10

Architectural Approaches

This chapter builds the bridge from polygon game worlds to architectural theory. It combines architectural concepts in a basic framework, which is then used to look at a number of sample structures. Architecture helps describe how a game world can gain significance and a quality or "place," which is at the core of the last chapters of this book. Depending on their interaction with the world, players change their positioning toward these environments and take on a role. This role, its limitations, and its possibilities are discussed before part III introduces story maps. Story maps offer a model to understand the player's overall comprehension of the engagement with the game world.

A designer of 3D video games uses evocative narrative elements in the virtual space and the interactive access to stimulate the player's participation and comprehension of the game world. One way to arrange this stimulation is the structure of the navigable virtual space. How then does space connect to the work of evocative elements? What processes can be shaped by a spatial design and how might they influence a player's comprehension of game events? What is the functionality of rule-driven, architectural game spaces?

It is the use of and interaction with the game world, or any other space, from which the character of the space can evolve. As Alexander recognizes: "*A building or a town is given its character, essentially, by those events which keep on happening there most often*" (1979, 66; italics in original). Like digital game worlds, architectural space comes to life through the way it is used, and specific structures can help particular patterns evolve. But this is not a one-way connection. At the same time, patterns of use reflect on architectural arrangements. Learning from architecture, 3D games can assist concentration on certain patterns of events and make others less likely to occur. They can also realize that the ultimate target has to be meaningful usage of these space, which means that they might be literally taken over by players and remodeled by their activity. How can architectural theory be applied to video games and help to identify and enhance the properties of video game spaces?

Numerous analyses of architectural structures define elements or patterns connected to particular qualities that affect the inhabitants. Elements have been defined ranging from basic geometric shapes (e.g., Ching 1979) through interconnected patterns of use (Alexander 1964, 1979; Alexander, Ishikawa, and Silverstein 1977) to cognitive structures (K. Lynch 1960) and social spaces (Hillier and Hanson 1984). Unifying these categories is beyond the scope of this (and probably any) book. The patterns and elements do not assemble into one singular structure and cannot be forced into a fixed "meaning." Ching explicitly excludes such an attempt (1979, 386), as do Lynch (1960, 9) and Mitchell (1990, 204). Alexander, however, addresses the task of matching meaning, structure, and use when he proclaims: "There is one timeless way of building" (1979, 7) that encapsulates all fundamentally active patterns. "The quality without a name in us, our liveliness, our thirst for life, depends directly on the patterns in the world, and the extent to which they have this quality themselves. Patterns, which live, release this quality in us. But they release this quality in us, essentially because they have it in themselves" (ibid., 122).

Alexander's universal combination of meaning and structure focuses architectural complexity in one holistic concept. The all-embracing presence of this "quality without a name" renders it problematic but nonetheless inspirational. Alexander makes this theory more concrete in a collection of spatial patterns (Alexander, Ishikawa, and Silverstein 1977). Chapter 10 does not seek to define a single "language of architecture" but to identify a framework of spatial understanding on different levels, which can be applied to game spaces.

First, it will develop its model from an assembly of various architectural theories and try to interconnect their key features in an admittedly simplified model. Then, it covers some specifics that are outside the scope of traditional architecture but integral to the nature of virtual space. Chapter 11 will apply these theoretical references to some examples drawn from typical game-like spatial structures.

10.1 Preparing the Model

Influenced by Heidegger, architectural theorist Norberg-Schulz (1980, 10) starts his analysis of space by dividing architectural space into two classes:

human-made space (settlements) and natural space (landscapes). Natural places are identified as landscapes with extension and surface relief, whose characters are defined through texture, color, and vegetation. Human-made spaces show human beings' understanding and shaping of the natural space that they build in. "The existential purpose of building (architecture) is therefore to make a site become a place, that is, to uncover the meanings potentially present in the given environment" (ibid., 18). These human-made places relate to natural spaces in three different ways:

- They make the natural space more *precise*—including the visualization of the natural space, the understanding of it, and the resulting building in it; for example, where the natural space indicates a direction, a path can be created.
- They *complement* the natural space—adding what seems to be lacking in the natural space; for example, a canyon might be crossed by a bridge built to allow further access.
- They *symbolize* the human understanding of nature—including the translation of acquired meaning of a space into another medium: "The purpose of symbolization is to free the meaning from the immediate situation, whereby it becomes a 'cultural object', which may form part of a more complex situation, or be moved to another place" (Norberg-Schulz 1980, 17, still based on Heidegger). For example: the Golden Gate Bridge has become a cultural icon beyond its functionality as a connecting bridge reproduced in various forms and media.

