



# Body Schema of Gaming: the Coupling of the Player's Body with the Game Body

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**Abstract.** Electronic game research is a comprehensive study that spans across many disciplinary fields. This paper attempts to summarize the theories related to electronic game research from the perspectives of perceptual phenomenology and ludology. It discusses the impact and changes of video games on players' body schema and aims to refine the related concepts of the game body, in order to propose a theoretical framework for the body schema of gaming. The game body can be seen as a collection of mediated senses, and the process of players forming a play body schema is the process of the player's body merging with the game body. The analysis of the body schema of gaming helps game designers, players, and researchers better understand the process of translating procedures into game mechanics and generating unique gaming experiences, providing new insights for the research and development of electronic games.

**Keywords:** electronic game ;film body; game body; embodiment; body schema.

## 1 Introduction

Clarifying the origins of game body theory requires tracing back to the development of phenomenology and the theory of the cinematic body. Phenomenology, developed by Edmund Husserl and Maurice Merleau-Ponty, emphasizes the study of the corporeality within subjective experience. Phenomenology views the body as “the living body” (Leib), which is the foundation for individuals to perceive and act in the world.<sup>[1]</sup> Merleau-Ponty emphasizes that the category of the body should not be limited to the material entity of the flesh but is also the basis of our interaction with the world, constituting the premise of all our experiences. The body schema is our inherent, spontaneously established model of body perception. The formation of the body schema integrates information from touch, proprioception, the vestibular sense, and vision, with vision being an important part of the body schema. Our understanding and imagination of the world primarily come from information provided by distant senses such as sight, hearing, and smell. Analyzing visual information is the primary way humans cognitively recognize and judge the state of the environment<sup>[2]</sup>, allowing us to more objectively grasp the existence and behavior of surrounding objects and perceive our body's position, posture, and movement in space. Since the invention of film and

the entry into the era of imagery, the experience of using media has profoundly changed the audience's body schema, especially the visual body schema. The Lumière Brothers' "The Arrival of a Train at La Ciotat Station" is famous for the anecdote of the front-row audience fleeing in panic during the screening. This approximately 50-second silent film shows a train pulling into a train station in the coastal town of La Ciotat, France, yet the audience in the front row were scared away by the train rushing towards them. Merleau-Ponty emphasizes that cinema is not just a visual and auditory experience but involves the comprehensive perception of the body. Through images and sounds, cinema brings the audience's body into the experience, creating a sense of "being there." Phenomenological research on the cinematic experience laid the foundation for subsequent cinematic body theory. Vivian Sobchack further proposed that the cinematic experience is a perceptual experience, where the audience perceives the world in the film through their body. This experience is not just about watching but a way of perceiving the medium through the body.<sup>[3]</sup> Although the audience sits still in the movie theater, a phenomenologically existent cinematic body is created through the continuous playback of images on the screen, seeing and hearing what the camera does. Subsequent researchers like Laura U. Marks and Steven Shaviro explored the role of kinesthetic sense, affective engagement, and haptic visuality in the cinematic experience. Cinematic body theory studies how the audience participates in the cinematic experience through bodily perception and reaction, not just through visual or cognitive levels. However, film is essentially a linear, non-interactive medium, and the unidirectional bodily experience limits the applicability of the theory.

Video games are a medium that requires active interaction, and the ideas of phenomenological film theory began to carry over into game research and became the foundation of game body theory. N. Katherine Hayles began to focus on the experience of the virtual body and the body in cyberspace, and discussed how the body is redefined between the virtual and the real<sup>[4]</sup>, becoming an important reference for subsequent game body theory research. Mark J. P. Wolf & Bernard Perron, and Torben Grodal published two anthologies in 2003, with some of the articles in the former beginning to explore how players interact through the "body" in games, with discussions of immersion and interactivity implicitly pointing towards the concept of the "game body."<sup>[5]</sup> Grodal detailed how players participate in game narratives through senses and bodily actions and analyzed how video games construct immersive experiences through sensory and bodily feedback, laying the foundation for game body theory.<sup>[6]</sup> Mark B. N. Hansen delved into the embodied experiences in digital media and analyzed how players interact with the virtual world through digital interfaces, indicating that this interaction is not only cognitive but also involves bodily immersion and perception.<sup>[8]</sup> Hansen's research not only provided theoretical support for the "game body" concept but also further expanded the discussion of the virtual body. Gordon Calleja further proposed the concept of "incorporation" in games, where players integrate their body's perception, actions, and the actions of virtual characters. He argues that game immersion is not just psychological involvement but is achieved through bodily participation. Calleja's theory connects embodiment and immersion, providing an important theoretical framework for game body theory. Ewan Kirkland's work focuses on the role of virtual avatars in games and explores how players experience the extension and

