



Inventing Space: Toward a Taxonomy of On- and Off-Screen Space in Video Games

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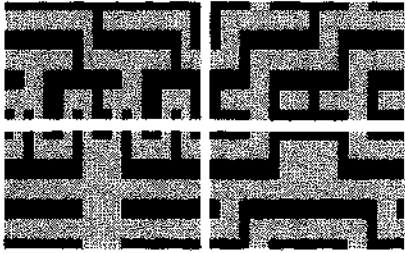
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Inventing Space



Toward a Taxonomy of On- and Off-Screen Space in Video Games

Last year marked the 25th anniversary of commercial video games, which began with Nolan Bushnell's *Computer Space* arcade game in 1971. In the past quarter century, the video game market has boomed and has proven to be powerful competition for film and television; and as films like *Super Mario Bros.* (game, 1985; film, 1993), *Street Fighter* (game, 1987; film, 1994) and *Mortal Kombat* (game, 1992; film, 1995) have shown, a source of material as well. In the last ten years, home computers and CD-ROM drives have taken over a large sector of the gaming market, although game systems such as Super Nintendo, Virtual Boy, Atari Jaguar, Sega Genesis, and others continue on in the game-console tradition. Stand-alone arcade-style video games found in malls are also keeping pace, moving into ever more detailed three-dimensional environments, virtual reality, and simulator games.

Despite more than two decades of development, there is relatively little scholarly study of these games. As audiovisual entertainment whose content is largely representational, video games have a lot more in common with film and television than merely characters and plotlines. Video games compete for audiences at the very same sites as film and TV—most multiplex theaters have video games in the lobby, if not a separate room devoted to them, and home video game systems use the television set itself, trading game programs for broadcast ones. Even the video rental industry now rents games and game systems. Theoretically, many of the same issues are present in video games and film: spectator positioning and suture, point of view, sound

and image relations, semiotics, and other theories dealing with images or representation. Indeed, video games are themselves becoming more like film and television, embedding video clips within the games, or like *Dragon's Lair* (1983), *Space Ace* (1983), *Dragon's Lair II* (1991), and *Mad Dog II: The Lost Gold* (1992), relying on video sequences almost entirely. Many games now use recorded sounds rather than just computer-generated ones, and visually they include opening scenes, closing scenes, and credits, attempting to create a more cinematic experience (*Mad Dog II: The Lost Gold* has over a dozen screens' worth of end credits!). As video game graphics increase in resolution and film and television move into the digital realm, the gap between them continues to close.

At present, film and television theory are best equipped for dealing with the medium of video games, which clearly overlaps them in places and extends many of their ideas, such as the active spectator, suture, first-person narrative, and spatial orientation. Video games are certainly deserving of their own branch of theory, and it will likely be one which is in close kinship to film and television theory. The study of the video game as a form of art and entertainment will undoubtedly bring to light certain unacknowledged assumptions in areas of theory including reception, spectatorship, and narrative structure, as well as the nature of the diegetic world and one's experience of it.

One of the many phenomena shared by film and video games, for example, is the use of on-screen and off-screen space in the creation of a diegetic world. Most games, like films, contain scenes or

locations inhabited by goal-oriented characters who are subject to certain “rules” of behavior. Whether characters are represented by high-resolution photographic images or a few colored squares, basic narrative roles and functions (protagonist, antagonist, obstacles, arena of conflict, etc.) are still present. The added elements of navigation and interaction, however, lend an importance to the diegetic space which is unlike that found in film or television.

As in film, the development of on-screen and off-screen space did not occur in a smooth, straightforward fashion; however, a history of video games and their development is beyond the scope of this essay. The 1970s alone saw the appearance of numerous arcade-style video games, as well as home video game systems produced by Magnavox, Fairchild, RCA, Coleco, Atari, and Mattel. Game cartridges were produced by these companies and others, including Imagic, Apollo, Activision, Sears Roebuck. Film and television industries were also interested; CBS Electronics and 20th Century Fox made their own game cartridges, and several dozen movies and television shows became game cartridges for the Atari 2600 system alone.¹ Since some of these games are somewhat obscure or nearly impossible to find today, I will mainly use well-known games for most of the examples, and will limit my recounting of the history to a few highlights, focusing mainly on the use of on-screen and off-screen space and its similarities and dissimilarities to their counterparts in cinematic space.

Just as cinematic off-screen space differed from theatrical off-stage space that preceded it (for example, characters could walk off-screen into the space behind the camera), the off-screen space of the video game differs from that of film. First, unlike film, off-screen space in a video game does not have a pro-filmic referent the way a filmed space often does. When a live action film camera is set up and pointed at something, there is always space outside the frame, off-screen, whether it is actively used or acknowledged by the film-maker or not. In a video game, not only the representation of space, but its very implication, depend on being programmed and actively created. Second, because the video game has no default structure for its off-screen space, that space can be shaped and structured in new ways that did not develop in film or television. And finally, the video game, as an interactive medium, often gives the player some control over the point of view, allowing one to choose

which spaces appear on-screen or off. Rather than wait for the film camera to show it, off-screen space can often be investigated and explored, and in some cases like *Adventure* (1978), *Doom* (1993), *Dark Forces* (1994), *Descent* (1995), *Stonekeep* (1995), or other maze-like games, it can constitute a large part of game play itself.

The design of the spaces depicted in video games can be attributed to both technical limitations and aesthetic influences. As video game technology developed, factors like hardware, software, processing speed, and memory limited what was technically and graphically possible; breakthroughs like the invention of the microprocessor in 1971 and development of the inexpensive AY 3-8500 chip in 1975 made smaller and faster games possible, as well as the entire home video game system industry. Graphically, technological improvements have helped games evolve from the simple blocky graphics of *Pong* (1972) and the Atari 2600 to the high-resolution, shaded, photorealistic images in CD-ROM games like *Myst* (1993), or games like *Doom* featuring detailed three-dimensional graphics that can change in perspective during real-time interaction.

