(Re-)Positioning the Senses: Perceptions of Space in 3D gameworlds

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Introduction

In his chapter titled 'Allegories of Space' Espen Aarseth states that, "[c]omputer games are essentially concerned with spatial representation and negotiation" (Aarseth 2001, 154). By playing a videogame, the player has to move their character or objects through space. This happens in two-dimensional platform games, first-person shooters, and even puzzle games such as *Tetris* or *Bejeweled 2*, where space is re-ordered through the constant movement of objects. But how do players perceive and consequently interact with these spaces? And how have the growing trend of what Jesper Juul (2010) terms to be "mimetic interfaces", such as the Wii with its unique remote control device, change our perceptions of space both inside and outside of the game?

There have been various discussions about how space can be categorized and defined within videogames, from Mark J.P. Wolf's (2001) categories ranging from "on-screen no wraparound" to "interactive, three-dimensional environments", to Aarseth's (2001) discussions of "indoor and "outdoor" spaces. These often relate to how space is displayed inside the gameworld, and do not necessarily assert a position on what is occurring in the space the player is situated in. However, Stockburger (2006) and Nitsche (2008) both make connections between other spaces of the gameworld, incorporating the player space into their analysis. Nitsche, in particular constructs "five main conceptual planes for the analysis of game spaces" (Nitsche 2008, 15) which include the spaces constructed by both the machine and the screen, as well as the space of the player's imagination and the space the game is played in both by the individual player as well as with groups of people on and offline. It is through using these categories of space, that this paper will examine the links between the "user" or "player space" as well as the "mediated" and "rule-based" spaces of the videogame (see Juul 2010, Stockburger 2006 and Nitsche 2008). As Stockburger notes, "While playing a video or computer game, the player, as well as the device the game is played on are located in a material, physical space that can be referred to as *user space*" (Stockburger 2006, 87). Systems such as the Wii, Playstation Move and Microsoft's Kinect offer ways for the real world experience to become supposedly mapped into the virtual space often through displaying a represented sense of depth in their design and types of interaction. Therefore, it is through discussions of three-dimensional space within videogames, that this paper will examine how players perceive related actions across all three axes potentially on display, and how this may change within gestural interface design. It is through the visuals and related responses of the game controller that we can understand three-dimensional space within the videogame. But how has this changed in games using mimetic interfaces such as the Wii, Playstation Move and the Kinect? Do our in-game spatial perceptions change through the use of each of these interfaces and if so, how does the game's design accommodate for these changes?

Locating objects in the game

3D space refers to space that is constructed and displayed in terms of the x, y and z axis. Two-dimensional games, such as *Super Mario Bros.*, exist on two axes, the x and y, horizontal and vertical planes. It is possible for the player to move Mario right and left (although mainly to the right due to its side-scrolling design) as well as being able to make Mario jump up and down onto objects and to kill enemies. It is not possible to move Mario into the depths of the game, or move around objects such as the tunnels or characters. This changes in three-dimensional games where the player can move the character up, down left and right, as well as back and forth into the space of the screen[1]. First-person games such as *Half-Life 2*, as well as three-dimensional platform action-adventure games such as *Tomb Raider* offer this experience.

This can also be seen within the game *Little Big Planet*. Although the game is constructed in a similar way to a platform game such as *Super Mario Bros.,* one of the ways that the game challenges the player is through the layering of space. The platforms of the game are not only arranged along the x and y axis, but also along the z axis, layering the architecture into the depths of the game. Therefore, the player may have to move the character forward in order to access one platform, and then back again to hide temporarily from an enemy that may be trying to attack on a different depth layer. So not only does the game play on the genre of a typical platform game, it also extends the space of the game by utilizing a sense of spatial depth within the puzzles and how the player may move the character through each level. It is through the movement of the character, and the character's interaction with objects via the player's control, that the player starts to make sense of the spatial qualities of the videogame. However, how do players perceive Sack Boy in *Little Big Planet* through the controller and resultant feedback displayed on screen both visually and aurally?

