against stereotype threat, suggests a broader potential for avatars. It is possible that digital bodies might help obviate some of the more negative impacts of oppressive graphical identity representations game

players face (see Nowak, this volume). Stereotypes like "white is good," classically described by the revolutionary theorist Frantz Fanon (2008) as a Manichean worldview, serve to disenfranchise many individuals in society. The pervasiveness of such worldviews (in society in general, not only those identified as "white") were historically made quite clear in the notorious Clark study in which African American children *consistently* showed a strong preference for a white-skinned doll *over* a brown-skinned doll (Clark & Clark, 1947). Taking a cognitive science perspective, these negative self-stereotypes may be the results of a *phantasm*—an integration of imagery, belief, and knowledge that occurs even without conscious reflection (Harrell, 2013). Given the underrepresentation of many social categories in Science, Technology, Engineering, and Mathematics (STEM) and the resulting stereotypes, people may find themselves questioning if they belong in a particular career path. In such cases where there is a conflict between a user's perceived identity and the stereotypical expert in a task domain such as STEM, obviating such oppressive phantasms becomes especially important (Ratan & Sah, 2015). In such domains, simple avatars may facilitate *identity protection*—buffering players from stereotypes that exist both at the individual level and throughout society more widely—enabling diverse players to see themselves as learners and doers in the domain without the hindrance of stereotypes they may face.

These patterns may hold true beyond the case of educational games. Even in virtual reality systems, evidence so far has consistently suggested that simple avatars are as effective, or even *more* effective (e.g., in terms of player performance when using them), than photorealistic, full body, gender-matched (in relevant cases), human avatars (Bodenheimer & Fu, 2015; Lugrin, Latt, & Latoschik, 2015). Researchers have hypothesized that differences between more abstract and more human-like avatars could be a result of various phenomena, including the Uncanny Valley effect in which an animated "almost" human elicits revulsion (Mori, 1970), "object-like" avatars increase a focus on game mechanics (Banks, 2015), etc. Though we are often keen on photorealism, simple avatars are still effective representations. However, they do not always support the needs of particular games or users. Hence, it is important to look at avatars that also more directly reflect the humanness of users in their graphical appearances.

Dynamic Embellishment Can Improve Performance Over Static Appearances

Videogame avatars often change graphically over time, especially as the player characters they represent become more powerful in the gameworld (Velez, this volume). Hence, it is important to look at avatars that change over time, or *dynamic* avatars, and even *type-changing avatars.* Players that use an avatar that is in their likeness only when achieving a goal, and at all other times a geometric shape have

significantly increased play performance and playing time compared to players that had the inverse. That is, when during gameplay a player's avatar is a simple shape, but when the player completes a level the avatar briefly changes to an avatar in the player's likeness as a congratulatory message is shown, that dynamic embellishment produces higher performance than static scenarios, as when likeness/shape are inversely shown, when the player always had a shape avatar, or when the player always had a likeness avatar (Kao & Harrell, 2016). This so-called *successful likeness* representation, it is suggested, results in higher identification with the likeness avatar facilitating vicarious experience of achievement, and lower identification with the object avatar facilitating the outcome dissociation of failure. Games, and perhaps virtual tasks more generally, might benefit from such a model of representation, shielding users from internalizing failure with, for example, a shape object during normal gameplay and trial-and-error, and basking them in self-success-identification with, in contrast, a likeness avatar during goal achievement. But this is only *one* possibility in the space of dynamic avatars—what other morphing, shapeshifting, transforming avatars have we still to imagine?

Self-similar Embellishment Is More Impactful

The *persona effect* was one of the earliest studies that revealed that the mere presence of a life-like character in a learning environment increased positive attitudes vis-à-vis the experience (Lester et al., 1997). A wealth of empirical research since then has demonstrated that digital characters are more influential (e.g., on performance, attitudes) when they have such similarities as competencies (Kim & Baylor, 2006) or genders (Baylor & Kim, 2004). This is posited to be a result of similarity-attraction, a theorized phenomenon in which people are attracted to similar others (see Kao & Harrell, 2016).

As a result, system designers may be tempted to always maximize the similarity of anthropomorphic avatars. This is likely not a bad heuristic, but one that may in fact be sub-optimal in some situations. Users may benefit more, in some situations, by avatars that embody some aspirational aspects, such as avatars resembling someone who should be skilled in the game domain, which we shall also call role-model avatars. While these could be some paragon in a field such as Marie Curie in science or Frida Kahlo in art, they could also be some ideal such as a blend between the user's ethnic and racial category and an action or fantasy hero in those game genres. Role models, in an offline context, have been shown to boost the academic performance of learners and reduce stereotype threat (Lockwood, 2006), while recently studies have been performed using role-model avatars (Kao & Harrell, 2015).

In a study in which participants were randomly assigned to either a scientist (e.g., Marie Curie), athlete (e.g., Muhammad Ali), or shape (e.g., triangle)

avatar—both scientist and athlete avatars led to significantly higher engagement. For female participants, the use of scientist avatars led to highest immersion and positive affect, and lowest tension and negative affect (Kao & Harrell, 2015)—confirming the notion that role models are effective for groups that have traditionally faced stereotypes within the task domain (in this example being women in STEM). For male participants, alternatively, the use of athlete avatars led to the biggest performance boost. Interestingly, this would appear to contradict our earlier assertion that embellishment can hinder performance (here the role model avatars outperform the shape avatars). In this case, the role model effect is stronger than any additional embellishment incurred by these avatars. Social identity—for role model avatars—influences avatar impact. In the previous section on dynamic embellishments, we saw that the actual event taking place in the game itself—if the player has just achieved a goal—also influences avatar impacts. Numerous other considerations may be of variable importance, discussed in the next section.

GRAPHICAL ELEMENTS AND WAYS OF (SCIENTIFICALLY) SEEING

The effects and embellishments of avatars will always be constrained by the systems from which they emerge, from sociocultural systems of thought and experience (McArthur, Teather, & Jenson, 2015) to social norms (Kafai, Fields, & Cook, 2010). Technological considerations are still important, including texture size (digital storage taken up by some graphics; Liang, Motani, & Ooi, 2008), pre-fetching and caching (saving data for future use; Bolger, Corrao, Hamilton, O'Connell, & Snitzer, 2015), and whether a game engine uses the CPU versus GPU for various particle effects (Unreal Engine, 2016). Of course, aesthetic considerations, e.g., the shape or timing of particle effects (Gilland, 2009) has been and always will be a priority.

Interpretation of graphics is, inevitably, subjective. While some technical details may be objectively true—for instance, textures make up a large majority of network traffic in *Second Life* (2003; Liang, Motani, & Ooi, 2008)—there are innumerable *ways of seeing* (Berger, 1972). In other words, there are multiple mechanisms for absorbing the world around us—including videogames and avatars—and establishing our place in it, each of them leading to questions, approaches, and interpretations. Many visual methodologies exist, and any one of them is valid: compositional interpretation, cultural analysis, discourse analysis, semiology, etc. (Rose, 2016). How harmonious are the colors? What is the spatial organization, the rhythm of the lines, the connections or isolations? Where is the viewer's eye drawn to? How will interpretation differ across people? How is power being constructed

or reproduced? We must constantly remind ourselves to step back, remain open, and consider other ways of seeing. More importantly, in our view, supporting other ways of seeing will inform the capacity of our systems to empower diverse users and learners and otherwise strive to support the social good.[1]

NOTE

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