Beyond Shooting and Eating: *Passage, Dys4ia*, and the Meanings of Collision

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Introduction

We are now more than three decades into the period of video games as a dominant media form. While only some of us remember the "*Pac-Man* Fever" that seemed to wash over the United States in the 1980s as this period began, a glance back at writing of the time reminds us that nods to video games became nearly universal among those commenting on the cultural changes enabled by, and enabling, the spread of computation—whether the topic was human-computer interaction techniques, computing's growth in our social and psychological lives, or the emerging informatics of domination.[1]

Yet somehow in the intervening decades we have developed no account of the basic operations of video games. The fundamental vocabulary of games is discussed, for the most part, only by those involved in game production and using terminology (for example, *collision detection*, *resource sink*) that is largely unfamiliar in circles concerned with culture. It is as though we are discussing cinema without access to concepts such as *montage*—or discussing poetry without concepts such as *meter*. Certainly interesting interpretive work can be done without access to such concepts (and it is), but for the field as a whole it is useful to be able to discuss works in such terms.

1. See Buckner and Garcia, "*Pac-Man* Fever," *"Pac-Man" Fever* (Columbia 02673, 1981); Ben Shneiderman, "Direct Manipulation: A Step Beyond Programming Languages," *Computer* 16 (August 1983): 57–69; Sherry Turkle, *The Second Self: Computers and the Human Spirit* (New York, 1984); and Donna J. Haraway, "A Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s," *Socialist Review* 80 (Mar.–Apr. 1985): 65–107.

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In the case of video games, the lack of such concepts may have seemed of little concern. If we think of games such as *Pac-Man* (1980) or *Missile Command* (1980), the most useful interpretive frames might be those focused on the embodied performances of players or the militarized national imaginations that gave birth to fantasies such as the "Star Wars" missile defense system. But now, especially in the last decade, we have seen the growing prominence of other kinds of games, grouped by names such as art games, indie games, documentary games, persuasive games, and so on. These games are doing urgent cultural work—and speaking to those for whom video games are the form of media in which they invest the most time and energy. And many of these games function by employing the fundamental vocabulary established by games of an earlier era, using it to produce vastly different experiences from the competitions of shooting and eating found in 1980s arcades.

To understand these games, we must grapple with this fundamental vocabulary of games. We must begin to have a language for discussing this vocabulary and how it functions both for familiar, mainstream video games and for new, strange, marginal games. This essay primarily approaches this work through two autobiographical games—the memento mori *Passage* (2007) and the transition story *Dys4ia* (2012). By examining them closely, we can see how they adopt and shift—and thereby reveal—the key strategies at work in video games from their beginnings.

This essay particularly builds upon prior work developing the concepts of operational logics and playable models to offer an account of how these strategies function. An operational-logics lens reveals that the fundamental vocabulary of games is made up of elements that cut across the usual categories used in discussing video games: computational processes (sometimes discussed as rules), audience communication (sometimes referred to as representation or fiction), and opportunities for play. My particular focus in this essay is on a particularly widespread logic: collision detection, used to communicate the "touch" of virtual objects. Given this focus, I discuss games that employ playable models of space. In particular, I am inter-

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ested in how games such as *Passage* and *Dys4ia* seek to use player experiences of collision to expand what collision and space are understood to mean—seeking to move beyond what was established in the early years of video game design and what is inherited from the forces that made these key logics and models available.

Passage

Jason Rohrer's *Passage* is a strange and powerful game.[2]

The game world is presented to the player as a horizontal strip with a deliberately simple, nostalgic art style. The first time I played, I went down, scrolling more of the game world into the visible strip, and discovered a familiar-feeling game world of abstract boundaries, shifting backgrounds, and the occasional iconic treasure chest that, when opened, sometimes provided a reward (fig. 1a). Many traditional game challenges were absent, however—there were no gaps to jump, no enemies to fight, no puzzles to solve. Getting the rewards required only locating them in the world and navigating my way to them. Frankly, I began to wonder what the fuss was about—a friend had recommended the game very highly.

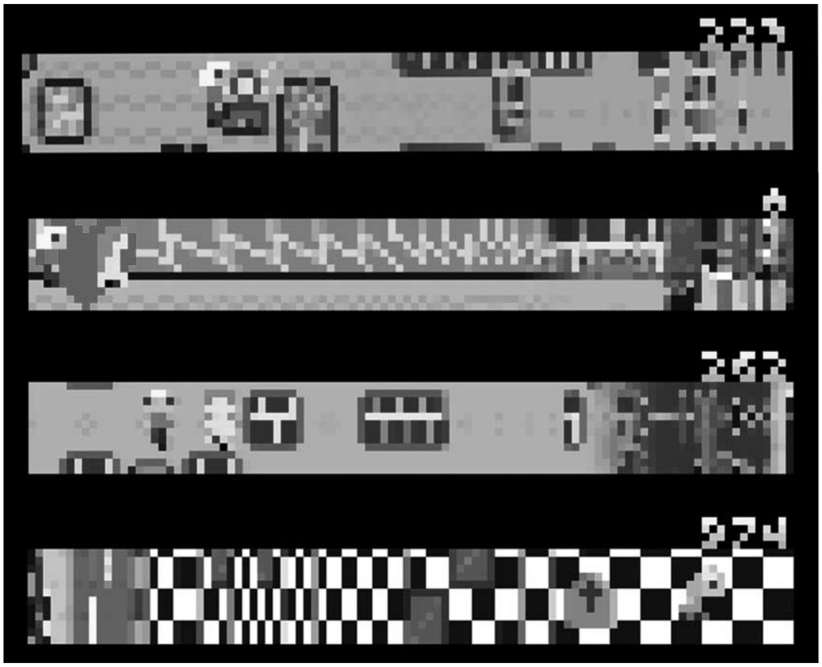
Within a minute, a visual shift happened, and I began to notice something strange. The player character—what I've been referring to as "me"—was no longer as far left in the game window. It had moved slightly rightward. And my character's visual presentation had also changed slightly, perhaps looking a bit older. This was the first of a series of shifts. I continued to move my character through the world, finding my way to treasures and discovering that as I walked my character to the right, new areas of the game world were revealed with different image patterns in the background.

Passage is a brief game, always lasting around five minutes. During my play I sought treasure at times and at others raced forward to find new areas (and to discover whether the game had a destination or goal), all the while with my character progressively shifting in a manner beyond my control—taking positions further to the right in the scrolling window and represented by the image of an older and older man. Then suddenly, I was dead, the last position of my character replaced by an iconic tombstone.

This was certainly an unusual play experience, but I only began to grasp the full strangeness of *Passage* when I played again.

The first time I played, I had seen the trace of another person to the right of the first screen but then never encountered any other people. The second time, I walked straight toward the other person. When the player char-

2. See *Passage*, dev. Jason Rohrer (2007), hcsoftware.sourceforge.net/passage/



FIGURES 1a, 1b, 1c, and 1d. Finding a reward (top); starting a partnership (top middle); spaces must be traversable by both partners side by side (bottom middle); and after a partner's death (bottom). Screenshots of *Passage*, dev. Jason Rohrer (2007) by John T. Murray.

acter touched her they fell in love, the moment marked by a heart (just as the reward from treasure chests is marked by a star) (fig. 1b).

From there we walked everywhere together, exploring and growing older together. But being together changed the experience of the world. Walking side by side down through the game space, we could not fit through gaps in barriers I had walked through easily before (fig. 1c). Some treasure chests became inaccessible and areas that previously presented no challenge became like mazes. But we went on, moving together, exploring, and aging. And then—in the moment for which *Passage* is best known—my partner became a tombstone beside me.

I no longer wanted to move. It seemed wrong to leave her behind me. Yet it was no longer her, and there was little point in standing around beside an immobile gravestone (fig. 1d). It was an experience of loss and confusion. I paused, dithered back and forth, moved forward a bit, and then mercifully became a tombstone myself.

Perhaps *Passage*'s meaning strategies seem abundantly clear from this description—but as strong as the voices of praise raised after its release were critical voices, some dismissive and befuddled. *What was the big deal?*

Critics expressed these views not only in writing but also in game form with the release of Marcus Richert's *Passage in 10 Seconds* (fig. 2). In this game the player walks the characters across the screen, perhaps opening one or both of the treasure chests presented; the two characters fall dead. Then wild applause breaks out, and a monocled audience member proclaims, "Now *this* is art!"[3]

But the simple appearance of death doesn't get at what makes *Passage* powerful and strange or even unusual. Characters die in many games.

It would also be a mistake to think that *Passage* is unusual in representing a landscape of life choices. It has this in common with forms ranging from the role-playing game quest to the Choose Your Own Adventure book.