All three effects are interconnected in the process of creating a place. Before one can build a bridge or any other structure that uncovers the qualities of the given space, one has to understand that a certain spot is a good place for such a structure. Such an understanding depends on a "reading" of space, a concept that leads into the realms of spatial recognition and cognitive mapping.

Cognitive maps are complex mental interpretations of a real or fictional environment, and its components that live in the fictional plane. Roger M. Downs and David Stea argue that "cognitive mapping is a process composed of a series of psychological transformations by which an individual acquires, stores, recalls, and decodes information about the relative locations and attributes of the phenomena in his everyday spatial environment" (qtd. in Kitchin and Freundschuh 2000, 1). The process for generating such a map differs from observer to observer. Kevin Lynch refers to the "light of his [= the observer's] own purposes" that is responsible for the generation of differing maps from the same environment (1960, 6). We can already add that for video game spaces the presentation is an essential part in this "light."

Each observer's cognitive map is unique. A tourist and a local police officer might read the same city structures—for example, the Golden Gate Park—but their cognitive maps differ completely, reflecting their subjective perspectives, individual experiences within the city, and the conditions of those experiences. However, Lynch analyzes the way observers create such a cognitive map of a city and extracts five shared elements that define evolving cognitive maps for different individuals:

- path—evoked, for example, by images of streets or rail tracks;
- landmark—evoked, for example, by monuments or historic sites;
- edge—evoked, for example, by rivers or seashores;
- node—evoked, for example, by crossings; and
- district—evoked, for example, by suburbs (K. Lynch 1960, 49–83).

These five elements are distinct parts of the mental image of a spatial structure that help observers to generate a cognitive map of the environment. Depending on the observer's position, a single spatial structure can have different connotative elements attached—for example, a bridge might be a path to use for someone standing on it, a landmark for orientation for someone far from it, or—if too low—an edge for a ship trying to pass under it. Perspective, positioning, and the "light of the purpose" profoundly influence these assignments and the generation of the cognitive map. As these factors change, cognitive maps are constantly updated and rearranged. During the exploration of a physical space "nothing is experienced by itself, but always in relation to its surroundings, the sequences of events leading up to it, the memory of past experiences" (ibid., 1). The resulting cognitive map ties spaces together in a meaningful way, assembles events in a spatial order, and positions the human in relationship to them.

Here, Alexander's "pattern language" is a good reference point. As unifying as the "quality without a name" might be, Alexander also recognizes that every culture, every subculture, and in fact every member of a culture, can and should have its own collection of "patterns." But he also argues that shared pattern systems can be identified. His collection of 253 patterns is one of these pattern systems. It consists of spatial hypotheses of which some, he claims, have qualities of archetypes. "In this sense, at least a part of the language we have presented here, is the archetypical core of all possible pattern languages, which can make people feel alive and human" (Alexander, Ishikawa, and Silverstein 1977, xvii). The patterns differ widely in size, from large regions inhabited by two to ten million people (pattern 1: Independent Regions) to "what kinds of things to pin up on the walls" (pattern 253: Things from Your Life) (ibid., 1165). One of the more archetypical patterns is that of arcades described as ambiguous spaces between the inside and the outside of a building that—through their ambiguity—make the building more "friendly" (ibid., 581). Arcades are described with a perspective to how a visitor might encounter them and in terms of "paths," "places," and "edges." For example, Alexander, Ishikawa, and Silverstein argue that "to establish this place as a territory which is also *apart* from the public world, it must be felt as an extension of the building interior and therefore covered" (ibid., 582). Kevin Lynch's principles reappear in the details of such a pattern. They materialize in detailed spatial observations.