Technical limitations, however, are not the only factors. The video game had a wide range of aesthetic influences; for example, commercially, it followed precedents set by pinball and other arcade games, and its cabinet and controls were designed accordingly. Graphically, it was limited by what computer graphics could reproduce; vectors (lines) and raster graphics (pixels). In the areas of representational characters, narratives, and spaces, there were the enormous precedents set by film and television imagery. It is perhaps due to the desire to measure up to the standards of visual realism set by film and television that the video game evolved as it has; today there are far fewer of the abstract game designs that were once so common in the days of *Qix* (1981) and *Tempest* (1980). Likewise, as computer technology allows faster and more affordable rendering and three-dimensional graphic environments, the structuring of off-screen space within video games increasingly follows the examples set by film, which paved the way and set precedents regarding the representation of complex, connected spaces onscreen. Today, the navigation of on-screen space has become more important than ever with the expansion of the World Wide Web, and nascent virtual reality spaces which are gradually finding their way to the Internet as well. Video

game worlds, then, can be seen as a kind of proto-cyberspace. En route to this present state, video games have explored a wide range of spatial geometries, and a number of different ways in which terms like “on-screen” and “off-screen” can function.

Spatial Structures in Video Games

While there are a large range of spatial structures or “spaces” possible in video games, these can be broken down into more elementary structures, some of which have similar counterparts in film. All of these spaces have appeared in video games individually, and different combinations of them occur together in a variety of games. Each has found its niche, as some kinds of games are more appropriate in one type of space than another, or because some require less computing power than others. These types of spaces apply not only to arcade and home video games, but computer games and hand-held games as well, and some of these will be included as examples. They are presented here in order of increasing visual and conceptual complexity, each requiring varying amounts of concentration from the player. Unlike the film viewer who is led (visually) through the film’s diegetic world by the film’s characters, the video game player has a stake in the navigation of space, as knowledge of the video game’s space is often crucial to a good performance.

1. No visual space; all text-based

A genre of home computer games, known collectively as “interactive fiction,” includes *Planetfall* (1983), *The Hitchhiker’s Guide to the Galaxy* (1984), and some of the earlier games in the *Zork* series. These games are completely text-based; the scenery, other characters, and the player’s surroundings are presented as verbal descriptions delivered as text on-screen, and the player’s replies and requests are typed commands, such as “north” or “open door.” In this sense, there is no on-screen space to speak of; everything has to be imagined, based on the descriptions. One could argue that *everything* takes place off-screen, as on a radio program; or, if the concept of on-screen space is needed for the concept of off-screen space to make

sense, one could argue that neither is present at all. Or, in still another sense, one could consider “on-screen” to mean “that which is currently being described by the text on-screen”; the use of descriptive text, then, raises the question of what it means to be “on-screen.”

Part of the reason for the use of all text, at least initially, was the difficulty of doing graphics. Nor did the computer keyboard have a control like a joystick (although many games now use arrow keys or some other configuration of keys to indicate directions of movement). However, instead of seeing this as a liability, these games took advantage of the lack of graphics to leave the images to the player’s imagination, much as a novel or as TSR’s table-top game *Dungeons & Dragons* did (*D&D* used graph paper, dice rolls, and verbal description to build fantasy worlds). Although early computer graphics would have been fairly limited in what they could depict, any amount of subtle detail could be verbally described; the player could even be told what he or she was feeling in certain situations, if needed.

Today, text continues to be used in some of the MUDs (Multi-User Dungeons) or MOOs (MUD, Object-Oriented) on the Internet, the gaming “rooms” visited by multiple players simultaneously, where all description, interaction, and dialogue are composed of text. When a player is inside a “room,” he or she can hear all the dialogue occurring in that room, as well as descriptions of actions done by the occupants. After leaving the “room,” the player will no longer know what is going on “inside” it; instead, there will be descriptions of the current “location” being visited. In this way, notions of “on-screen” and “off-screen” can reappear, even in a text-based environment.

The text-based environment differs from that of a book in that it can be time-based, especially when there are multiple players. Even though the descriptions may provide more detail than low-resolution graphics would, players must imagine the spaces based on descriptions, and react verbally as well; to some degree, both brain hemispheres are required to match up verbal and spatial processing, if the scenes described are to be visualized and connected. Because the action taking place is indirect, the pace of these games is slower, and reaction time much less of a factor, making these games something of an exception—and today a rarity—in the world of video games. Although some games may incorporate text-based informational screens (as in

Stellar Track [1981]), only a few games, like *Myst* (1993), come close to being a graphic equivalent of these kinds of games; *Myst*, in fact, makes frequent use of on-screen text, in a series of books and letters the player reads on-screen.

2. One screen, contained

Text-based games are only a tiny minority in the video game world compared to graphic-based video games, in which space is graphically depicted instead of just verbally described. Computer games first appeared on mainframe computers, and one of the earliest ones to contain on-screen graphics was a game called *Spacewar*, developed in 1961 by Steve Russell and J. M. Graetz at MIT. This was the game that inspired Nolan Bushnell, who adapted it in 1971 into the first coin-operated stand-alone arcade video game, *Computer Space*. From the \$500 he made in profits, he was able to incorporate his company, Atari, the following year, and produce his second arcade game, *Pong* (1972). After its success in game rooms, *Pong* was developed into a home video game system in 1975. Following this, in 1977, was the release of the Atari 2600 Video Computer System, which soon came to dominate the market. The Atari 2600 was, however, by no means the first home video game system; Magnavox's Odyssey 100 system had appeared in 1972 and its Odyssey 200 system in 1975, and Coleco's Telstar and the Fairchild/Zircon Channel F had appeared in 1976. Atari, however, was able to license the game that was one of the huge, international, early successes in the video game world: Taito's *Space Invaders*, brought to the U. S. by Midway in 1978. Atari's own *Asteroids* in 1979 further contributed to the company's success, as did its licensing of *Pac-man* (1980) for its home system in 1981. Since its beginning, then, the video game has been primarily graphics-oriented.²

Many early video games were designed so that the entire game was contained on a single screen of graphics; the player did not leave the screen, nor did the screen scroll to reveal off-screen space. *Space Invaders*, *Pong*, *Breakout* (1976), and other games had all their action contained on one screen and there were no other levels; the destroyed characters or objects simply were replaced and the action was faster. Cinematically, these games resembled the early films of Lumière and Méliès, in which the camera was pointed at the action and remained static for the duration of the action, with-

out any editing to link it to other locations. Even the instantaneous disappearance of game objects (like the destroyed space invaders) is similar to Méliès' stop-action effects in films like *A Trip to the Moon* (1902) and *The Black Imp* (1907), in which objects or people suddenly vanish.