There have been many discussions as to how the character, avatar and player can be defined. These often lead to theories of the avatar being an "embodied manifestation of the player" (Klevjer 2006), or how the player experiences a "sense of being-in-the-world" (King and Krzywinska 2006). On the other side of this debate, the character is seen as "a tool, a puppet, an object for the player to manipulate according to the rules of the game. In this sense, the player is fully aware of the character as an artificial construct" (Salen and Zimmerman 2004). For the interests of this paper, I wish to separate out the spatial identity of the player and the spatial identity of the controlled object or character onscreen.

In discussing spatial awareness and the perceptions of the real world body, Shaun Gallagher distinguishes between the body image and the body schema. He states that "a body schema is a system of sensory-motoric capacities that function without awareness or the necessity of perceptual monitoring" (Gallagher 2005, 24) In other words, our body schema is how we perceive the world and we move our own bodies without thinking. If we reach for a glass of water, we are not actively conscious of how our muscles work to create that movement, but we sub-consciously know how to move our hand to the correct point in space to pick up the glass. It is partly through our body schema in the "player space" that we play the game through the controller. Our actions of pressing various buttons and moving control sticks, in turn lead to us seeing the characters move around onscreen. However, this is not entirely how we understand the spatial movement of objects and characters in the virtual gamespace.

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[1] However, some three-dimensional games may display 3D space, although the player is not able to move the character through all three axes of the space, as will be discussed later on in this paper.

We have our own spatial awareness outside of the screen through our body schema, but this is not replicated within the gameworld. We cannot physically touch characters or objects within the screen-space nor do we have the same sense of understanding of their positioning as we do when we pick up the glass of water.

Instead, we can understand where characters are located in the gameworld through what Peter Bayliss (2007) defines as the "locus of manipulation". He uses this term over "character" or "avatar" to describe the "in-game position of the player's ability to assert control over the game-world, whether this is a visible character, an implied avatar, or a graphical user interface cursor" (Bayliss 2007). Therefore, it is through the locus of manipulation that we can understand the movements of the character, and where the character is spatially located in relation to other objects in the gameworld. We can then receive feedback from this positioning through associated visual and aural clues onscreen (or through speakers) linked to the action of the physical game controller.

Controllers, habit and spatial perceptions

By using the locus of manipulation as a way of understanding the in-game character we can recognise the player and the character to be two separate entities. However, it is not possible to disregard the real world body in playing the game, as it is through the body that we can make the connection between "play space" and game space. As has been established, our own bodily relationships with space are not the same as how we perceive space and how the character interacts with the space (through our actions) in the gameworld. Instead it is through our body's learning mechanisms that we start to understand how space functions in the virtual realm. As Emma Westecott (2008) notes in her discussion of the body's relationship to the controller, "In game form the screen and the game controller consist the boundary points between our physical and game bodies. Our flesh is the connective tissue that watches and reads the screen spectacle to respond in rapid touch through a game controller". Therefore, it is through our skin that we have a sense of our "somatosensory, and proprioceptive systems" (Gallagher 2005, 45). It is through both the somatosensory and proprioceptive systems that we are aware of our sense of touch and the movement of our bodies, an idea we can use to understand the player's connection to the game controller as a feedback device. We cannot physically feel the characters in game position in the virtual world, but we can link up what we feel and move on the controller in rhythm to the visual and/or aural feedback we gain in response to this through the screen. It is through linking these perceptions that when, for example we encounter an obstacle that prevents the character's movement in the gameworld, the controller will in some ways start to imitate a sense of friction, as the up command on the d-pad no longer issues a response. Returning to the example of *Little Big Planet*, we can see how the player starts to understand the locus of manipulation of the Sack Boy character as the player uses the analog control sticks on the Playstation 3 controller, and starts to develop an understanding of how the movements relate to the actions occurring on the screen through the linked proprioceptive, somatosensory and visual feedback. This is part of the initial learning curve in playing the game. We have to understand how to use the controller to make sense of the resultant actions occurring on screen, and learn how to initiate the correct response when faced with overcoming obstacles in the game. As Westecott (2008) notes, "Our bodies have evolved to proprioceptively understand our physical environment and the disorientation created by the flattening of a 3D object (the game controller) to effects visible on a 2D object (the game screen) confuse our flesh and cause our bodies to react inappropriately”. Therefore, how do we, as players, start to understand these feedback loops as we learn how the locus of manipulation can be re-positioned in relation to various other objects in its path?