transformation of the body through these virtual bodies.<sup>[9]</sup> The somatic and virtual reality gaming interaction technology, with its significant physical appeal, is drawing more attention from researchers. The study by Wilson and Sicart analyzes the methods of physical movement and game interaction in somatic games and performative games (such as dance games), and emphasizes the emotional and cognitive impact of physical participation in games on players.<sup>[10]</sup> Schott and Barta, on the other hand, explore how physical participation alters players' cognitive experiences through motion and perception.<sup>[11]</sup>

Game body theory has gradually taken shape with the development of game research, phenomenology, and embodied experience research, encompassing different theoretical sources and development trajectories. Corresponding to immersion and interactivity, research on embodied

## 2 Body Schema of Gaming

The process of using and becoming familiar with media is also a process of changing and extending our original body schema. In the course of civilization, artificial objects have gradually replaced the natural environment as the object of perception, and our perceptual experiences have been continuously shaped by the succession of emerging media.

Looking back at the history of media development, the audience has undergone a transformation of identities from oral communicators, print readers, film audiences, to game players. Media not only serves as an extension of human perception but also participates in the reconstruction of the body. It can be said that the theory of the game body complements and develops the theory of the cinematic body. Unlike the one-way input of visual information from movie screens, input devices such as mice, keyboards, and touch screens fundamentally differentiate the experience of using electronic games as a medium. In the "game body," perception returns to our bodily experiences in the form of "interaction," that is, players and electronic games together construct a cybernetic circuit of embodied pleasures in the real space.<sup>[12]</sup> In this circuit formed by players and games, "interaction" is like the lightning that strikes Frankenstein's body on the operating table, making the game body a true "Leib."

In games, the coupling between the player's real body and the game body constitutes a complex body schema. The body schema is a dynamic system that includes people's perception of their own bodies, action control, and interaction patterns with the external world. When a player engages in a video game, this schema is extended into the virtual world, combining the player's real body with the virtual body in the game. The player's body's perceptual range extends from the real world to the virtual world. "Immersion" is no longer adequate to describe this phenomenon, but as Calleja describes it: players "incorporate" the game world and game body into their own body schema<sup>[8]</sup>. The play body schema inherits the concept of the traditional body schema and is endowed with new characteristics by the medium of video games, which can be summarized as multisensory integration, restructuring and extension of the body schema, and procedural embodiment.

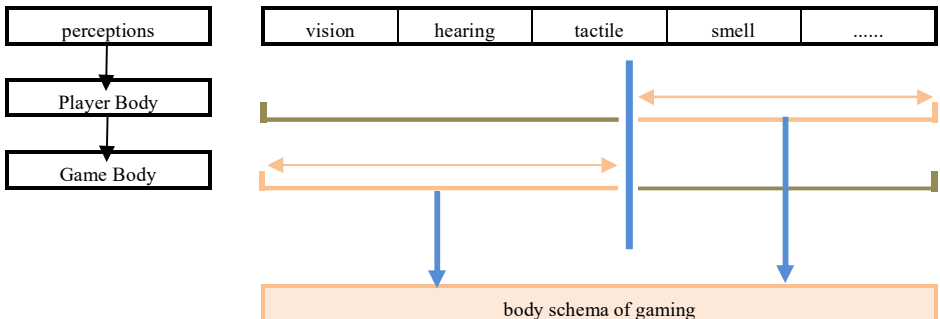
### 2.1 Multisensory Intergration

Media technology has re-integrated various sensory information such as visual, auditory, tactile, and balance sensations. Players use input devices like controllers, mice, and keyboards to map the actions of their real bodies (such as pressing buttons, moving the mouse, or using a joystick) to their game bodies. This establishes a real-time causal relationship between the actions of the real body and the responses of the virtual body, creating a bodily experience within the game. Rune Klevjer refers to this mapping and feedback as “prosthetic agency”<sup>[13]</sup>. As players become accustomed to this mapping, the perceived actions in the game begin to feel as if they are directly acting themselves.