Both the early films and the early games also acknowledged that there was a space outside the frame, even if it was never shown; for example, in *Pong*, missed balls fly off-screen, scoring a point, and in *Space Invaders*, bullets missing the invaders fly up and off-screen. Likewise, Lumière's *Workers Leaving the Lumière Factory* (1895) showed people moving through the frame who disappeared off the edge of the screen in a manner similar to the bullets and balls. Although this off-screen space was not actively used (objects leaving the screen were not seen again), its presence was implied in either case.

3. One screen, contained, with wraparound

A variation on the single-screen video game is one in which space is finite but unbounded; objects leaving the top of the screen immediately reappear on the bottom, maintaining their same speed and trajectory. The top and bottom of the screen "wrap around" to meet, as do the left and right sides of the screen. *Asteroids* was among the first games to use this kind of space, as well as certain games in *Combat* (1977), the cartridge shipped along with all Atari 2600 systems. The asteroids (or fighter planes in *Combat*) move in straight lines, exiting the frame and reentering on the other side until destroyed by the player. In this sense, there is really no off-screen space to speak of; everything in each of these tiny universes is represented on-screen, a structuring of space that had never arisen anywhere in film (although it could have, in animation).

A slight variation on this ordering of space occurs in *Pac-man*; the game has a space similar to that of type 2, except for a tunnel allowing Pac-man to exit the screen on the right or left side of the frame and reappear on the opposite side. When passing through the tunnel, though, Pac-man does not immediately appear on the other side; there is a slight pause between the moment he leaves the screen and the moment he reemerges. This implies that the tunnel is slightly longer than what is shown on-screen, and suggests a tiny bit of off-screen space that is never seen, which the character can

pass through. For the most part, though, games using wraparound depict a self-enclosed space, finite but unbounded, in which all the game's action occurs.

In both type 2 and type 3, the player can see everything there is to see on-screen, and will probably concentrate most on the character represented there which he or she is controlling. However, the reactions to the two spaces differ somewhat: in type 2, the edges of the screen are walls, and thus one can safely turn one's back on them; the focus then becomes mainly the center of the screen, where threats are more likely to come from. In type 3, targets or attackers can "wrap around," disappearing off one side of the screen and reappearing on the far side, and so edges must be paid more attention, since it is often harder to keep track of these off-and-on movements. Although in both cases the action is wholly contained on-screen, different parts of the screen become important and require attention depending on how the space is configured.

4. Scrolling on one axis

Certain genres of video games require more than a single screen's worth of graphics for their action; racing games, like Atari's *Street Racer* (1978) and Activision's *Skiing* (1980), need a long strip of space for players to travel through. Other games involving the shooting or catching of moving objects while moving through a space, like *Defender* (Atari 2600 version, 1982) or Activision's *Stampede* (1981), also use a long, track-like space. By moving the game's "set pieces" across the screen, often synchronized with the player's movements, a "scrolling" space is made, in which objects come on and off the screen. In some games, these configurations of objects are always the same, allowing a player to anticipate what lies ahead in the game, off-screen but approaching. These games make active use of off-screen space, using it to build a player's anticipation, and sometimes creating the illusion of an endless track of space which players could continue moving through, provided they were good enough at the game to keep going. Seeing more and more of this "track" can itself be a kind of reward, just as moving to higher levels is in other games.

Spatial scrolling can occur horizontally, as it does in most games like *Defender*, *Stampede*, *Space Jockey* (1982), and others, or vertically as in *Skiing* and *Street Racer*. It can also be used to reveal

spaces which the player has to return to later, as in Activision's *Keystone Kapers* (1983) which depicts three levels of a department store; the screen scrolls horizontally, and the upper levels of the store can only be reached by elevators or escalators at the far right and left ends of the scrolling space. Cinematically, the revealing of off-screen space by scrolling or reframing the image is accomplished by tracking shots and crane shots (or by panning and tilting, if one ignores the changes in perspective in each). This movement can be traced back to panning used in early films like Porter's *The Life of an American Fireman* (1903), the tracking shots used in Queribet and Hepworth's *A Day with the Gypsies* (1906), or even farther back to the scrolling images of the dioramas of the late 1800s. In both the games and often in film, space scrolls through the frame in order to keep the moving character visible on-screen, to follow the action, and to build anticipation in the viewer. In the video game, however, it is the space which is being moved instead of the camera/viewer.

Whether or not a player must be able to recall the spaces passing on and off screen depends on the game. Some, like *Stampede* and *Street Racer*, do not allow the player to stop or change direction, nor is the space passed through ever returned to (except in repeated playings, where a player may be able to anticipate what is coming). Other games, like *Keystone Kapers* and *Defender*, allow a player to navigate and revisit spaces, putting more emphasis on spatial orientation and navigation, and making the experience more interactive as well.

5. Scrolling on two axes

Some games, like the computer game *Sid Meier's Civilization* (1993) or *SimCity* (1989), have screens that can scroll either side-to-side or up-and-down. This results in more than just a combination of the two types of scrolling, because it implies a large plane of space, of which only a small rectangle is seen at any given time. Most of these games involve a bird's-eye view of some terrain, although the objects within that terrain are typically shown in side view (resulting in scenes with perspectives similar to those found in medieval paintings before the Renaissance). Cinematically, this kind of sideways tracking movement is found mainly in cel animation, and occasionally in live action, such as the cut-away office set of Godard and Gorin's *Tout va bien* (1972), which the camera tracks side-to-side

and up-and-down.³ The amount of scrolling possible can vary from one axis to the other (up and down movement may be limited to only certain spaces), as will the importance placed on spatial navigation. Like the wraparound screen, players often must monitor the edges of the screen for incoming characters, but unlike wraparound, there is more uncertainty as to when and where these characters will appear. Just as few films are long, unbroken tracking shots, most games do not use two-axis scrolling for displaying all of their spaces; instead, both media usually employ “cuts” between adjacent spaces.