Rather, what makes *Passage* remarkable is how it works with common meaning-making strategies of video games—in particular, how it takes them apart and reassembles them so that they are active both in traditional and in new ways, making them visible to us again.

Consider the player character. *Passage* presents us with something we can control in the game. Almost no matter the form such a thing takes—from the nearly abstract graphics of a ship in *Spacewar!* (1962) to the unnamed textual adventurer of *Adventure* (1979)—we quickly, when playing a game, begin to identify with what we control. When describing the game's events we will often refer to this element as "me" or say "then I" for what it does next.

This identification is established through a combination that enables the experience of controlling something external to disappear from how we think about games. One part of this combination is implemented technically, executing algorithms—computation—that alter the ongoing presentation of game state. Another part of this combination is communicative, designed to play a role in how the game is interpreted by players through its ongoing presentation. Together, they open a space of play. A fundamental combination of this sort, bringing together algorithm and communication, is *navigation* (also called *control*).

Some of these combinations are so conventional that to describe them explicitly can seem strange. For example, in *Passage*, when the player presses the down arrow, the representation of the game world scrolls upward while the representation of the player character remains in place. When the player releases the key, this stops. When the player presses the right arrow, the world scrolls left while the player character remains fixed. As in all com-

3. *Passage in 10 Seconds*, dev. Marcus Richert (2010), www.kongregate.com/games/raitendo/passage-in-10-seconds

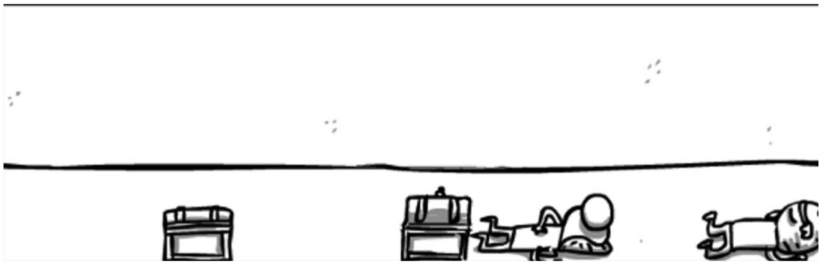


FIGURE 2. After both partners' deaths. Screenshot of *Passage in 10 Seconds*, dev. Marcus Richert (2010).

puter games, this navigation is enabled by a combination of computational process and media representation, working together with literacies developed while playing other games and analogies with the everyday world, producing in part the identification that causes me to refer to the player character as "me" and "I."

And then *Passage* disrupts this identification. Character aging shifts character representation and screen placement in a manner beyond player control. When these moments take place—and immediately afterward—I no longer feel comfortable referring to the player character in the unfolding game events as "me." That identification is deliberately breached, opening a space for momentary reflection on the passage of time—also out of our control. Then continued play reestablishes the connection.

Similarly, the events that take place during navigation operate both familiarly and strangely. It is a well-understood convention of video games, and of interactive computer graphics generally, that when virtual objects "touch," the event can have consequences. This is commonly called *collision detection*. Collision detection can be used to represent objects that are solid and cannot pass through each other; this is how it is used with the barriers of *Passage*. Collision detection is also often, in early computer games of the sort that *Passage* deliberately references, used to carry out a wide range of actions in the world—and its range has been further extended by contemporary independent games. Collision detection is how a *Pong* (1972) paddle deflects balls, how Pac-Man eats, how Lara Croft shoots, and how Anna Anthropy's autobiographical avatar (to which I will return below) deflects hate speech.

One might argue that the conventionality of this wide range of meanings makes every collision with an iconic object potentially rife with meaning. *Passage* takes this a step further. Even collisions with simple, abstract barriers are coded with multiple meanings. They represent the inability to physically move through certain spaces in the game world while also representing a barrier to certain life choices. They are not only obstacles that must be navigated to collect certain rewards but also, for example, obstacles that are much more challenging (or impossible) to traverse if moving through life with a partner.

Through these remappings, movements across and encounters with the gameworld of *Passage* become representations of movement, choice, and action in life at a level more abstract and profound than the momentary level represented by many games. And it is only through this that the sudden stillness of the companion's tombstone becomes potentially shocking and moving.

This is a strategy for producing meaning that is unique to computational media—combinations of an abstract process and a communicative goal, each refined through implementation to drive an ongoing state presentation and play experience. We see examples of this strategy in navigation, collision detection, and many other *operational logics*, both conventional and newly emerging. We see this in how *Passage* combines its operational logics into a *playable model* of space that is at once traditional and, simultaneously, expansive—remapping its structures for use as a model of life's opportunities and choices.

For the casual player of *Passage*, none of this need be said. Players understand *Passage* through expectations and literacies developed over years of playing games and experiencing other forms of media. But as games become a more developed and significant cultural form, it is important that some critics begin to examine more deeply how games like *Passage* and others work with logics and models. This will enable new forms of critical interpretation, new ways of thinking about innovative game creation, and even new tools to help a broader range of people express themselves through the medium of games.

Operational Logics and Playable Models

It is now commonplace to say that every emerging media form has elements that set it apart. Film, for example, is set apart from prior media forms by the ways it uses the moving image to communicate. Before the moving image we had photographic framing, theatrical acting, and many other things that contribute to film meaning—but they were recontextualized, combined, and transformed by the moving image.

Similarly, video games are set apart by the ways they communicate using automatic computation—the enactment of processes by digital computers. We had games before video games, just as we had moving images (and sound, and text), but we have only since the 1950s had games or media of any sort driven by modern computers.

Many of the communicative strategies developed for film that depend on the moving image—the cut from wide context to close action, the revealing pan—have become so conventional that we cease to see them except in their most unusual uses. And this is also true for the most conventional strategies of games, such as the ways that navigation, collision detection, and movement physics are used to create playable models of physical space. In a similar vein, the same strategies are used over and over in film in different contexts. A shot and its reverse are used both to show a character's shock in a war film and a character's tenderness in a family drama. Games also employ the same strategies in many different contexts. The same resource management logics are used for unit production in *StarCraft* (1998) and household chores in *The Sims* (2000).

But games are crucially different from film. The moving image always moves the same way. The standardization of projection apparatus and media players depends on it. Computation, however, is constantly shifting—not only in the specifics of its hardware and algorithms, but also through the invention of new high-level processes (more abstract than detailed algorithms). And in games these processes are often developed specifically to enable new types of communication, modeling, and gameplay.

So to understand the fundamental meaning-making strategies of games, we must consider not only what is presented to the audience and the communicative role each element of this presentation plays over time but also the computational processes that enable the behavior of the elements and the opportunities for play these open. Just as the cut and pan are inseparable from the moving image, so video-game communication techniques are inseparable from the processes that partially constitute them. In other words, to understand the meaning making of video games we need ways to talk about computation and communication together with play.

The concepts of operational logics and playable models provide ways to do this.[4] Operational logics are combinations of abstract processes (or

4. Operational logics and playable models are not the only attempts to think through this. Many of the most influential writings about games emphasize the connections between games as systems, as media, and as play experiences, often calling attention to these in pairs. Jesper Juul's *Half-Real*, for example, foregrounds the connections between a game's rules and its fiction; see Jesper Juul, *Half-Real: Video Games between Real Rules and Fictional Worlds* (Cambridge, Mass., 2005). Similarly, the "Mechanics, Dynamics, Aesthetics" framework, which emphasizes the connections between systems and play experiences, has for years been at the core of the Game Design Workshop offered at the Game Developers Conference—and has been widely cited since the 2004 MDA writeup by Robin Hunicke, Marc LeBlanc, and Robert Zubek; see Robin Hunicke, Marc LeBlanc, and Robert Zubek, "MDA: A Formal Approach to Game Design and Game Research," presented at the Association for the Advancement of Artificial Intelligence workshop, San Jose, Calif. (July 2004), http://www.aaai.org/Papers/Workshops/2004/WS-04-04/WS04-04-001.pdf. Doris C. Rusch and Matthew J. Weise describe how, at a high

lower-level logics) with their communicative roles in the game, connected through an ongoing game-state presentation and supporting a gameplay experience. Operational logics are critical building blocks for the construction of playable models, through which games represent everything from

level, these connections function metaphorically, and how this opens the door to designing games about actions that are not simple physical actions (such as shooting and eating); see Doris C. Rusch and Matthew J. Weise, "Games About LOVE and TRUST?: Harnessing the Power of Metaphors for Experience Design," presented at the Association for Computing Machinery Sandbox Symposium, Los Angeles, Calif. (Aug. 2008), delivery.acm.org/10.1145/1410000/1401861/p89-rusch.pdf; hereafter abbreviated "GAL."