In the player’s perception, visual feedback often serves as the primary sensory input. The synchronization of vision and movement is at the core of multisensory integration, while auditory feedback complements the visual and helps players form a complete spatial perception of the virtual world. In most shooting games like “Counter-Strike” (Valve, 1999) and “APEX” (Respawn, 2019), the judgment of information such as footsteps and gunshots can give players an advantage in confrontations with opponents, even when their game view is limited (first-person perspective). A complete body schema is formed by the integration of visual, auditory, vestibular, and proprioceptive senses. Under the dominance of vision, the vestibular and proprioceptive senses together contribute to our perception of balance, movement, and a sense of ownership over the body. While commonly available monitors, speakers, and keyboard-mouse setups can handle basic audiovisual and tactile integration, these devices are not designed with additional structures to feedback the perceptions and actions of the game body, given their need to cater to daily and office needs.

Motion-sensitive devices designed for virtual reality games have brought more possibilities to the game body schema and have garnered attention from researchers. Through technologies like vibration feedback and force feedback, VR controllers, headsets, and body sensors can make players feel the actions and physical feedback of the virtual body, enhancing the sense of presence and identification with the game body.<sup>[14]</sup> Compared to the metaphor of a “prosthesis,” interactive devices are more like “mediated organs” for the game body. The collection of senses forms the coupling between the player’s body and the game body. When these two are coupled, As shown in Table 1, the perceptions of the mediated organs will overlap, combine, and re-integrate with the player’s perceptions, thus forming the game body schema.

**Table 1.** Body schema of gaming



## 2.2 Body Schema Restructuring and Extension

The plasticity of the game body schema is first manifested in the diversification of visual body schemas. The advancement of computer technology and the maturity of the gaming industry have led to the continuous iteration and development of video game graphics, gradually becoming typified. From the early fixed-perspective arcade games and platform scrolling games that could only move the view horizontally or vertically, to the advent of the first-person shooter game “Wolfenstein 3D” (id Software, 1992) and the third-person action-adventure game “Resident Evil” (Capcom Co, 1996), terms like 2D, 3D, pseudo-3D, first-person, and third-person began to appear and became one of the standards for classifying game genres. As shown in Figure 1, in third-person follow-up perspectives, third-person top-down perspectives, or other types of perspectives, the player’s virtual body is often fully displayed in the center of the screen. Players rely on visual perception of the body outline, position, and relationship with the surrounding environment to gain a new form of bodily existence.

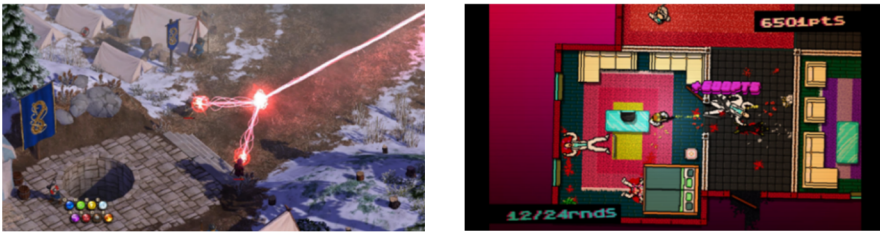


Fig. 1. *Hotline Miami* (Devolver Digital,2012) & *Magicka* (Arrowhead Game Studios,2011)

Secondly, the control methods in games are usually not directly corresponding to real-life actions, but are mapped through buttons, joysticks, or VR motion-sensing devices. Often, several physical buttons are redistributed and linked to the player’s entire sensory body: when using a game controller, the execution of actions such as movement, turning, and jumping in the game body requires only the touch of the player’s fingers, and the player’s proprioception is mostly idle. This control mode requires players to reprogram their perception and control of the body. By continuously adapting to new interaction methods, players can redefine and coordinate their movements and perceptions.