6. Adjacent spaces displayed one at a time

The joining of contiguous spaces through cutting signaled the arrival of editing in the cinema. Likewise in video games like *Adventure* (1978) or *Superman* (1979), both for the Atari 2600, adjacent spaces or rooms are displayed as a series of nonoverlapping static screens which cut directly one to the next without scrolling, not only following the precedent set by film but relying on it to allow the player to make sense of the geography of the game. As the player’s on-screen character moves off-screen in one direction, the screen changes instantly and the character reenters on the opposite side of the screen; the direction of screen movement is conserved, and the screens are seen as being immediately adjacent to one another, an assumption that relies on one’s knowledge of continuity editing in film.⁴ In both *Adventure* and *Superman*, the games’ spaces can be mapped out as a series of screens joined side by side (although the *Superman* screens join together in a wraparound pattern; in some places, if you fly in one direction long enough, you will eventually return to the same screen).

As film editing developed, some films were structured into a similar pattern of nonoverlapping adjacent spaces. For example, in both *The Lonely Villa* (1909) and *A Corner in Wheat* (1909), D. W. Griffith divides certain spaces into a series of static camera set-ups. The spatial representation of the villa in *The Lonely Villa* is remarkably like that of a video game, in both editing and graphics. As Rick Altman describes it:

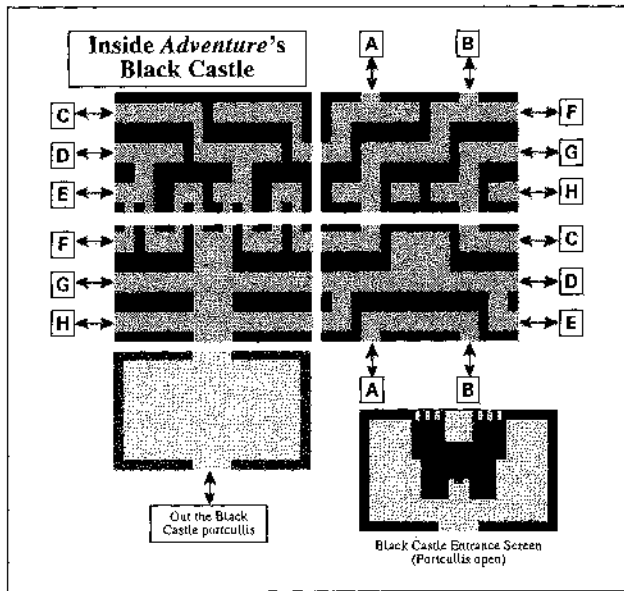
The film’s space is divided up into a dozen mutually exclusive shots; that is, there is no overlapping between the fields of one shot

and another. This method produces a fragmented view of space in which we never see an object or stationary character from more than one point of view. This fragmentation is compounded by the fact that the camera always remains immobile and level (except for a single low-angle shot of the burglar who climbs a pole to cut the wires).⁵

The movement of characters within the film is also graphically similar to the video game: “Each edge of the frame represents an entrance or exit; the dominant motion is thus across the frame, either horizontally or diagonally.”⁶ Robert Adams describes Griffith’s *A Corner in Wheat* as having a similar set-up of adjacent nonoverlapping spaces, and this time including vertical spaces as well; for example, when the Wheat King falls through a trap door into a grain bin, the two spaces are shown separately.⁷ As Altman points out, these films also use static camera set-ups, at right angles to the scenes, depicting them from a single point of view; a visual style similar to that found in many video games, visually simplifying the diegetic world and the action taking place there.

Adjacent spaces displayed using “cuts” between them can in some ways provide more suspense than a scrolling space, since the player does not see the space until it is entered. In *Adventure*, for example, a dragon would occasionally be hovering near the edge of the screen, and an unsuspecting player could be attacked immediately upon entering the screen. While similar “shock” cuts can be used in the cinema, in video games it is the player who decides when to cut to the next scene, and so there is an element of responsibility, control, and decision-making that one does not find in the cinema, which is often used to add an element of suspense into the design of a game.

Adventure for the Atari 2600 is one of the earliest games to make use of multiple connecting screens, and also nonplayer characters (three dragons and a bat) who can come on-screen and off-screen, or even be followed from one screen to another. The game contains more than two dozen interconnected screens, most of them spatially adjacent to one another. The way in which these spaces connect, however, need not be limited to those which can be mapped out on a flat surface (see illustration, “Inside *Adventure*’s Black Castle”). The interiors of the castles, which are entered through the on-screen castle gates rather than sides



Adventure for the Atari 2600 displays adjacent spaces one at a time, cutting between screens as characters leave or enter the frame. The player enters the Black Castle through the gate in the middle of the screen, and reappears in an empty room, which leads into the rest of the castle. The screens containing the maze in the Black Castle connect in wraparound fashion, top to bottom and side to side as shown above. Notice how the paths connect on the sides of the screens, resulting in a space which loops around itself and contains connections that cannot be mapped onto a flat surface.

of the screen, are an exception. The interiors of the castles in *Adventure* were among the early instances of off-screen space occurring *behind* or *inside* an object pictured on-screen, a space like that used for interiors in film.

In *Theory of Film Practice*, Noël Burch divides off-screen space into six “segments,” and describes the first four of these as the areas beyond the four borders of the frame. He then adds:

A fifth segment cannot be defined with the same seeming geometric precision, yet no one will deny that there is an off-screen space “behind the camera” that is quite distinct from the four segments of space bordering the frame lines, although the characters in the film generally reach this space by passing just to the right or left of the camera. There is a sixth segment, finally, encompassing the space existing behind the set or some object in it: A character reaches it by going out a door, going around a street corner, disappearing behind a pillar or behind another person, or performing some similar act.⁸

The castle interiors are clearly an example of Burch’s sixth “segment” of space; entering the castle gate (located in the middle of the screen) immediately takes the player to a screen depicting the castle interior.

Besides the player’s character, *Adventure* also features three dragons and a bat that can freely pass

over the terrain and the objects on-screen; thus Burch’s sixth type is also evoked as these characters pass in front of scenery. Although this was a step towards the idea of Z-axis depth on-screen (depth toward and away from the viewer), it was only indicated by momentarily replacing the pixels of the background with those of the character as it passed over (a concept in computer graphics known as “priority”). In *Adventure*, then, the idea of overlapping planes is indirectly suggested, but not graphically depicted with the illusion of depth.⁹

7. Layers of independently moving planes

A number of games, such as *Zaxxon* (1982) and *Super Mario Bros.*, depict a space made up of layers of overlapping and independently moving planes of graphics; the front layer contains the player-character (and often the scenery the character stands on), while the back layer contains background graphics and scrolls at a slower rate than the foreground, creating an illusion of depth. In some games, like *Warioland* (1995) for the Nintendo Virtual Boy system, the player-character can even jump from one plane to the other, at places indicated in the game. In these games, figure-ground relationships can become more complex, as graphic planes can function as either, depending on what is “behind” or “in front of” them, requiring more sophisticated degree of spatial orientation than was needed for the flat, single-plane

scenes of earlier games (the Virtual Boy system uses stereo three-dimensional graphics to help separate out its planes of action, though most games are wholly dependent on other depth cues).