Our question is how to follow through on what these ideas recommend—that we think, at the same time, about how games function, how they communicate, and how this shapes play experiences. While other frameworks give names to the different categories one must think about (for example, Juul's *rules* and *fiction*) they do little to develop the terminology they use for discussing what exists across categories (such as *virtual* and *simulation*). This is also true of work that focuses specifically on conceptualizing game entities. For example, Raph Koster's work to develop "a grammar of gameplay" (first presented at the 2005 Game Developers Conference) entirely brackets how games are experienced as media; see Raph Koster, "A Grammar of Gameplay: Game Atoms: Can Games Be Diagrammed?" RalphKoster.com, www.raphkoster.com/gaming/atof/grammarofgameplay.pdf. Koster's work is in dialogue with that of Ben Cousins, who writes about the "primary elements" of games as the conscious player interactions that cannot be further subdivided; see Ben Cousins, "Measurement Techniques for Game Designers," Gamasutra, 12 May 2005, www.gamasutra.com/view/feature/130716/measurement_techniques_for_game_.php. In practice, this puts Cousins's work at the level of game mechanics (such as jumping or shooting) with no way to talk about the logics that support them.

Alternately, we could look at a much more abstract level. For example, arguing that game players must understand game systems algorithmically to succeed, Alexander Galloway calls for us to interpret these algorithms—to discover the "allegorithms" of games (Alexander R. Galloway, *Gaming: Essays On Algorithmic Culture* [Minneapolis, 2006], p. 91). McKenzie Wark expands this notion, relating the allegorithms of games explicitly to algorithmically-infused life in our everyday world, and focusing on the gap between them; see McKenzie Wark, *Gamer Theory* (Cambridge, Mass., 2007), pp. [30–32]. This is related to Ian Bogost's notion of the "simulation gap" between a rule-based representation of something and our subjective experiences of it (Ian Bogost, *Unit Operations: An Approach to Videogame Criticism* [Cambridge, Mass., 2006], p. 129). Interpretations in these veins could be supported by the concepts of logics and models, allowing a focus on the specific elements that build up allegorithmic experiences—but no writings in this area provide any concepts or vocabulary at anything but a quite abstract level, so they provide no alternative to logics and models.

The approaches of semiotics—from a variety of traditions—seem likely to help address this in the future. And the influence of semiotic thinking on the concepts of logics and models, and work that has been done with them, is undeniable. But for now even the most developed semiotic approaches tend to bracket the actual systems of games, instead focusing on game processes (to the extent they do) only as experienced by the player. For example, William Huber, building on the tradition of Peircean semiotics, makes the argument that "the basis of the player's engagement with the digital game is the interpretation of a stream of signs" (William Humberto Huber, "The Foundations of Videogame Authorship" [PhD diss., University of California, San Diego, 2013], escholarship.org/uc/item/96x08750, p. 32). Whether we accept this or not, such a framing leaves no space for talking about the operations of the game system. Similarly, approaches that adopt a pattern-language approach to thinking about games also tend to bracket consideration of processes, exclusively focusing on player experiences; see Bernd Kreimeier, "The Case For Game Design Patterns," Gamasutra, 13 Mar. 2002, physical space to economic systems, social relations, character development, and combat.

An abstract process is a specification for how a process operates. For example, the abstract process for collision detection could be stated as, "When two virtual objects intersect, declare the intersection." This specification is agnostic as to the specific algorithm and *implementation*—it would be quite different for 2-D and 3-D games, as well as for games using rough bounding boxes versus pixel-accurate methods. Not all implementations of an abstract process may succeed in supporting the communicative role of the logic for all audiences or in all contexts—and, for an emerging or proposed logic, it is possible that no implementation can succeed with intended audiences.

A communicative role describes how the logic is being employed authorially, as part of the larger game system, to communicate something to players. For example, the generic communicative role of collision detection could be stated as, "Virtual objects can touch, and these touches can have consequences." Of course, such communication does not always succeed for all audiences, but the most common logics are widely (if somewhat unconsciously) understood by game-literate players. It is through this understanding that players develop their ability to play—to understand the game world such that they can take action intentionally and interpret its results, an important part of the experience of agency many games provide.

A game state presentation is how players see, hear, and feel the specific behavior of the operational logic in the context of the game. Different ways of presenting the game state can require very different data—often called game *assets*—to support presentation of the logic's operations. For example, in *Pong* the only asset specific to the presentation of collision detection

www.gamasutra.com/view/feature/132649/the_case_for_game_design_patterns.php, and Staffan Björk and Jussi Holopainen, *Patterns in Game Design* (Hingham, Mass., 2005).

Logics and models address this lack. On a detailed level, looking at a logic (such as collision detection) names a general strategy (how it combines an abstract process and a communicative role) and gives a way of talking about how a particular game, or part of a game, employs the strategy (the specific algorithmic implementation and game state representation) opening possibilities for player experience. At a broader level, looking at a playable model (such as of movement through a continuous, two-dimensional space) encompasses the abstract processes and structuring information that allow the model to operate as well as the types of domains the model is designed to represent and enable play in terms of.

Certainly, my goal is not to argue that operational logics and playable models are the only useful lenses for thinking about games—or computational media generally. Rather, they provide a vocabulary for thinking about elements that are simultaneously process oriented, communication oriented, and play oriented. This nicely complements existing vocabularies, which often urge us to think about the connections between process, communication, and play but provide concepts that organize them apart.

is a sound triggered when the ball collides with a wall or paddle. But in a *Call of Duty* (2003–) game the presentation of collision detection for bullets and bodies alone may involve many animation and sound assets, required to present different types and locations of damage with the simulated cinematic feel to which the series aspires. This is a general trend as the desired level of detail rises—more data assets are required for a logic's presentation. At the same time, especially for logics that have been established with relatively abstract communicative goals (like pattern matching or linking), the crafting and selection of data is a way game creators can suggest more concrete audience interpretations.

The gameplay experience is what happens when a player encounters the logic through the game state and whatever interaction methods are available. This is where the game's creators hope the communicative role will be fulfilled, and also where players may discover possibilities never intended by the creators. Often player understanding and discovery is not immediate, and it may be imperfect, especially in its details; it takes place through player experimentation. This is especially true of the connections between logics. Even in a simple game such as *Pong* or *Breakout*, the simple physics that are triggered when a ball collides with a paddle can differ depending on where the collision occurs, and this basic connection (between collision and physics) may take time for players to grasp. Nonetheless, the communication that balls and paddles can collide, and that balls bounce back when this happens, takes place rather immediately in nearly all initial play sessions (confirming the expectations of game-literate players).

A playable model is a type of representational practice rising to a new level of cultural significance in video games and other types of computational media.[5] While some games are rightly viewed as largely abstract, many games include procedural representations of domains—ranging from city planning to playing football—that are activated and understood through play. These representations are in part constructed of operational logics used to support game mechanics.[6] Like any form of representation, playable models are partial (the map is never the territory) and can be used

5. Playable models have a history reaching back, at least, to tabletop war simulations. But video games, and computational media generally, have brought them to many more domains, with vastly greater complexity, as well as wider contexts and audiences.

6. Playable models are constructed of operational logics (used to support game mechanics) and structuring information (for example, the coordinate system of a spatial model or the affinity system of a social model). Because they are procedural representations of particular domains, they are not as abstract as operational logics. Implementations of playable models also include specific, implemented algorithms for operational logics and other processes, as well as data used to support these logics and their game state representations (ranging from tables of numbers to text, sound, and imagery).

for a variety of purposes: persuasion, education, escape, and so on. Further, not all models used in games combine logics, and not all deserve the term *playable*—for example, the models of space in track games such as *Monopoly* (1935) and *Candyland* (1949), which invite players only to enact unidirectional spatial movement determined by randomness, rather than to play in a space navigated in part based on player choice.

These concepts are ones that colleagues, students, and I have been developing for more than a decade.[7] My particular interest here, as the following sections will illustrate, is twofold. First, I am particularly interested in how the familiar logics and models of video games can be employed in *expansive* fashions—and how creators outside the mainstream have used these strategies to shift what we understand games to be able to address through play. Second, I am particularly focusing on games that employ these strategies with the logic of collision detection, as *Passage* does.