To understand this, we can look to Rune Klevjer’s (2006) discussion of “habit”, which he uses through the work of phenomenologist Maurice Merleau-Ponty. Merleau-Ponty discusses habit through the analogy of the typewriter noting,

> If habit is neither a form of knowledge nor an involuntary action, what then is it? It is knowledge in the hands, which is forthcoming only when bodily effort is made, and cannot be formulated in detachment from that effort. The subject knows where the letters are on the typewriter as we know where one of our limbs is, through a knowledge bred of a familiarity, which does not give us a position in objective space (Merleau-Ponty 2002:166).

It is this statement that leads Klevjer to conclude that “in broad terms: ‘habit’ refers to how perception works, and is a result of the embodied subject’s efforts to come to grips with its environment” (Klevjer 2006, 90). Therefore, in the case of the perception in the player’s space of the real world, the habit of continually moving the controller and processing the displayed response on screen helps the player to come to terms with both the environment of the controller and how this links to the game environment. This is only possible through the bodily effort that is made in interacting with the control device. Again, although these environments do not exist as the same place, they are linked through the feedback loop of processes inherent in the machine code that allows for the interlinking of these two separate actions. It is through the constant manipulation of both environments that patterns of events start to emerge in both instances, linking to how gamespaces can be perceived. We can see this in the diagram below (see figure 1), where the controller and screen link together to provide a feedback through Nitsche’s (2008) planes of “mediated, fictional and rule-based space”. It is the “rule-based” space in particular that provides this connection as it processes both the input from the controller to relay any feedback back to the controller as well as displaying visual and aural stimuli on screen (or through speakers). However, as certain controllers start to move towards gestural or what Juul (2010) terms to be “mimetic” interfaces, the spaces of the game start to be displayed in different ways, changing the way player space and game space are perceived. It is these changes in the way the game space is presented that will be discussed in more detail, as the player space often becomes the focus of increased action. By analyzing various games on the Wii, Playstation Move and Kinect, these changes in design will become more obvious, highlighting how objects within the game are displayed and used in different ways depending on the control mechanism and how the player can interact with the gamespace.

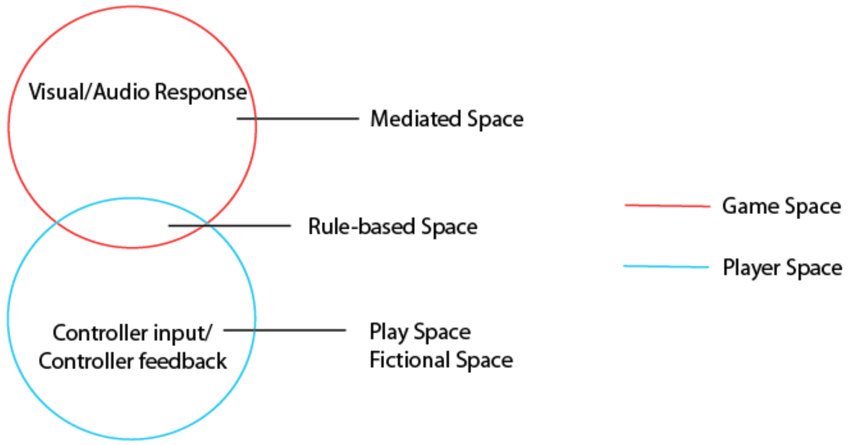

Figure 1. *Relationship between the controller and related audio/visual response (combined with some of Nitsche's (2008) "five main conceptual planes")*