The use of layers of planes creates a three-dimensional effect, without being truly three-dimensional; each layer is still a flat two-dimensional plane. The effect is similar to that created by the theatrical flats used on-stage as scenery, several layers of them providing depth, as well as places for actors to enter and exit. In video games, characters are present within these layers (as opposed to between them) along with the scenery, although the layers themselves pass in front of other layers. This is similar to compositing in film and video; for example, a television weatherman placed over a weather map, combining two layers of imagery. Thus, in these games, Burch's sixth segment of off-screen space came into maturity, bringing the graphical depiction of Z-axis depth to the games, even if it was in a somewhat limited fashion, as a series of two-dimensional overlapping and independently moving planes.

8. Spaces allowing Z-axis movement out of frame

Burch's fifth segment of space, extending behind the camera (or the viewer's point of view), was the slowest to emerge in video games, due to the difficulty of depicting the dimensional movement it required (objects growing larger until they move out of frame). Early appearances of objects moving toward the viewer and out of the frame can be found in the arcade game *Tempest* (1980), *Star Ship* (Atari 2600, 1977), and in *Night Driver* (arcade game, 1976; Atari 2600 version, 1980). *Tempest*, a vector game, depicts objects coming up the inside surfaces of a tunnel, growing larger until they reach full size at the edges of it. In a sequence at the end of each level, the tunnel grows in size, and the viewer's point of view is made to appear to be flying down through it to the next level; the tunnel, then, is passing into the space located behind the camera/viewer.

In *Night Driver* the screen is black, and contains two series of white rectangles, or posts, which come down the screen, growing in size (and moving sideways, as one "steers") to produce the illusion of driving on a road. A house, tree, and oncoming car that grow in size as they move down the screen provide additional depth cues. Although

the space behind the camera/viewer is acknowledged, it is not actively used; the posts passing into it are not used or seen again (like the *Pong* balls or *Space Invader* bullets that leave the screen); in this sense, the Z-axis movement is one-way, as it is in the early scrolling games which do not allow players to back up or return to spaces passed through. Likewise in *Tempest*, the Z-axis movement is one-way and does not affect play; the player's point-of-view moves through the tunnel only between levels (thus no steering is even required), and the only other Z-axis movement is that of objects growing in size as they move up the tunnel to its edge, where the player's character is; the 3-D effect employed is just for show. Active use of the space behind the camera/viewer only later appeared in games representing an interactive three-dimensional environment.

9. Multiple, nonadjacent spaces displayed on-screen simultaneously

One of the more rare types of spatial structures found in video games involves two different points of view—each belonging to one of the players—displayed on-screen at once. While each of the viewpoints can contain any of the types spaces mentioned here, the combination of multiple viewpoints can make for a very different game, since attention can be split between two points of view. One such game is *High Velocity* (1995), a racing game for the Sega Saturn. Players can see both their own and their opponent's point of view on-screen, and can use this information to monitor each other's progress, and in some cases even slow each other down. One of the more interesting uses of this type of space, and one of the earliest examples of it, appears in *Spy vs Spy*, a game released by First Star Software in 1984 for the Commodore 64, Apple II, and Atari home computers. In the game, two players (the White Spy and the Black Spy) travel through rooms looking for certain objects (passport, money, key, and secret plans) that a player must get in order to win. While doing so, each player can set traps for the other player, or get caught in the other player's traps. The screen is divided into two smaller screens, each representing the room a player's Spy is in, and both players play simultaneously and can see what the other player is doing at all times, even if they are in different rooms (see figures 1 through 4).¹⁰ In order to play the game well, a play-



Figure 1 The title screen of First Star Software's *Spy vs Spy* game for the Commodore 64 computer.

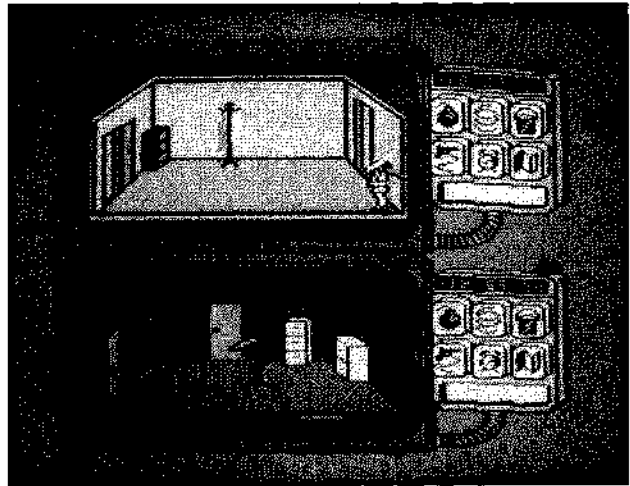


Figure 2 A typical game screen from *Spy vs Spy*. Each Spy has his own window, trapulator (the menu board on the right side), and timer. Play is simultaneous, and both arenas of action must be watched in order to avoid traps.

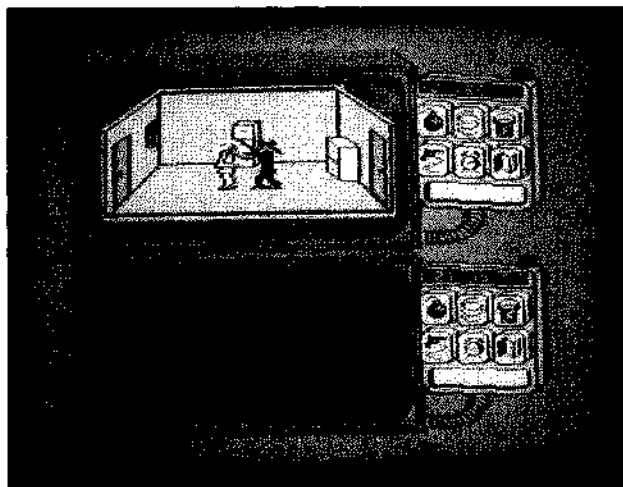


Figure 3 The Black Spy has entered the room where the White Spy already is, so his screen goes blank and he appears on the White Spy's screen above.