The game body schema can extend the boundaries of the player’s body and break the physical limitations of reality. This extension not only involves the player’s perceptual range but also extends to their motor abilities, perception, and interaction with the virtual world, allowing players to experience surreal actions and abilities. As shown in Figure 2, in the near-future world presented in the game “Cyberpunk 2077” (CD Projekt, 2020), the player’s character can gain superhuman strength or the ability to scale walls through cybernetic implants. The game body schema in the virtual world not only reshapes the player’s perception of themselves but also extends the boundaries and capabilities of their body, forming an experience that is interconnected with the real body schema but has unique characteristics.



**Fig. 2.** *Cyberpunk2077* (CD Projekt, 2020)

### 2.3 Procedural Embodiment

Research on game immersion and interaction generally revolves around its embodied experience, which is composed of three core elements: the sense of ownership of the body, the sense of self-location of the body, and the sense of agency of the body<sup>[14]</sup>: the sense of ownership reflects the psychological identification of the player with the virtual body, the sense of self-location primarily constructs the player's cognitive understanding of the virtual world environment, and the sense of agency emphasizes the consistency and timeliness of the game body's response to the player's instructions. These three elements are closely related in a dynamic system, integrating and redistributing the player's senses, reshaping and extending the original body schema, and forming the game body schema.

Embodied experience is essentially procedural. Games are driven by program code, with the rules, mechanisms, and events of the game world being set and controlled by the program. The rules, algorithms, and interactive mechanisms in game design affect the player's choice of actions and perception<sup>[15]</sup>. The procedural nature is not about replicating a "Hamlet holographic deck" on a universal machine but lies in its limitations for players. Program algorithms simulate inertia and gravity, the movement style, speed, and abilities of the player's virtual body. When players try to act as their game body, the boundaries of the program precisely shape the player's body schema. As shown in Figure 3, in the game "The Binding of Isaac" (Edmund McMillen & Florian Himsl, 2011), new players will find that the control of the game character has a noticeable "inertia." When the player presses the movement key, the character always starts moving slightly slower than the direction of the key press, and when the player releases the movement key, the character does not stop immediately but continues to move for a short distance. The program implicitly affects the process of button response and image representation in the game and skillfully recreates the presence of inertia in reality, making it feel like the player is "flicking a heavy object with their finger." Another classic example is the "jump" design in "Super Mario Bros" (Nintendo, 1985), where the game program detects the duration of the player's jump key press and determines the height of the character's jump. The simple yet clever design brings an excellent game control feel, and the harder the player presses the key, the higher the character jumps. The player's "effort" is procedurally linked to the jump action of the game body through their fingers.

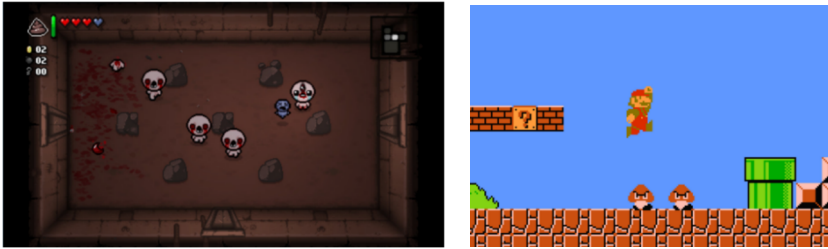


Fig. 3. *The Binding of Isaac: Rebirth & Super Mario Bros*

### 3 Conclusions

The mediatized senses are the foundation of the existence of the game body. Within the cybernetic circuit of embodied pleasure formed by the player and the game, the game body is generated and coupled with the player's body, thus forming the play body schema. The multisensory integration and the nature of reshaping and extending the body schema of the game body are essentially procedural expressions of embodied experience. Interaction devices and game programs determine the rules and mechanisms of the game, with the boundaries of player behavior allowed by the game rules defining the form of the game body, and the content of player behavior presenting the construction of the game body. The embodied agent experience is a unique aesthetic mechanism of electronic games. Game designers have designed different game body schemas for players, whether it be a super soldier, a mutated monster, or an omnipotent god in a sandbox game. This article attempts to propose a more universal model of the game body schema, viewing interaction devices as mediatized senses to reveal the coupling process of the player's body and the game body, providing game designers with new perspectives and design insights.

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