Mimetic interfaces and in-game spatial change

Juul states that "where traditional hardcore games focus on creating worlds, on 3-D space…mimetic interface games emphasise the events in player space." (Juul 2010, 103) He goes on to state that "mimetic interface games shift the focus from the three-dimensional space created by the game graphics, to the concrete player space". Although the player space does become the focus of much of the action (and often the main discussion of gestural interfaces), it also continues to exist as a space in which we understand, perceive and manipulate these virtual spaces. In the same way the game space becomes an important part in how we connect the action between both of these spaces. If we return to Nitsche's "five main conceptual planes", we can examine the differences between the "mediated space" and the "play space" to see how gestural interfaces may be changing the action occurring within each realm. It is through an examination of *Virtua Tennis 2009* for the Xbox 360 and *Wii Tennis* for the Nintendo Wii, that the differences between these two spaces will first be evaluated.

In *Virtua Tennis 2009*, I am able to move the tennis player character (via the controller) around the full length and breadth of its side of the court, as in a real tennis match, concentrating the game on both spatial skill and timing. I can direct the character's shots using the control stick and pressing the A button. I don't have to be aware of my own arm movement, as I come to recognise the small movements of my thumb and how they translate to the acts unfolding on the screen. I can use this to take advantage of the full length of the court as the locus of manipulation is under my control through these small controller-based navigational actions. In doing so, the character is both moving and hitting the ball, with the controller allowing for both control stick movement and button pressing at the same time. However, there are some in discrepancies as to how the character responds to controller input. The tennis racquet does not move unless the ball is near it. Pressing A on the control pad does not make the tennis racquet move in the case of the character standing idly waiting to take a shot e.g. in the waiting around period before the opponent serves. In this instance, the player can only start to understand the feedback of pressing the button and hitting the ball once the character is next to the object. As the player is in control of navigating the character around the court, this feels like a minor limitation, as the player's main focus is on lining up the objects at the right point within the x and z dimensions of the court and not about whether the character animates every possible position. It is through recognising this missing animation that we can start to see how the game of Wii tennis varies in its representation of the character's locus of manipulation and the player's movements in the play space.

Wii tennis exists as one of the playable sports within the *Wii Sports* game. To play the game, players have to mimic a tennis swing action using the Wii remote in order to hit the ball coming at the character on the screen. By learning to play the game, it is possible to see how only a slight wrist movement is required, although it depends on the group of players as to how exaggerated the motion is in the player's space of the game. Unlike *Virtua Tennis 2009* on the Xbox 360, the character in *Wii Sports* is not positionable and in this sense it has no controllable locus of manipulation. This is highlighted by the fact that even in a single player version of the game, there are two displayed characters on the screen. Every match is a doubles match, as it allows two characters to cover the space of the court, making the AI of the ball being directed at the character much easier and slightly less obvious. It is only possible to control a single player in the training mode when the tennis balls are also directed towards the character's exact positioning. Returning to Juul's (2010) comment that "mimetic interface games shift the focus from the three-dimensional space created by the game graphics, to the concrete player space" we can further examine the player's action and the resultant on-screen displayed response. Although the Wii creates an experience that mimics the player, it only does so at an arm, or even wrist, level of bodily experience. The motion of the controller is tracked, but the rest of the player is not recognised within the gamespace. The gamespace depicted is as being three-dimensional, however, the player is now in some ways restricted to the one, or two dimensional movement of only controlling the swinging motion of the remote across the x or possibly the x and y axis. The player space is further emphasised by the audio connected to the Wii remote in terms of a knocking sound emitted from the Wii remote when the ball is hit. As the player has no haptic force feedback from the remote control, the audio feedback from within the remote becomes essential as a way of allowing the player to recognise that they are completing the correct action. The audio gives a sign of spatial feedback, of the collision between objects and at the same time emphasises the shift from the game space into the player space. This is unlike the audio in *Virtua Tennis 2009*, which is confined to the speakers on the television set (or other connected device) and does not filter out through the controller. However, the Wii is unique in this regard, with its inbuilt speaker in the controller. What happens in mimetic interface games when there is no audio feedback within the controller? What other visual spatial signifiers can be used to help with the player's understanding of how space is constructed?