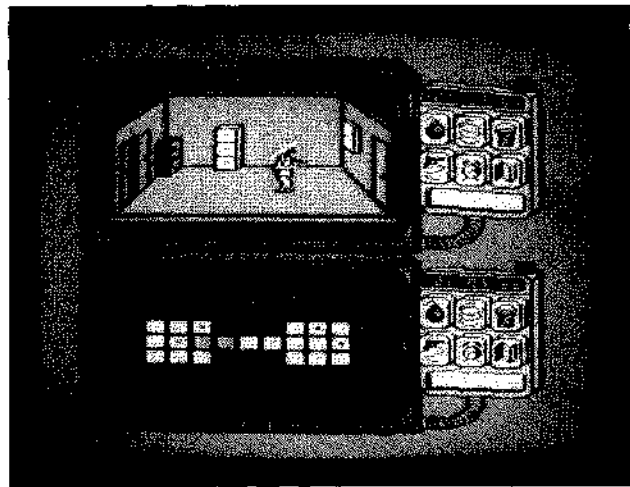


Figure 4 The player controlling the Black Spy checks the Help Map, and the room screen is replaced by the map, which represents rooms by adjacent rectangles. A blinking rectangle indicates the room the player's Spy is currently in. Rooms containing dots indicate the locations of important items the Spies need to win.

er must find the required objects as well as watch what the other Spy is doing elsewhere. Since multiple, nonadjacent spaces are depicted on-screen simultaneously, each Spy is in his own space and screen; "off-screen" could then apply to the rest of the rooms of the maze not on-screen, or, if we take "off-screen" to mean the *player's screen* within the game, we could say that the opposing Spy's

off-screen actions are depicted on the other player's screen. The meaning of "off-screen" varies, then, depending on the screen to which we are referring.

Although not very common in video games (some multiple-player arcade games, such as *Dactyl Nightmare* [1992], use two screens instead of a split screen), the representation of multiple

nonadjacent spaces on-screen is more common in film. Split screens have been used in a wide variety of films (*Carrie* [1976], *Pillow Talk* [1959], and Abel Gance's *Napoleon* [1927], to name a few), often to show simultaneous events or actions of characters. The use of the split screen in the video game, then, serves a similar purpose (the depiction of simultaneous actions) but differs from the film because of the interaction possible in the video game, and the control the players have over which spaces are depicted or remain off-screen. In video games, a player also has more reason to identify with one screen (with the player-character), giving it the majority of his or her attention, rather than divide it equally among the images in a split-screen sequence of a film. Games like *Spy vs Spy*, in which watching the other player's actions is an important part of the strategy, do create an interesting tension between passive watching and active playing, and between thought and action, that can make the player much more aware of the difference between the two modes of activity.

10. Interactive three-dimensional environment

While *Spy vs Spy* does represent movement through a three-dimension interactive environment, it still depicts each of its spaces—the rooms—from a single point of view, much like a Griffith film of the action would (although Griffith, of course, would have used cross-cutting instead of a split screen to depict the simultaneous actions). Most games representing their diegetic space as an interactive three-dimensional environment follow, to some degree, the precedent set by the space represented in the classical Hollywood film.¹¹ Spaces and the objects in them can be viewed from multiple angles and viewpoints, which are all linked together in such a way as to make the diegetic world appear to have at least enough spatial consistency so as to be navigable by the player. The way the player is allowed to freely navigate the space varies widely. A few games—like *Dragon's Lair* or *Space Ace*, which use film clips stored on a laserdisc—give the player some control over a character's actions, but spatially they are not much more navigable than a film, which gives the viewer no control over which spaces are seen when. Others, like *Myst*, allow for more navigation of space, but limit the player to selection of rendered views of the space, limiting the viewing angles and standpoints available. Still

other games, like *Doom*, *Dark Forces*, *Descent*, and *Stonekeep*, and various virtual reality games, provide players with an unbroken exploration of space, allowing them to pan, tilt, track, and dolly through the space, which is usually presented in a first-person perspective view and in real time.

The first commercial game to offer a first-person perspective of an interactive three-dimensional environment was the arcade game *Battlezone* (1980).¹² The player's point of view was that of a tank, which roamed a sparsely decorated landscape and fired upon other tanks (which were, in turn, trying to shoot at the player's tank). The other tanks could sneak up from behind, so a player had to be vigilant in watching and turning, to locate the other tanks first; off-screen action could be as important as on-screen action. *Battlezone* was also the first game to feature off-screen sound and events; sounds of the player's tank getting hit indicated an off-screen tank's attack, alerting the player to turn and fight. The first-person perspective increased the importance of off-screen space because it positioned the player within the space, subjectively, as opposed to the third-person "objective" view in earlier games.¹³ This shift also allowed a more mature usage of off-screen space, and one closer to that of cinematic off-screen space.

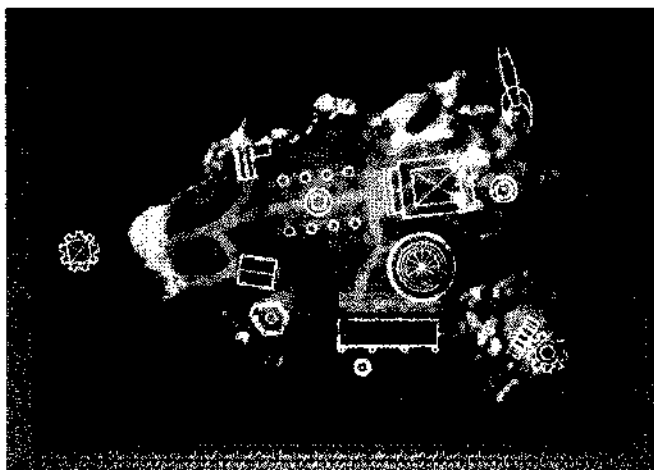
In cinema, the understanding of a narrative may depend on a detailed understanding of the space it unfolds in, but this is not always the case. Indeed, some cinematic spaces—such as Rick's diner in *Casablanca* (1942)—function adequately within the narrative, but physically are not consistent enough to be reconstructed into a coherent space. Most video games, however, require players to know their way around the diegetic world in order to be successful in the game—multiple playings are almost always necessary. A knowledge of what areas have not been seen may lead to the discovery of a hidden room, and spatial orientation may be useful in solving puzzles, such as in the Selenitic Age in *Myst*, in which the player must rotate radar dishes to pick up signals from other parts of the island.