I make these choices for two reasons. First, while certainly the economic and culture-shaping force of mainstream video games has never been greater, over the last decade we have seen a great expansion in games outside the mainstream.[8] New tools have enabled many more games to be created by individuals or small teams, motivated primarily by what they wish to communicate rather than by the economic imperatives of a large company. At the same time, new distribution methods and venues for discussion of games have enabled a startling growth in the audience for such games. So I believe now is an important time to be focusing on such games. Second, the logic of collision detection is key to many of these games—but also to many mainstream games. If we can better understand collision de-

7. See Noah Wardrip-Fruin, "Playable Media and Textual Instruments," *Dichtung Digital* 34 (2005), www.dichtung-digital.de/2005/1/Wardrip-Fruin/index.htm; Michael Mateas and Wardrip-Fruin, "Defining Operational Logics" (2009), escholarship.org/uc/item/3cv133pn; Mike Treanor, Mateas, and Wardrip-Fruin, "*Kaboom!* Is a Many-Splendored Thing: An Interpretation and Design Methodology for Message-Driven Games Using Graphical Logics," presented at the Fifth International Conference on the Foundations of Digital Games, Monterey, Calif. (June 2010), dl.acm.org/citation.cfm?id=1822378; Joseph C. Osborn et al., "Combat in Games," presented at Foundations of Digital Games, Pacific Grove, Calif. (June 2015), escholarship.org/uc/item/9zj6r5wz; and Osborn, Wardrip-Fruin, and Mateas, "Refining Operational Logics," presented at Foundations of Digital Games, Hyannis, Mass. (Apr. 2017), escholarship.org/uc/item/2jh5c6k7

8. While there are many senses in which some games are mainstream and others are not, two (connected) senses are important for my purposes here. The first is that, at this point in the history of game design, certain uses of logics and models are well-understood and common (mainstream) for both professional game creators and players of the games they create. (But for this young art form, what is now mainstream was, in living memory, experimental.) The second is economically and culturally mainstream—the game making that is supported by large companies, the games that are advertised by those companies in other media, the types of games that are then shown or mentioned when someone is being presented as a "gamer" in these other media forms, and so on.

tection, and the many ways it can be employed, we will have an important interpretive tool for the types of emerging games on which I focus as well as a new way of investigating the possibilities realized (and ignored) in mainstream game production.

Expanding Graphical Logics: *Adventure*, *Tax Avoiders*, and *Passage*

In my earlier discussion of collision detection I suggested the abstract process, "When two virtual objects intersect, declare the intersection," and the communicative role, "Virtual objects can touch, and these touches can have consequences." In many games the role of collision detection is relatively straightforward—it represents things running into each other. In *Tennis for Two* (1958) and *Pong* it represents a ball colliding with racquets/paddles and a net or walls. In *Spacewar!* it represents spacecraft colliding with each other, or with each other's projectiles, or with the central star. But over the decade following *Pong*'s release, the uses of collision detection expanded radically, arguably changing its communicative role.

Adventure and *Adventure*

A notable example of this expansion is Warren Robinett's 1979 game *Adventure* for Atari's hugely successful home console, the Video Computer System (VCS).[9] As Nick Montfort and Ian Bogost discuss in *Racing the Beam*, Robinett faced a massive challenge in developing this game.[10] He was attempting to create a game in the vein of the original *Adventure*, which was developed by Will Crowther and greatly expanded by Don Woods using DEC PDP-10 computers in 1975–1977.[11] Crowther and Woods's game pioneered a major thread in the models employed by video games, the development of which has been ongoing, alongside the continuous spatial models pioneered in games such as *Spacewar!* The original *Adventure* creates the experience of exploring a large virtual world of multiple, interconnected spaces, presented as text, using discrete models of space and time. Players engage in exploration, mazelike navigation, object collection and manipulation, puzzle solving, and simple combat—specifying their actions, and receiving game responses, in text.

9. See *Adventure*, dev. Atari, Inc. (1979). The VCS was later renamed the 2600.

10. See Nick Montfort and Bogost, *Racing the Beam: The Atari Video Computer System* (Cambridge, Mass., 2009).

11. Dennis G. Jerz, "Somewhere Nearby Is Colossal Cave: Examining Will Crowther's Original 'Adventure' in Code and in Kentucky," *Digital Humanities Quarterly* 1, no. 2 (2007), www.digitalhumanities.org/dhq/vol/001/2/000009/000009.html

The original *Adventure*, like the original *Spacewar!*, was created on a general-purpose computer far too expensive for use in homes. In attempting to create an analogous experience for the Atari VCS, Robinett faced a task similar to what Nolan Bushnell and Ted Dabney famously attempted (and failed) in emulating *Spacewar!* with the limited resources used for *Computer Space* (1971).[12] This was because the Atari VCS, even though it had a stripped-down microprocessor within it, could only be used effectively by offloading much of a game's logic and presentation to a proprietary Television Interface Adapter (TIA). The TIA embodied many of the lessons Atari had learned with *Pong* and its arcade successor *Tank* (1974). In particular, the key operational logics of navigation and collision detection were implemented by the TIA in hardware. As Montfort and Bogost explain regarding collision detection:

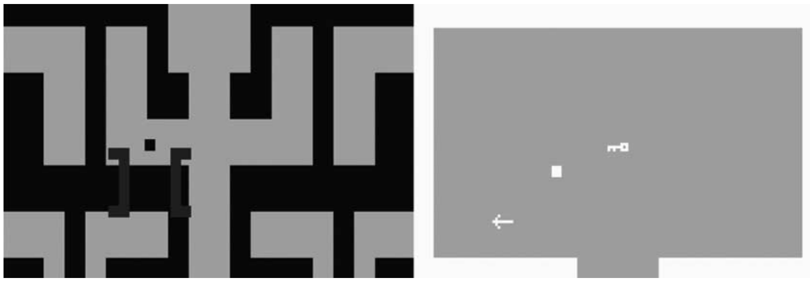
> Collision detection is a common feature of graphical video games, but it is often a bit tricky to code up. Thanks to the TIA's provision for collision detection in hardware, it is easy to implement things such as shooting or being shot by missiles, running into a wall, or consuming something. All the program has to do is read from a set of memory-mapped registers reserved for collision.[13]

This had the impact for Robinett—and for every other programmer and designer seeking to bring a new video game experience to the vast VCS audience—of making spatial models of the sort pioneered by *Pong* the overwhelmingly obvious choice for making playable almost anything they sought to represent. Doing this for *Adventure*-style movement was a difficult undertaking. Robinett's approach was to make a virtual world of many interconnected screens, with movement off the "edge" of one triggering a move to another. This may seem unremarkable to us now, but it was a very influential innovation in the era of single-screen games. Further, the games for which the VCS was designed didn't actually have to keep track of the locations of objects in an absolute coordinate space (the programs could simply move objects relative to their previous positions and respond to collisions). Robinett had to alter the implemented model to trigger an event, rather than wrap around the screen, when the edge of the screen is reached.

With exploration in a virtual world possible, Robinett was left with the question of how to create gameplay analogous to the original *Adventure*'s many experiences of finding, transporting, manipulating, and employing

12. See Henry Lowood, "Videogames in Computer Space: The Complex History of *Pong*," *IEEE Annals of the History of Computing* 31 (July–Sept. 2009): 5–19.

13. Montfort and Bogost, *Racing the Beam*, p. 48.

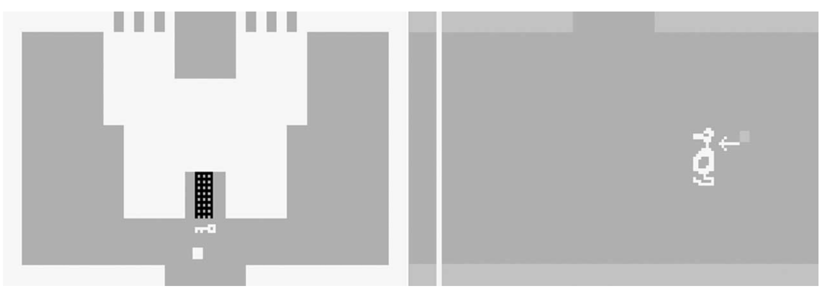


FIGURES 3a and 3b. Collision detection is used to create walls that limit navigation; the small square is the player character (left). Collision is used for picking objects up; the joystick's button is used to put objects down (right). Screenshots of *Adventure*, dev. Atari, Inc. (1979), on the Stella emulator, version 5.0.2.

objects in order to gain access to new areas, collect treasures and objects useful in future areas, and defeat enemies. In addition, the virtual world needed to include walls for basic navigation, for access-restriction puzzles, and for mazelike experiences. Only one of the TIA's primary hardware-implemented logics remained for this collection of tasks: collision detection. Further, the standard VCS joystick offered only two controls: the directional pointing of the joystick and a single button.