Light, shadows and identifying objects

The Wii obstacle course is a mini-game included with the *Wii Fit Plus* gamepack. Instead of using the Wii remote control to control the game, the obstacle course relies on the player using the Wii board. Spatial movement of the character across the obstacle course occurs through the player performing a walking on the spot motion, gently lifting the left leg, then the right leg, in a marching pattern. Walking on the spot on the board causes the character on the screen to start moving. Much like in Wii tennis, the player has no real control over the navigable spatiality of the character.

The player, once again, only has control over one-plane or axis of movement, this time across the z axis of spatial depth by making the character move forward, or stop if the player stops moving. Unlike Wii tennis, although spatial navigation is restricted, the game operates around the idea of spatial movement and this movement is through moving the character into the three-dimensional spatial depths of the game away from the player. Although the player cannot determine the position of the character in space, it does have to time when to make the character jump across gaps in the level. The somatosensory and proprioceptive feedback of a standard controller now moves to being linked to the player's feet, rather than their hands. Just like a standard controller, the Wii board does not move, although the actions occurring on the board makes the characters' locus of manipulation move in one direction through the space of the game. This raises the question of how does the player recognise when to jump or avoid obstacles in the way of the character when they are not in full control of the locus of manipulation?

In examining the game, it can be seen that the obstacle course relies heavily on the use of harsh, dark shadows to add to the visual understanding of the space. When an obstacle moves across the screen, a dark shadow accompanies the movement to situate the object within the 3D space. The shadow does not conform to real world lighting techniques, but instead helps with the players understanding of the gamespace. It helps the player visualise the character's locus of manipulation, through understanding depth based on the size and position of the shadow. Therefore, although objects are swinging across the platform, they can be located by the movement of the shadow depicted on the player's path. This helps the player identify the location of the object and time the movement of the character's position to avoid any possible collision. The concept of timing the character in relation to other objects is also shown through another spatial signifier found within the game via the resultant animation of the character if it is on ice. On an icy surface the character takes longer to stop moving, emphasising how the game is about timing the space in each instance. Walking on the spot and stopping, then recognising the resultant visual effects become a part of the player's understanding of the game space and how it functions. Although the game is mimetic, in that the walking motion is replicated as an experience onscreen, the 'jumping action' is only partially mimetic. The player can exaggerate a lifting motion to simulate the character jumping within the game. It is not possible for the player to actually jump on the Wii board, as it is not designed for that force, however, the bending of the legs, and then straightening them replicates a jumping action of the character onscreen. The "rule-based space" of the game determines the size of the jump and it is not under the player's control. This once again highlights the limited spatiality of action at the hands (or in this case, feet) of the player, something that the Playstation Move attempts to offer in its design.

The Playstation Move takes the precision of mimetic interfaces a stage further, as it combines a web-cam as part of the system to provide a sense of three-dimensional spatiality in its design by being able to recognise depth. This is shown within the game *Tumble*. *Tumble* is a game based around building up different blocks, destroying blocks and solving various other spatial puzzles. Players can 'grab' the virtual boxes by using the back trigger button on the Move controller, and move them around the 3D space in order to place them on the floor or on top of other blocks. As the gamespace can only be displayed as a representation of 3D space, on the 2D screen, the player has to use the Move button to move around the boxes, using up, down, left, right icons on the screen, in order to see where each box is situated in relation to one another. This spatial puzzle is part of the game mechanic, and at the same time, helps the player learn how to manoeuvre the Playstation Move controller to affect the space. Many of the game-levels again rely on the player's perception of space through the use of shadows. When positioning boxes, a red shadow displays under each box to show where you are about to position it, giving a form of visual spatial feedback, allowing the player to understand the relationship between blocks through the shadow effect layered on top of them. This feedback is necessarily as in later tasks within levels, there are no shadows. In one of the building block challenges, there is a target medal, as well as the bronze, silver and gold medals. The target shape is seen floating in space near the building block equipment, but unlike the blocks the target does not have a shadow underneath it. By learning how to place the blocks and understanding the relationships between them through the shadows, it is then possible for the player to gain some sense of where the target medal may be in order to obtain it. It is not expected for the player to gain the medal straight away as it is ordered after the main goals have been completed, and it requires a greater understanding of the space it is situated in.