With the development of 32-bit and 64-bit home video game systems, games involving three-dimensional interactive environments have become quite common, and computer games on CD-ROM feature increasingly detailed graphics in their 3-D environments (one need only compare *Doom* [1993], *Dark Forces* [1994], *Stonekeep* [1995], and *Quake* [1996] to see how much it has developed

over a three-year period). Navigation through a labyrinth is a large part of these games, and there are often books sold for these games which provide maps of the different levels. Frequently, however, there are maps of the spaces built into the games themselves which depict the off-screen space in highly simplified schematic form.

11. Represented or “mapped” spaces

As the size of the video game’s diegetic world grew from one screen to several screens to intricate multi-leveled three-dimensional labyrinths, it became more important to provide the player with some visual representation of a conceptual map. These represented or “mapped” spaces became an on-screen representation of off-screen space; they were not spaces in and of themselves, but rather simplified schematic versions of spaces designed to orient a player or indicate important events occurring in off-screen space. For example, *Battlezone*’s visuals included a small radar screen which used a series of dots to represent enemy tanks in an overhead view, giving a player a 360° sense of the immediate surroundings. Some games use a map only to indicate a player’s progress from level to level, as in the inter-level screens of *Warioland* (1995), but these provide little information for the actual play of the game. Some games, in which figuring out the maze is part of the objective, do not provide maps, and those that do can discourage their use (*Spy vs Spy*, for example, subtracts 70 points from a player’s score for calling up the “help map” [see figure 4]). But quite often, these maps are designed to provide just enough information to keep a player interested, without giving too much away.



Typically, these orientation maps are iconic and contain very little detail. Some of these maps are even worked into the diegesis of the game; in *Myst*, there is a map of the island in the library which lights up various portions of the island as their marker switches are flipped (see figure 5). This map indicates that there is something behind the cabin which a player might have missed; the tall tree with the elevator in it (the angles of the views of the island that a player sees while moving about it are designed so that the tall tree can only be seen from certain vantage points on the island).¹⁴ *Myst* also includes maps of various ages in the books in the library, which are useful in finding the secret rooms in the Mechanical Age, and finding one’s way around the Channelwood Age.

Other games such as *SimCity* and *SimCity2000* (1994) are based entirely on maps, using maps as their graphics as well as informational purposes. Here, too, off-screen sounds are used to indicate events; in *SimCity*, for example, off-screen sounds of disasters can occur, and the game can be set to immediately bring these locations on-screen right after they are detected. Video games, then, have come full circle; whereas once their spaces were simple and iconic fields with little detail, today they can be so complex that low-detail maps of their spaces are far more complex graphically than any of the early games were.

Finally, off-screen spaces can be represented as unseen on-screen space. In some games in which exploration is important, such as Sid Meier’s *Civilization*, unexplored areas of the screen remain blacked out until a player has moved into the area. In this sense, off-screen space could be in the middle of the screen; the player could circle around an area, not venturing into it, leaving it black. Once

Figure 5 The map on the wall of the library in *Myst*. The white outlines on the map only light up once the locations have been visited and their marker switches placed in the “on” position. The space of the map is both conceptual, orienting the player on the island, as well as physical, since it takes up space on the library wall.

this area is ventured into, its contents are revealed and appear on-screen; the black area having represented the unexplored space without revealing what was in it. Here, too, the notion “off-screen space” can be interpreted in two ways: it could refer to the land areas which lie outside the frame at any given moment while not including the black areas (which are still “spaces” even though their content is not shown); or, the blacked out spaces on-screen could be included in the term because their contents are not displayed on-screen, just like the areas lying outside the frame. It all depends on whether the space, or what is in the space, must be depicted in order to be considered “on-screen.”

Video games continue to develop, as virtual reality systems (allowing real-time multiple-player interaction in a simulated three-dimensional environment) improve and become inexpensive enough to make their way to the arcade; Virtuality’s *Dactyl Nightmare* (1992) was the first to appear, and others are following. As Michael Benedikt demonstrates in his book *Cyberspace: First Steps*, computer-generated representations of spatial structures are completely fluid, leaving the video game plenty of room to explore the representation of space.¹⁵ New tools for home computer games and game systems are also being developed, like Apple’s QuickTime VR, a scrolling kind of space mapped onto the inside of a sphere as it rotates, to give the illusion of being an interactive kind of space.¹⁶ Gradually, films are joining video games in the realm of computer graphics, not only through the growing use of digital effects in film and the use of video clips and film language within games, but with films like *Toy Story* (1995), the first feature-length film to be completely computer generated. *Toy Story* was also released as a Super Nintendo game, the graphics of which, although much lower resolution, still manage to keep quite a bit of detail from the film’s characters, showing just how much the gap between film and video game is closing. Actors, storylines, and cinematic conventions are making the crossover into video games, and many are the familiar titles, series, and franchises that can be found in both film and video games.

The use of space—on-screen and off—in video games is certainly linked to cinematic space, which was an important influence on its development. However, through combinations of the spatial struc-

tures mentioned above, video game space goes beyond cinematic space and shows the various possibilities for organizing space within a diegetic world, as well as broadening the sense of what a diegetic world can be. The structuring of diegetic space in video games in many ways has come to follow the precedents set by film, and has also revealed new possibilities of dealing with on-screen and off-screen space; as video games continue developing and film moves into the realm of computer graphics, film may, in some ways, begin to follow precedents set by the games. Much of the theory pertaining to cinematic diegetic worlds can be applied to those of video games, and likewise, the diegetic worlds of video games can reveal new possibilities for film. The cross-fertilization between these two media has occurred commercially, aesthetically, and technologically, and the two continue to converge. Whereas the cinema offered a window and positioned the spectator within the world it depicted, the video game goes further, allowing the spectator to explore that world and take an active role in its events.

If knowledge of how film operates on the spectator is still incomplete, consider how much more incomplete is the knowledge of how video games operate on players, and what their effects are. They already have been shown in a number of studies to shape people’s behavior and outlook, and the breadth and depth of these influences are still being researched. We may also ask how video games are related to the cultures producing them, and what they say about those cultures. Video games have become well integrated into other cultural forms and media, yet perhaps overlooked as a cultural influence. As generations of children raised on video games begin reaching adulthood, how will society and the cultural milieu change?