As a result, collision detection is used to create walls that limit navigation, and for picking up objects. And collision, while holding an object, is used for the simple puzzles, as well as—while holding a sword—for simple combat (figs. 3a–4b).

The expansion of collision detection to this range of uses and meanings may seem quite familiar now. Most of us who have played video games have become culturally accustomed to interpreting collisions in a wide va-



FIGURES 4a and 4b. Collision, while holding an object, is used for the simple puzzles in *Adventure*; castles of different colors can only be opened using keys of corresponding colors (left). Collision, while holding a sword, is used for simple combat in *Adventure*; though it may not look like it to a modern eye, here the player fights a dragon (right).

riety of ways—much as viewers of film have become accustomed to interpreting cuts as transitions across a wide range of shifts in space and time. But at the time even using collision to collect objects was in need of explanation, with *Adventure*'s manual telling prospective players:

> Scattered throughout the Kingdom are certain objects to help you in your search for the Enchanted Chalice. To pick up an object, all that is necessary is to touch it. You will hear a sound that will notify you that you have the object in tow.[14]

Tax Avoiders and *Passage*

Yet even with this remarkable new set of communicative roles, *Adventure* still represents only an early stage of collision detection's expansion. By 1982, with the release of *Tax Avoiders* (a game brought to wider attention through discussion in Bogost's *Persuasive Games*) one can see a game for the Atari VCS that has expanded the logics of collision detection and navigation in a manner remarkably similar to modern independent and art games.[15] During a play session of *Tax Avoiders*, as the days of the game's year tick by, the player character navigates a four-level space in which green dollar signs and coils of red tape appear, disappear, and move left to right. Colliding with the dollar signs adds to income, while colliding with red tape reduces it. Four times during the year the player character is moved to another screen of ladders and box-shaped platforms, on which a non-player character is alternating between a black-colored IRS agent (who, upon collision, performs an audit players always lose, costing income), a green-colored investment advisor (who, upon collision, provides the best tax sheltered investment currently available), and a pink-colored CPA (who, upon collision, provides a more valuable tax sheltered investment than currently available, for a fee) (fig. 5). Once character collisions make investments available, the player character must collide with them to collect them and then collide with a briefcase to put them in his or her portfolio.[16] Bogost considers *Tax Avoiders* through the lens of *procedural rhetoric*, which he describes as "a practice of using processes persuasively . . . persuad-

14. Atari, Inc. Consumer Division, *Adventure Game Program Instructions* (Sunnyvale, Calif., 1979), p. [3].

15. See Bogost, *Persuasive Games: The Expressive Power of Videogames* (Cambridge, Mass., 2007). One might even argue that *Tax Avoiders* is a *Tristram Shandy* (1759) of video game history—a work that troubles the identification of certain approaches with a particular time period. Certainly the doubling accomplished through its expansion of logics is much more common today than in the early 1980s.

16. See *Tax Avoiders*, dev. Dunhill Electronics (1982).

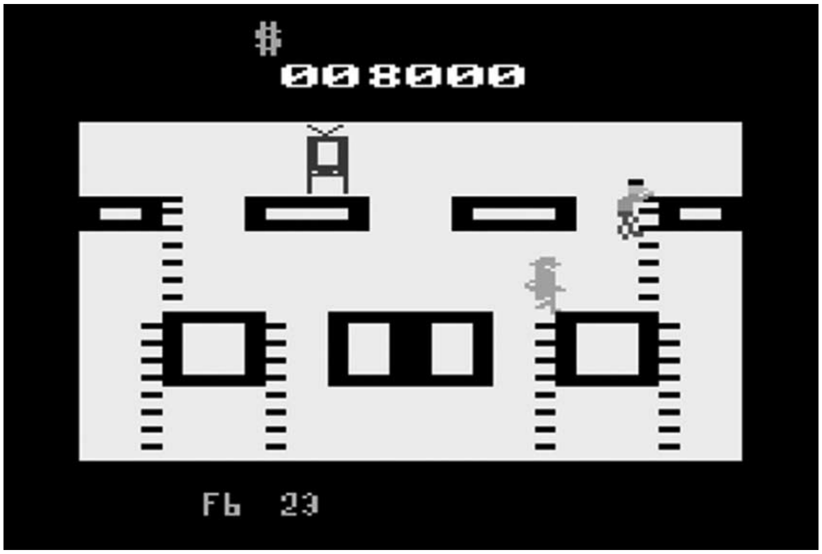


FIGURE 5. The financial landscape of *Tax Avoiders*. Screenshot of *Tax Avoiders*, dev. Dunhill Electronics (1982), on the Stella emulator, version 5.0.2.

ing through processes in general and computational processes in particular."[17]

> *Tax Avoiders* mounts an interesting and relatively complex procedural rhetoric about tax avoidance strategies. The fact that these techniques are mapped onto movement, a graphical logic, is perhaps not ideal, but it is also not detrimental to the argument. The player must run around to collect income, literally *avoiding* red tape. Likewise, he must avoid the IRS agent while racing to *catch* investment opportunities before their window of opportunity closes. These metaphors of locomotion correspond quite well to the abstract processes of work, investment, and taxation.[18]

By using the operational logics built into the TIA in this way, *Tax Avoiders* creates an experience that is at once both spatial and nonspatial. The player character's movement is not through the sort of space simulated in *Adventure* (or *Spacewar!*) but through a metaphorical space we might call a financial landscape. The player character's collisions are not meant to represent actually touching anything but rather taking financial actions,

17. Bogost, *Persuasive Games*, p. 3.
18. Ibid., p. 52.

being caught in bureaucratic situations, and even carrying out financial transactions with other people. At the same time, the player character is literally moving around the space of the screen and colliding with other onscreen objects, with resulting effects. Through this, the logics of movement physics and collision are used with two different communicative roles, and contribute to the construction of two different playable models—one spatial and one financial.

We can see a similar approach at work in Rohrer's *Passage*. As discussed above, this game uses movement and collision detection toward two different communicative roles, constructing two simultaneous playable models—one spatial and one representing life choices and the passage of time.[19] Montfort calls our attention to this, arguing that in *Passage* choosing to do things like explore the world—perhaps searching for hidden treasure—becomes as much about how one lives one's life as about spatial exploration and game accomplishment.[20] He writes, "*Passage* is about *life*, about how your movement through a virtual space using video game conventions maps to our experience of growing up, living together or alone, growing old, and dying."[21] Or as Doris C. Rusch and Matthew J. Weise put it, "living is translated into screen navigation" ("GAL," p. 93).[22]

19. These could be seen in general terms, or through the specifically autobiographical framing Rohrer offers. If choosing the former, as Patrick Jagoda points out, one must contend with the fact that "the options for modes of living are here limited by parameters of white heteronormativity" (Patrick Jagoda, "Passage," in Jagoda and Michael Maizels, *The Game Worlds of Jason Rohrer* [Cambridge, Mass., 2016], p. 27).

20. The tradeoffs between these activities, like other aspects of the game, may not be (through play, or in code) as described in Rohrer's widely cited artist's statement. See Dylan Lederle-Ensign et al., "A Software Studies Approach to Interpreting *Passage*," presented at Foundations of Digital Games, Pacific Grove, Calif. (June 2015), fdg2015.org/papers/fdg2015_paper_46.pdf

21. Montfort, "PvP: *Portal* versus *Passage*," Grand Text Auto, 24 Feb. 2008, grandtextauto.soe.ucsc.edu/2008/02/24/pvp-portal-versus-passage/

22. As Rusch and Weise point out, the metaphor also extends beyond player actions, notably in the unusual shape and composition of the window in which we see the game. Of the window's shape they write, "At all times you can only perceive a very limited section of the gameworld. Moving left and right, up and down allows you to explore it, but your perspective stays restricted. The effect is quite profound: you realize that you will never know what you are missing unless you go and find out" ("GAL," p. 93). Of the window's composition, particularly its edges, they write:

> In *Passage*, LIFE is represented by a spatial metaphor. This space is visually restricted by "blurry edges" i.e. the pixels at the left and right edge of the screen appear to be scrambled. As you move, all the landscapes, obstacles, and objects you encounter seem to unscramble out of the blur in front of you and scramble again into the blur behind you. One reading that suggests itself: the scrambled left and right edges of the screen are a visual metaphor for the human cognitive experience of life, one in which a hazy future and a hazy past are expressed in scrambled pixels. ["GAL," p. 93]

Metaphor and its Limits

The question is how far we can go with this approach. *Tax Avoiders* presents a well-known conservative vision of personal finance, one found in media ranging from the high seriousness of *The Wall Street Journal* to the broad humor of CNBC's *Mad Money* (2005–). *Passage* presents a well-known heteronormative model of romantic relationships and the tradeoffs between pursuing material reward, broad life experience, and partnership. These examples leave open the question of whether game design approaches such as theirs can be used to communicate and explore ideas that may be unfamiliar to audiences or that present an alternative to the easily recognized tropes of mainstream culture.