Alongside the use of shadows, other systems are in place within the game to relay feedback to the player. Sensory-motoric feedback is given in the act of holding down the button to pick up an object. The player has to retain the grip, much like you would with your hand clasped around a physical object, except the controller acts as a stand-in device for every virtual object displayed. Placing the object is then shown to the player through the visual of the object remaining in place, or falling over. So although there is some spatial feedback with regards the placement of objects, there is no other touch-based feedback in terms of where the object is placed with regard other boxes. Once again, visual feedback becomes key in understanding the location of objects in relation to one another. Unlike having a regular controller, it is not possible to feel a sense of friction in placing an object in the 3D space, once again showing how mimetic interfaces adapt the way they offer spatial awareness to the player through each object's locus of manipulation. So far, both of the examples of mimetic interfaces, in terms of the Wii and the Playstation Move have still involved controllers, allowing for a mapping between the object of the controller and vaious in-game objects. But what happens when you remove the controller altogether, as offered in Microsoft's Kinect interface, the peripheral advertised as 'You are the controller'?

Removing the controller

Whereas the Wii and Playstation Move both offer a mimetic experience through still incorporating the controller into their design, the Kinect has nothing to act as a stand-in and it is now that the player's body starts to become an object in itself. Although the controllers of the Wii and Playstation Move act differently to other standard controller designs, they do help the player have a sense of spatial reference, by linking the controller as an object to other moveable objects within the gamespace. Therefore, in *Wii Sports* tennis, the Wii remote acts as a reference point to where the tennis racquet is in the game, allowing for a mapping between the two objects. However, in *Kinect Sports* table tennis, there is no controller or racquet like prop within the player space, and this sometimes makes it difficult to understand the mapping between the two events. As there is no stand in object in the player's room view, it sometimes makes it difficult to change the direction of the ball or put a spin on it, as the action is based on hand movement, rather than the movement of a flat object like a table tennis bat.

As Merleau Ponty notes, the spatiality of the body is often thought about in relation to its position in terms of other objects in our surroundings. He writes "It is never our objective body that we move, but our phenomenal body, and there is no mystery in that, since our body, as the potentially of this or that part of the world, surges towards objects to be grasped and perceives them" (Merleau-Ponty 2002, 121). Therefore, in the Wii and Playstation Move we are able to map the controller onto the object it represents within the gameworld, using this information alongside how other interactions between objects are displayed through different visual and audio techniques. So, if we understand everyday objects through our relationship to them in space, how do we understand objects in Kinect where the only objects are virtual constructs on screen? It can be seen that in Kinect, we are in some ways playing in a fluctuating spatial vacuum, as we have no relationship to objects in the player space, and must now completely rely on the mapping of actions occurring to the objects in the game space. As Brian Massumi notes in discussing the movement of the body, "proprioception translates the exertions and ease of the body's encounters with objects into a muscular memory of relationality" (Massumi 2002, 59). Now the body has to understand the mapped virtual body's encounters with other virtual objects to try and create new memories of relationality. To do this, there are now two mappings occurring in terms of the locus of manipulation; the locus of manipulation of our mapped arm movement in the table tennis game, and the locus of manipulation of the racquet in the table tennis game. Although the two are connected as they are attached, it is only through understanding the first physical-to-virtual arm mapping that we can then see how this links to the movement of the racquet. In the first instance of playing the game it often feels as if the ball is not physically touching the racquet due to the way the space is displayed with the see-through character and the angling of the bat on the screen. We are not used to perceiving our bodies as objects and the connection between our bodies and the objects that are holding. Therefore, we have to re-train our bodily perceptions of space through the visual and aural, and not through our understanding of objects, as we would usually recognise them through our sense of touch in the real world. As players we are used to doing this through a controller, as the link between player and game space, yet when the body becomes the controller, we have to re-think how we would act within the real world and understand how this maps onto virtual world actions.