And the medium of video games itself is still changing, and changing rapidly. When one considers the progress that has been made during the medium’s first 25 years, it is enormous. Even film, another rapidly developing medium, was, for the most part, still black and white and silent after its first quarter century. Comparing *Pong* to 64-bit CD-ROM-based games, it is difficult to say what even the next five years will bring, much less what the effects of such future technology will be.

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NOTES

Besides the books listed here, Greg Chance's "History of Home Video Games Homepage" on the World Wide Web [<http://www.sponsor.net/~gchance>] was also very helpful, as was the Web pages of the Video Arcade Preservation Society [<http://www.vaps.org/klovsrch.cgi>]. And, of course, much of the data comes from playing many of the games themselves over the years.

1. Besides all the arcade video games based on movies, there are many home video games based on film and television. For the Atari 2600 alone, cartridges based on movies include: *48 Hours*, *9 to 5*, *Butch Cassidy and the Sundance Kid*, *China Syndrome*, *Deep Throat*, *Dragonslayer*, E. T. *The Extra-Terrestrial*, *Escape from Alcatraz*, *Excalibur*, *Fantastic Voyage*, *Friday the 13th*, *Ghostbusters*, *Ghostbusters II*, *Gremlins*, *Jaws*, *Karateka*, *Marathon Man*, *Poltergeist*, *Porky's*, *Raiders of the Lost Ark*, *Star Trek II: The Wrath of Khan*, *Star Trek III: The Search For Spock*, five different games based on *Star Wars* films, *Texas Chainsaw Massacre*, *The Day the Earth Stood Still*, *The Last Starfighter*, *Towering Inferno*, *Trail of the Pink Panther*, and *Tron Deadly Discs*.

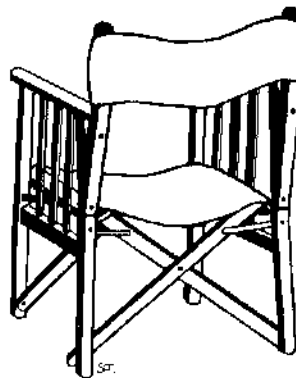
Game cartridges listed based on television shows include: *\$25,000 Pyramid*, *A Game of Concentration*, *Dukes of Hazzard*, *Emergency!*, *Family Feud*, *Flipper*, *Jeopardy*, *Joker's Wild*, *Knight Rider*, *M*A*S*H*, *M*A*S*H II*, *Magnum P I*, *Mission Impossible*, *Password*, three different games based on *Romper Room*, *Scooby Doo*, *Star Trek*, *The A-Team*, *The Flintstones*, *The Incredible Hulk*, *The Price Is Right*, *Tic-Tac-Dough*, and *Wheel of Fortune*.

2. See Sullivan, George, *Screen Play: The Story of Video Games* (New York: Frederick Warne, 1983); Herman Leonard, *Phoenix: The Rise and Fall of Home Videogames* (Union, New Jersey: Rolenta Press, 1994); Kesten, Lou, "Arcade Classics," *Games* magazine (October/November 1989), pages 40-41; and Cohen, Scott, *ZAP! The Rise and Fall of Atari* (New York: McGraw-Hill, 1989).

Although the video game itself grew out of main-frame computer games, home computer games using a television set were first patented by Ralph Baer, on August 10, 1970, as patent #3,829,095 (see Sullivan, *Screen Play*, page 17).

3. *Tout va bien* also has a number of long tracking shots which are visually very similar to scrolling video game graphics.
4. As for as the player-character's movement off the edge of the screen and back on at the opposite side, it is exactly like the on-and-off movement in spaces of type 3, except for the change of background, which indicates the new space.
5. Altman, Rick, "The Lonely Villa and Griffith's Paradigmatic Style," *Quarterly Review of Film Studies* (Spring 1981), Volume 6, Number 2, pages 123-124.
6. *Ibid.*, page 129.

7. See Adams, Robert L., "D. W. Griffith and the Use of Off-Screen Space," *Cinema Journal*, Volume XV, Number 2, pages 53-57.
8. Burch, Noël, *Theory of Film Practice*, trans. Helen Lane (New York: Praeger, 1973), page 17.
9. The asteroids in Atari's arcade game *Asteroids* were vector graphics that passed over each other, superimposed on each other, and so could not be considered to be an example of Burch's sixth segment of off-screen space.
10. If one player's Spy enters the room the other one is in, the action appears on one of the screens, and the other goes blank, until the Spies are in separate rooms again; thus there can be times in the game where off-screen space (from either player's point of view) is not depicted on-screen. Likewise, *High Velocity* also merges its views when players are close together.
11. See Bordwell, David, "Space in the Classical Film," in David Bordwell, Janet Staiger, and Kristin Thompson, *The Classical Hollywood Cinema: Film Style and Mode of Production to 1960* (New York: Columbia University Press, 1985), pages 50-59.
12. Prior to video games, flight simulators using computer animation offered first-person perspectives of interactive three-dimensional environments, but these were not commercially available for public use.
13. Text adventures created a first-person perspective verbally by describing what a player was seeing, hearing, feeling, etc. (although grammatically employing "you" in the text instead of "I"); but this is, of course, much different than a game with graphics.
14. When the elevator in the tall tree is running, it produces a periodic, metallic ka-chunk sound that can be heard even on other parts of the island; likewise, when the right plaques by the fountain are activated, there is an off-screen sound of water indicating that something is happening. Games, then, that have similar spatial structures as those seen in films can use off-screen sounds in a fashion similar to film.
15. Benedikt, Michael, "Cyberspace: Some Proposals," in Benedikt, Michael, ed., *Cyberspace: First Steps* (Cambridge, Mass: The MIT Press, 1991).
16. For an overview of the technology and how it works, see Milano, Dominic, "QuickTime VR: An Overview of Apple's Virtual Reality Tools," *Interactivity* (March 1996), pages 34-43.



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NOTES

⁷ **D. W. Griffith and the Use of Off-Screen Space**

Robert L. Adams, Jr.

Cinema Journal, Vol. 15, No. 2, American Film History. (Spring, 1976), pp. 53-57.

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