Ching concentrates on visible architecture and provides detailed definitions of those visual properties at work in architecture that can be applied to evoke the images leading to more complex forms such as Alexander's patterns or Lynch's key elements. He defines "visual properties" as consisting of "shape/size/color/texture/position/orientation/visual inertia" (Ching 1979, 51). The resulting combinations of properties are manifold, but Ching establishes limited ordering principles, among them:

- Axis—A line established by two points in space and about which forms and spaces can be arranged.
- Symmetry—The balanced distribution of equivalent forms and spaces about a common line (axis) or point (center).
- Hierarchy—The articulation of the importance or significance of a form or space by its size, shape, or placement, relative to the other forms and spaces of the organization.
- Rhythm/Repetition—The use of recurring patterns, and their resultant rhythms, to organize a series of like forms or spaces.
- Datum—A line, plane, or volume that, by its continuity and regularity, serves to collect, gather, and organize a pattern of forms and spaces.
- Transformation—The principle that an architectural concept of organization can be retained, strengthened, and built upon through a series of discrete manipulations and transformations (ibid., 333).

These ordering principles determine the visual properties, which then can evoke Kevin Lynch's "mental images." In terms of design, a bridge, for example, consists of various visual properties arranged in a special way: arcs, beams, surfaces as shapes, pillars of a certain size arranged in a certain repetitive pattern, concrete or metal as colored textures, all occupying a given position and orientation within the surroundings. These ceilings, pillars, and pathways can add up to make an arcade "friendly."

Various examples have demonstrated that virtual space is filled with evocative narrative elements that help to transform its arbitrary origins into meaningful worlds. In the design of these game worlds, combining Ching's theories with those of Lynch and Norberg-Schulz is strikingly helpful. The visual properties of a video game space correspond with the immediately visible geometrical information in a game world and can be analyzed and designed in accordance to Ching's principles. Indeed, the modeling functions of a 3D creation program like *Maya* copy Ching's "visual properties." They can also be encountered in structures that might follow Alexander's pattern. In combination with interactive events and explorations, these structures can evoke certain readings of a space. These readings use Lynch's definition of the main structural elements and lead to a mental image of the space for the visitor—a cognitive map. Based on such an understanding of the space, the player forms a new interpretation of the virtual world. Here, Norberg-Schulz's outline can describe the possible nature of this evolving relationship to virtual space. The combined model presents a connection from the single evocative spatial element and its visual appearance to the overall context that is projected into a space.

Although this brief overview of architectural theories cannot hope to offer an in-depth evaluation of their claims, in summary, it provides a way to describe how evocative spatial features can affect a player's perception and interaction. But having prepared the architectural vocabulary for game spaces, one immediately faces another challenge: virtual space is not restricted by the same limitations as the physical space on which these architectural theories are based.

10.2 Expanding the Space

Due to their mathematical nature, game spaces can be encountered in ways that Norberg-Schulz did not foresee for physical spaces. Two new features are the *destruction* and *construction* of space, which offer an addition to Norberg-Schulz's three main activities in relation to space. The notion of destruction has a different meaning in an experiential game world due to the mathematical—instead of natural/physical—foundations of virtual worlds. Digitally created space can be "destroyed" and blown into oblivion without any significant consequences for the physical world. But unlike any other mediated space, only the interactive environments can make this destruction experiential to the player. One example points back to the bridge metaphor: the first-person shooting game *Medal of Honor: Allied Assault* (Giolito 2002) positions the player in the role of a U.S. soldier in World War II and incorporates references to historical battle sites.

Once more I pick up the controller to win a war seemingly single-handed. The first-person point of view takes me back to selected battlefields. At one point in the game I receive the mission to guard a virtual bridge and prevent enemy access. If I fail to stop the enemy characters, they will destroy the virtual bridge and my mission is a failure. Historically, the setup quotes an important tactical moment of the World War II campaign "Operation Market Garden." It shaped the progress of the Allies into Germany in the summer of 1944, when they had to cross the rivers between the Netherlands and Germany and needed connecting bridges. The battles ensuing have been the topic of films such as *A Bridge Too Far* (Attenborough 1977). The same theme of guarding a bridge also turned into a powerful metaphor for the German antiwar film *Die Brücke* (Wicki 1959). A number of visual cues and a wide range of thematic references remain in *Medal of Honor: Allied Assault*. In fact, the game's origin itself points back to Hollywood and Steven Spielberg, who is still credited as creator of the series. The *Medal of Honor* series clearly aims at a dramatic depiction of World War II with a focus on atmosphere and action. Still, few of the critical notes that defined similarly themed movies remain in the game, which concentrates more on heroism and pure action. My virtual killings of enemy soldiers to save that bridge are never questioned in the same way that similar actions are, for example, in *Die Brücke*. *Die Brücke* tells the story of some students, who are positioned as the last line of a senseless defense against the approaching superior Allied forces. It concentrates entirely on the stories of those German troops that remain faceless and nameless opponents in *Medal of Honor*.