The body as a set of objects can also be seen in the 20,000 leaks game as part of *Kinect Adventures*. Here the player has to use their hands, feet and head to map out actions onto the character. The character's head, hands and feet then have to match up with cracks in the wall to make them disappear. Each section of the player's body acts as a separate object, as a way of mapping onto the different locus of manipulations that are effected. This is emphasised by the way the character is displayed onscreen. The character has an outline of a body shape, which is translucent, whereas the hands, feet and head are coloured differently to the body shape indicating that they are sites of potential mapping. Within this game it is now the case that multiple positions can be manipulated at one time. With the physical game controller we are used to often controlling a central locus of manipulation at one time, but now we have to split up these positions, as there are multiple areas in the gamespace under the player's control. On top of this, the player has to work within the restrictions of the real world player space, which is limited to the Kinect sensors positioning. This causes the player to re-map distances of movement on both the x and z axis of floor space to equate to the floor space of the virtual tank in the gameworld. Once we start to understand this mapping, we can start to use our bodies in playing the game, as we start to learn a new habit through mapping these two spatial positions. Much like having a physical controller, once these translations are learnt, the game becomes quicker and easier to play as we understand how to make the locus of manipulation move through space. As was the case in the examples of Wii tennis and even *Tumble*, the virtual space displayed in each game is simplified in terms of its spatial capabilities. Once again, although 3D space is depicted, the limits of how the space can be navigated within the *Kinect Adventures* games is often limited to one or two axis as this is all that can be offered by the body as a controller.

Conclusions

By discussing the different occurrences in both the player and the game space of non-mimetic and mimetic interface games, we can see how space changes in each instance. For the most part, having a controller with a navigational device such as a control stick allows for free movement of the locus of manipulation in the game. Removing this aspect, as in many mimetic game interfaces, removes the way the player can interact with the dimensions of the gamespace through the controller. However, in each instance, the player has to learn the controller input/output -> visual/aural feedback loop to understand any perception of three-dimensional space. Having a controller as an object often makes this loop easier, as the physical object allows for a reference point of feedback as to the limitations and mappings of the controlled object within the gameworld. Being able to equate the two events allows for a greater understanding of the way the gamespace can or can't be manipulated.

By removing the controller, the body itself becomes an object, and in many ways exists within a vacuum of player space. There is no objective reference until the position of the body's movement starts to map onto the position of the locus of the manipulation. Through this initial feedback loop, the player has to re-learn how to move virtual objects via their locus of manipulation in relation to that of the virtual character. In each instance of the gestural or "mimetic" interface we can see that by attempting to bring much of the action into the player space, most of the space onscreen becomes overly simplified. This may be as a way of emphasising the object the player is supposed to be controlling and making sure that is the focus of their attention. Although the games are presented as three-dimensional worlds, the more mimetic the interface, the less navigable the space becomes. Therefore, games have to feedback other aspects of the space to the player as a way of compensating for lack of navigable control, such as the use of unnatural lighting techniques to produce dark shadows, or by bringing the audio of the game into the player space, as with feedback used via the Wii remote, or as in the case of the Kinect, by splitting up the locus of manipulation into smaller areas so that moving multiple positions becomes part of the puzzle of the game. It can also be seen that with the Kinect in particular, using the body as an object to act as a controller, actually means the machine now controls much of the gamespace. The focus becomes centred on the performance rather than the connection of direct actions between spaces. Small actions in the Wii or the Kinect create much larger onscreen actions in the gameworld. We are re-training our real world actions such as hitting a ball to adhere to the performative aspect of playing the game rather than re-creating the exact bodily experience. Simplifying the onscreen action helps with this learning process. Aspects of how the player can manipulate the space are taken away, and replaced by the "rule-based" space determining much of what is happening. This allows the player to focus on the mappings of actions but in doing so, makes the player re-examine how they would usually respond to objects in the real world. However, it is through an understanding of "fictional space" that we allow this to happen, and as with any game, it is still down to the player to understand how Nitsche's planes of "rule-based space", "mediated space" and "player space" intertwine, evolve and shift with one another in each new game (and controller) experience.

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