This certainly seems possible, on first consideration. While we only have well-developed logics and models in limited areas—in particular, space and resources—these have been used to make a wide variety of types of games and are rich areas for metaphor. Both of the games discussed above offer examples of spatial metaphor: *Tax Avoiders* builds on common spatial metaphors of choice as a landscape and seizing opportunities, while *Passage* builds on the traditional spatial metaphor of life as a journey. We also use spatial metaphors when we discuss needing emotional space, arranging ideas, looking toward the future, and overcoming obstacles on the way to our goals. We use resource metaphors when we give attention, spend time, use up patience, get ideas from someone who is a storehouse of knowledge, and so on. So it might seem that creating additional, metaphorical, playable models that build upon spatial and resource models could allow us to create games about nearly any of these topics, from our internal mental lives to our interpersonal relationships and attempts to accomplish things in the world.

To consider this possibility, we can begin by digging deeper into how metaphor is at work in the games we have discussed. At a foundational level, the expansive approaches to logics in games such as Robinett's *Adventure* don't require metaphor for understanding. For example, the expansions of collision are all specific ways objects can touch (a person picking up a key, a sword cutting a dragon). I call these *refinements* of a logic's communicative role. But the expansive approaches to logics in *Tax Avoiders* and *Passage* are clearly metaphorical in some sense. Talking with a CPA and having abstract life options limited by one's partner are clearly not spe-

The effect of these visual metaphors is to help the presentation of the game work in tandem with both models created through the expansive uses of logics. If the visual presentation was more traditional, it would be working to support only the spatial navigation model.

cific ways that objects can touch. I call these metaphorical expansions *doublings* of a logic's communicative role.[23]

It is in these metaphorical cases that expansive approaches to logics support a second playable model (which I call the overloading model), which itself helps signal players to interpret their actions (enabled by the logics) metaphorically. The question is how we conceptualize these two levels of metaphor. Rusch and Weise, in their article discussing *Passage*, suggest using a conception of metaphor derived from the work of George Lakoff and Mark Johnson, sometimes known as Conceptual Metaphor Theory (CMT). Rusch has expanded on this approach at book length, including numerous pedagogical examples, in *Making Deep Games*.[24]

The CMT view of metaphor takes two domains as a target and a source. The target is the domain we are meant to understand through the metaphor. The source is the domain that will help us understand. For example, in the metaphor *love is a journey*, love is the target and a journey is the source. It is certainly possible to discuss games in this way—with, for example, *Passage*'s spatial model and scenario as the source and its model of life choices as the target.[25] But this ignores something key about the CMT

23. I introduce the distinction between these two forms of expansion (refinement and doubling) in part as a way of responding to a question about *Passage* that Michael Mateas and I raised in a 2009 article:

> In this game graphical logics are used as the basis of spatial mechanics associated with metaphors about life. For example, collision detection is used to determine whether the character's journey will take place with a partner or alone. This isn't just part of the fictional world—solo characters can explore parts of the world that couples can't. . . . One can imagine such currently-unusual uses of graphical logics eventually becoming well-understood, to the point that the underlying abstract processes become recognized as participating in two kinds of operational logics: both the current graphical/spatial logics and another in which the shifting position of elements on the screen is actually understood as the making of non-spatial life decisions. This seems unlikely in the specific case of *Passage*, but it explains part of what seems unusual and full of potential about the work. [Mateas and Wardrip-Fruin, "Defining Operational Logics," p. 7]

It now seems clear to me that this is one of the key ways we can distinguish between refinement and doubling. Both of these are expansive approaches, giving an additional communicative role to an existing logic, but we experience them differently as they are used more frequently. For example, the refinement of "touch" to "collection" that Robinett's *Adventure* pioneered is now commonplace—with the joyful Mario collecting coins midair while tough-as-nails soldiers walk over health packs to collect them in their apocalyptic battle zones. This is because the actions communicated remain physical—the playable model remains spatial. The model is not being overloaded to communicate something further.

24. See Rusch, *Making Deep Games: Designing Games with Meaning and Purpose* (Boca Raton, Fla., 2016).

25. Though Rusch often uses the language of simulation theory, which instead terms the real-world phenomenon being simulated the *source*. For clarity, I will consistently use the CMT meaning of *source* here.

conception of metaphor. For example, take the metaphor, *An idea is a building*. For this metaphor, it makes sense to ask questions such as, "What is the foundation of this idea?" But it doesn't make sense to ask, "What is the HVAC system of this idea?" because the metaphorical mapping is to an idea of a building (a source) that is highly abstract and schematic, without specifics such as HVAC systems. In his overview of the evidence supporting CMT, Raymond W. Gibbs, Jr. explains why CMT proponents believe this happens:

> CMT does not maintain that *all* aspects of the source domain are mapped onto the target domain in metaphorical expressions or conceptual metaphors. One proposal within CMT, named the "invariance hypothesis," states, "metaphorical mappings preserve the cognitive topology (that is, the image-schematic structure) of the source domain.". . . Image schemas are not propositional in nature, but are highly abstract or schematic.[26]

On the other hand, when we are building a game, the metaphorical mapping is made to every specific element of the game. Getting all these specifics to work appropriately for the metaphor is very challenging and can prove impossible, as recounted in the development stories in Rusch's book.

If we want a more formal way of understanding this kind of metaphorical overloading of a very specific source (a game's specific playable model and scenario), CMT is not the right approach. In his book *Phantasmal Media*, D. Fox Harrell presents a more appropriate alternative. Harrell provides a detailed account of *Passage* that shows how each aspect of the implemented, playable version of the game maps to ideas the game is expressing metaphorically, using an approach he calls "morphic semiotics."[27] This approach is intriguing not only because it accounts for the specifics, but also because it can be expressed formally—so that computing systems can, for example, blend together metaphors expressed in this form. Harrell has demonstrated, through his own creative work, some of the exciting possibilities this opens.

26. Raymond W. Gibbs, Jr., "Evaluating Conceptual Metaphor Theory," *Discourse Processes* 48 (Oct. 2011): 535–36. In the particular case of "'Theories are buildings'," Gibbs notes that it can also be seen as a complex metaphor (combining "'Persisting is remaining erect'" and "'Structure is physical structure'") which motivates metaphorical inferences such as needing support, while not motivating those about HVAC, windows, and many other aspects of buildings (p. 537).

27. See D. Fox Harrell, *Phantasmal Media: An Approach to Imagination, Computation, and Expression* (Cambridge, Mass., 2013).

But Harrell's analysis also reveals part of what makes *Passage*'s design approach challenging, especially for more complex games. As Harrell notes, "Every element and action in the game reflects an underlying metaphor involving abstract ideas about the passage of time and one's (both Rohrer's and the player's) eventual death."[28] This means that, to make games according to such an approach, every time a new element is added to a game we must understand its role in terms of both the primary and metaphorical models, down to the level of logics.

This is not impossible, as games like *Passage* demonstrate, but it is also quite a bit more difficult than using the kinds of metaphors studied in CMT. While *Passage* might seem simple and short, Harrell's reading demonstrates that its metaphorical correspondences are numerous and complex. To take on more challenging topics, following this approach, would require even greater complexity.

Some game creators will choose to follow this path. But there are also other paths. One that seems promising grows from a tradition of gameplay that is, in each instance, even simpler and shorter than that found in *Passage*.

Sequence and Remapping: *WarioWare* and *Dys4ia*

Two decades after *Tax Avoiders*, video game audiences already had widespread expectations of expansive uses for navigation and collision detection, as well as widespread familiarity with certain conventional, non-metaphorical expansions (such as collision detection's use to represent *Adventure*-style collection, combat, and object use). This made it possible to create commercial games that not only depend on this expectation and familiarity but that can be read as comments on them. A notable example is *WarioWare, Inc.: Mega Microgame$!*—a 2003 game framed as the nefarious Wario's attempt to cash in by creating a video-game company.[29] Wario and his friends create games that use collision detection and navigation in many ways familiar to video game players: space ships shooting, characters collecting coins, athletes catching balls, characters jumping over obstacles and onto enemies, cars dodging other cars, athletes skiing around obstacles, a customer catching a drink as it slides down a bar (reversing the sit-

28. Ibid., p. 165. Harrell is building on the work of Joseph Goguen, whose semiotic work bridges the traditions of Ferdinand de Saussure and Charles Sanders Peirce.

29. See *WarioWare, Inc.: Mega Microgame$!*, dev. Nintendo R&D1 (2003). The "microgames" referred to in the title are the primary content of the game. Each presents a small scenario, in which the player is asked to accomplish a simple goal, with limited available actions, in a small amount of time. However, the first time a microgame (or variant) is presented, it may be a challenge to understand the goal, the available actions, and/or the mappings of actions to on-screen entities.

uation of *Tapper* [1983], an arcade bartending game), and so on. However, these scenarios are presented in much greater variety and quicker succession than in most games, with generally short timers for completion, creating a sense of disorientation even from these familiar tropes. Part of this disorientation comes precisely from the way that the learning process important to navigation—and the identification and agency it produces—is disrupted. As Chaim Gingold observes:

> Sometimes a *WarioWare* micro game will start, and I'll understand the fiction, goal, and controls, but fail to map myself into the right object. My goal is to keep a creature under a spotlight, and I often guess incorrectly as to whether my directional buttons move the spotlight or the creature. If I were consistently mapped to a particular character, such as Mario, there would be no such confusion.[30]

Further, in *WarioWare* the logics of collision detection and navigation are also used in situations that are perhaps no more unusual than in the microgames that reference past games but that are unfamiliar (alternative) as game representations, and thereby reveal a certain absurdity even in the more traditional uses with which they are intermixed. These include a character catching falling clothes to get dressed (fig. 6), a racecar fleeing from giant soccer balls, a character falling on a diamond to mine it from the ground, pieces of a robot falling and stacking as an assembly process, and an anime-style character sniffing mucus back up her nose (with a lighthouse, dark ocean, and starry sky in the background). This gameplay experience emphasizes both the flexibility with which we are accustomed to interpreting these logics as well as the continuity of the Nintendo Game Boy Advance (the 2003 game's platform) with the models of space and interaction in earlier generations of game systems, tracing back to Atari's VCS. This formula was so successful that it continued on a variety of other Nintendo platforms, with *WarioWare: Touched!* (2004) performing a similar approach to the touch screen interaction of the Nintendo DS and *WarioWare: Smooth Moves* (2006) undertaking this for the Nintendo Wii's motion-sensing remote.

Anna Anthropy's 2012 game *Dys4ia* is built from a series of microgames, much like *WarioWare*.[31] But while *WarioWare*'s microgames avoid metaphorical doubling and overloading, *Dys4ia* embraces them and employs

30. Chaim Gingold, "What WarioWare Can Teach Us about Game Design," review of *WarioWare Inc.: Mega MicroGame$*, *Game Studies* 5 (Oct. 2005), www.gamestudies.org/0501/gingold/

31. This and subsequent discussion and quotations refer to *Dys4ia*, dev. Anna Anthropy (2012).

FIGURE 6. Catching falling clothes. Screenshot of *WarioWare, Inc.: Mega Microgame$!*, dev. Nintendo R&D1 (2003), on a Flash emulator at www.arcadespot.com/game/wario-ware-inc/

refinement and alternative uses as well. *Dys4ia* also explores something not yet discussed in this essay—what happens when metaphorical overloading is used in the context of a familiar game design.

Dys4ia does these things in a context very different from *WarioWare*'s. While *WarioWare* is presented with a minimal frame story (and a knowing wink) *Dys4ia* tells Anthropy's specific story of beginning, as a transgender woman, to take estrogen. This is a topic that might result in a complex, perhaps belabored metaphor if taken on as a single game using an expansive approach. *Dys4ia* shows how it can be addressed successfully as a series of microgames, often by taking approaches familiar to players of *WarioWare* and employing them in a new way.

One aspect of this can be seen in the games' approaches to repetition. *WarioWare*'s microgames are often repeated (at higher speed) and sometimes combined into boss games that mimic traditional game genres. These combinations are interesting formally, as Gingold notes, in that they illustrate how microgames are in some sense decompositions of game elements familiar from larger games.[32] But in the context of *WarioWare*'s deliberately disposable fictions, the return of previous games (in their original forms or as combinatorial transformations) offers little emotional res-

32. See Gingold, "What WarioWare Can Teach Us About Game Design."

onance. *Dys4ia*, in contrast, uses transformed repetition as a key element of its emotional communication.

While *Dys4ia* contains a number of microgames that treat spatial models in a mostly alternative manner, such as a series of walking-home microgames, here I will focus on those that operate in an expansive mode. One set of these presents speech bubbles as physical objects. In the first microgame of this series, appearing in the Gender Bullshit phase of *Dys4ia*, two pairs of flapping lips project speech bubbles containing male (Mars) symbols across the screen, representing "feminists" not accepting Anthropy as a woman (fig. 7a). The player character is represented by a shield that moves up and down the screen, like a *Pong* paddle—and as in *Pong*, the offscreen space is also important to the player.

Collision between the speech bubbles and the shield causes it to strobe visually, an indication of taking damage used in many games; unlike in *Pong*, the collision does not cause the objects to bounce back. Speech bubbles that get past the shield cause new speech bubbles containing iconic swearing to appear from that side, analogous to the other side scoring a point in *Pong*. Tellingly, there is no way for the player's/Anthropy's side to score points in this conversation—either in the literal space of the *Pong* variant or in the metaphorical space of the gender accusation.

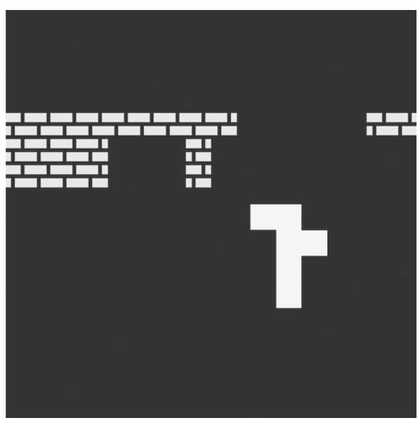
A transformed version of this microgame appears in the third phase of *Dys4ia*, Hormonal Bullshit. The shield representing Anthropy and the player has moved to the right-hand side, where the aggressor lips appeared in the previous version. Now a single pair of lips, representing Anthropy's

FIGURES 7a AND 7b. The first of three versions of a *Pong*-like conversation microgame; speech bubbles are hurtful whether intercepted or not (left). The second of the three conversation microgames; speech bubbles bring a tear if intercepted, no response if not (right). Screenshots of *Dys4ia*, dev. Anna Anthropy (2012).

girlfriend, appear on the left-hand side, projecting speech bubbles containing question marks (fig. 7b).

In this version, collision once again does not result in the speech bubbles bouncing back. Instead, the shield sheds a tear, and text on the screen informs the audience, "Everything my girlfriend says makes me cry." But the other element of gameplay calls this assertion into question. If the player fails to move the shield to collide with the speech bubbles—the situation that would correspond with failure in *Pong*—it appears that nothing happens. In other words, if the player/Anthropy exerts effort to converse, the experience is painful. But without effort, or with failed effort, the worse result is no response to the girlfriend's attempts to reach out.

The last version of this microgame appears in the final phase of *Dys4ia*, It Gets Better? The shield representing Anthropy and the player has returned to the left side, and two pairs of lips again project speech bubbles containing male symbols—the same characters still saying Anthropy is a man. But now, if the shield collides with one of the bubbles, it bounces back and is transformed into a speech bubble containing a female (Venus) symbol (fig. 8a). When these transformed symbols collide with the lips, the lips strobe as the shield did in the first microgame (taking damage). And when the speech bubbles projected by the lips aren't intercepted by the shield, the results are curious. Sometimes there is no response—the gender accusations no longer seem to impact Anthropy/the player. But at other times the gender accusations bounce back, and are transformed, on their



FIGURES 8a and 8b. The third conversation microgame; speech bubbles bounce back if intercepted and sometimes even when not (left). A *Tetris*-like piece shifting through a wide range of shapes and colors, moving toward a wall that has been opened enough (through earlier play) to admit many of them through (right). Screenshots of *Dys4ia*.

own—they no longer always require effort from Anthropy/the player to be rebutted.

A number of other microgame progressions in *Dys4ia* use expansive approaches to spatial models. As with the *Pong*-like conversation microgames, these are often explicitly modeled on elements of well-known games. A particularly striking example features a *Tetris*-like piece and a *Breakout*-like wall. At the start of *Dys4ia* the player is asked to move the piece through the wall, but discovers it is impossible (piece-blocking collision is unavoidable) and text tells us "I feel weird about my body." During the Hormonal Bullshit phase the piece reappears, rotated, with one square dangling and shifting position—passage through the wall is even more clearly impossible. But in the final phase of *Dys4ia* two related microgames appear. In the first, a visually similar wall is opened up through *Breakout*-style gameplay. And the second is the final moment of gameplay, featuring a *Tetris*-like piece shifting through a wide range of shapes and colors, moving toward a wall that has been opened enough (through earlier play) to admit many of them through (fig. 8b).[33]

In these microgames that use spatial models expansively, *Dys4ia* is in some ways operating similarly to games like *Passage*. Movement and collision detection are doubled, each with a second communicative role. This supports two simultaneous playable models—a primary spatial one and an overloading one representing another aspect of Anthropy's experience (for example, conversation or body image). But there are two key differences. The first is the rapid succession of different microgames. The second is using elements of well-known games as the basis of many of the microgames with expansive approaches to spatial models.

Dys4ia's succession of microgames supports a metaphorical complexity I will discuss below. At the same time, its rapid switching between microgames, each of which can have initially uncertain rules and roles for the player, produces some of the same disorientation that players experience with *WarioWare*. And because many of *Dys4ia*'s microgames are simultaneously building two playable models, players are sometimes asked to quickly reorient in two domains, rather than just one. Yet at other times *Dys4ia* is using spatial models in an alternative way, so that a player who has been keeping two models in mind must collapse back down to one—or vice versa—as the gap between two models is opened and collapsed in rapid succession. This is one manner in which *Dys4ia* succeeds in putting

33. Even if players never return the ball, in the *Breakout*-style microgame, it is served twice, which is sufficient to create an opening that many of the *Tetris*-like pieces could pass through.

its audience in a situation that is an experiential metaphor with that of its protagonist, increasing the potential resonance of its play.[34]

Dys4ia's use of elements from well-known games as the basis of many of its microgames follows a strategy that is not only familiar from *WarioWare*, but also from many independent and art games (one example might be *Layoff* [2009]).[35] As Alexei Othenin-Girard explains in "Bodies, Games, and Systems," for *Dys4ia* this is not only an effective means of shaping player expectation (helping scaffold some of the agency and identification that discontinuous microgames undermine) but also provides players with a familiar situation on which to map the (potentially) unfamiliar situation Anthropy communicates through the game:

> The familiar nature of the vignettes as game-objects serves both to guide and remap player expectations, such that the experience of playing a vignette serves as an analogy to Anthropy's corresponding experience. Most of *Dys4ia*'s players will not know what it is like to have to fight for their preferred gender identification, but most of them *will* be familiar with the systemic elements of *Pong*. Since the "lose" condition in *Pong* mirrors the "failing to protect yourself from hurtful assertions made by others" condition in *Dys4ia*, players can quickly make the emotional analogy between the two. It is important, of course, that Anthropy has chosen the rhetorics of her vignettes carefully.[36]

As a result, *Dys4ia* illustrates two aspects of the potential for overloading of playable models. The first of these is present in all expansive uses of logics and models; while the overloading communicative role may be successful, the original is never entirely effaced. We see this clearly in *Passage* (the spatial model is always legible spatially, as well as the model of life choices) and in *Dys4ia* (the spatial models are always legible spatially, as well as the models of conversation, body image, and so on).

What separates *Dys4ia* from the previous examples is that it is organized as a series of microgames. This allows *Dys4ia* to take an approach different from the complexity of *Passage*, which seeks to fit several different elements of a model of life choices to elements of a single spatial model and scenario. Instead, in *Dys4ia*, the spatial metaphors in the conversation-*Pong* microgames are incompatible with those of the *Tetris* piece moving through

34. In Rusch's terminology.

35. See *Layoff*, dev. Tiltfactor Lab (2009), www.tiltfactor.org/game/layoff/

36. Alexei Othenin-Girard, "Bodies, Games, and Systems: Towards an Understanding of Embodiment in Games," (MFA thesis, University of California, Santa Cruz, 2012), danm.ucsc.edu/sites/default/files/Othenin-Girard_thesis.pdf, pp. 18–19.

the *Breakout* wall. In the microgame design, each is simple, stands on its own, and serves to deepen the overall experience. If they were combined in one screen, rather than combined through sequence, the result wouldn't work spatially or metaphorically. By reducing what needs to be communicated at any particular moment through the overloading of playable models, *Dys4ia*'s design shows an important way forward for expansive approaches.

Second, as discussed above, *Dys4ia* shows how overloading can be used with familiar game designs, producing a doubling of the communication of aspects beyond the logics. The intended audience understands how the referenced game operates at a high level—the player goals, the failure states, and so on. Players know how to play and, unless and until it is demonstrated that they should not (or cannot) play in this manner, they will attempt to. At the same time, as Othenin-Girard suggests regarding *Dys4ia*, players will also interpret elements of the referenced game in terms of the second, expansive playable model.[37] For example, in the second and third iteration of *Dys4ia*'s conversation-*Pong* microgames, we might not interpret the lack of response to speech bubbles moving past the shield as meaning anything if we did not already know that this is the circumstance that players work hard to avoid while playing *Pong*.

Taken together, *Dys4ia*'s strategies show that the microgame sequencing approach and remapping of familiar game elements have strong potential for communication regarding a wide range of topics—moving beyond the familiar domains of games such as *Tax Avoiders* and *Passage*. However, *Dys4ia* also leaves open a question for future game creation and analysis: how, and whether, these strategies can be used in games that allow for greater player experimentation, creativity, and discovery. While the game as a whole can be a powerful experience, each of *Dys4ia*'s microgames is played quite briefly, and often with a focus on understanding its situation. As a result, players do not uncover or enact anything beyond the immediate even to the extent they do in *Pong*, much less to the extent of *Spacewar!*, *Adventure*, or *Passage*. Moving beyond this might require something more than expansive approaches to logics and models developed for other purposes.

Conclusion: Beyond Today's Logics

Looking at games through the lens of operational logics and playable models is revealing in three ways, only two of which have received significant attention above. First, it provides us with a vocabulary for talking

37. See ibid.

about fundamental elements of games that cut across the categories often used in game analysis: process, communication, and play. Second, it helps us understand the design strategies used by innovative game makers to broaden what games can address, as illustrated here by examining expansive approaches. These two aspects of logics and models have been the focus of this essay.

But the cases of *Passage* and *Dys4ia*, considered together, are revealing in a third way. *Passage* demonstrates the metaphorical power of doubling logics and overloading models but also shows the challenges of using this approach beyond the mainstream, broadly familiar ideas found in this game and others such as *Tax Avoiders*. If we try to imagine, for example, how one could add to *Passage* multiple-character relationships, that perhaps change over time, or additional relationship models to complement its mainstream heteronormativity, we are likely to find ourselves considering changes that would undermine the coherence of either the primary (spatial) or overloading (life choices) domain. On the other hand, *Dys4ia* demonstrates that sequences of microgames can address significantly more complex and challenging topics. It does this with two strategies: first, by not attempting progressively more complex overloading of the same spatial model (rather, sequencing simple but incompatible overloading models), and second, by building on player familiarity to meaningfully remap elements of game designs that it does not, itself, introduce. But *Dys4ia*'s microgame design approach results in play that is so brief and simple, in each instance, that many of the core player experiences we associate with games are foreclosed.

As a result, *Passage* and *Dys4ia* demonstrate two things worth our consideration. The first is the potential power of one of the primary strategies game creators are using for broadening what games can address: an expansive approach to logics and models. But the second is the challenges and limitations of this approach, especially when trying to use the most well-developed of these logics and models for ideas beyond the broadly familiar mainstream.

There is another way of putting this. Game creators have been remarkably creative and successful at expanding what can be communicated through logics and models that have arisen out of military investment, but unsurprisingly, this work is challenging and remains limited. In this essay I have focused on continuous spatial models—the result of the development of computer graphics pushed forward by military funders for purposes such as flight simulators for training fighter pilots. The other most developed set of logics and models for game design focus on resources—developed as part of tabletop *Kriegsspiel* games by European armies and further refined, and made into software, in the twentieth century by the RAND corporation and others. This is not simply history but also the foundation of ongoing connections between game development and military investment, as discussed by Nick Dyer-Witheford and Greig de Peuter in their *Games of Empire*.[38] I believe that turning these game design tools to new uses is an important part of cultural progress. I believe developing critical approaches for understanding this work is necessary. And yet I also believe that perhaps our most important work in this area, in the coming decades, will be the development of new logics and models—seeking to make domains such as human caring and ideological belief and political resistance playable in new ways, on their own terms, rather than through the overloading of models developed for quite different, arguably incompatible aims.

38. See Nick Dyer-Witheford and Greig de Peuter, *Games of Empire: Global Capitalism and Video Games* (Minneapolis, 2009).