The difference in relevance is also apparent in the use of space in the game. Unlike any physical demolition, the destruction of the game bridge is an interchangeable game state. If I fail in my guarding mission, the same scene restarts and the bridge is intact once more. The restart not only resets the event time of the game world but also the spatial setting, the event space. In a world where spatiotemporal settings are game states and basic variables of a rule-based system, the buildings fade to mere possibilities. This applies to in-game architecture as well as any other "body" that inhabits the virtual stage—including the player's character. In *Medal of Honor*, as well as in most other first-person shooter games, the player-character can be healed—reconstructed—almost at will. That certainly changes but does not necessarily erase the significance of a virtual death. One earlier mission of *Medal of Honor* is another reenactment of the D-Day landing at Omaha beach.

As character Mike Powell, I find myself on a landing boat approaching the beach with no means to escape the counterattack. It is a claustrophobic and scary situation that—like the entire sequence—borrows moments from Spielberg's own version of the D-Day attack in *Saving Private Ryan*. I reach the beach and try to use any cover I can find on my way to the cliffs, but I keep failing. Mike Powell dies again and again. Thanks to the reload function the virtual death can easily be dealt with and the game resets to the last save point. This surely is no realistic simulation as I cheat death constantly. But even with that cheat the experience of virtual deaths is overwhelming to the level of frustration. After Mike Powell has been shot by virtual snipers, killed by virtual machine guns, blown up by virtual mortars, and annihilated by virtual mines, I start to reflect upon the situation. The overall game might remain a kind of World War II theme park ride, but at that moment I get a glimpse of an antiwar message because body and space are interactive game states that I can play with. The shocking deaths of the historic attack cannot be recreated by either film or game but reinterpreted by both media to evoke some new understanding in their audiences—I find myself experiencing exactly this effect.

Computer values that give birth to the navigable space can be set to naught and the world might simply disappear, but the effect of that reset can be expressive and significant for me as the player. Through active participation in this world, the player can add to it and become a part of it—own it—even though it might all just disappear in the next minute. At times, players can revolt against such a data disappearance.

The player community of the beta-test for the online world *Uru* (Miller 2003) was told that the game would not launch into the commercial stage. But during the test, the online world had become the home for a great many social interactions and had turned into an important place for the players. Their virtual "home" was on the edge of oblivion. Players met and debated possible steps and literally emigrated from the *Uru* world into other online universes such as *There* (Harvey et al. 2003) or *Second Life*, where they recreated the locations of their *Uru* "home world" (Pearce 2007). This reaction points to another option in video game spaces—the creation of space. Instead of changing an existing virtual environment, these virtual emigrants created new spaces to inhabit based on the technologies provided by the system.

Digital space can be created and extended whenever desired and is not limited by any physical restrictions apart from the computer's hardware and software. Good examples of this are procedural game worlds that create game spaces in real-time during gameplay. Procedural game spaces have been implemented in a small number of game titles, most notably in *Rescue from Fractalus*

(Fox 1986), as well as in architectural systems (e.g., Novak 1991, 1996b; Parish and Mueller 2001; Wonka et al. 2003), and art and research projects (e.g., Furmanski 2005). Modern games often use (random) level generators as space generators for new game levels, as implemented in the *Age of Empires* series and the *Diablo* series, but also in the classic predecessor for *Diablo*: *Rogue* (Toy, Arnold, and Wichman 1980). Wichman (1997) wrote, "Most of the existing adventure-type games had 'canned' adventures—they were exactly the same every time you played, and of course the programmers had to invent all of the puzzles, and therefore would always know how to beat the game. We decided that with Rogue, the program itself should 'build the dungeon,' giving you a new adventure every time you played, and making it possible for even the creators to be surprised by the game" (ibid.).

Yet the generation of space and the interactive access of the player to this world remained unconnected. Instead, level generators create more or less random game spaces.

The other extreme is world generation by players, as seen, for example, in *Second Life*. Here, the game space expands with a growing user base and gets more detailed the more this user base adds its own content to the virtual playground. In these cases, the world creation happens independently from the existing game universe, as seen in *Second Life*, or independently from the player, as in *Rescue from Fractalus*. Game space and agency of the player in relation to its generation are not balanced.

To change this, we started a research project, called *Charbitat—Game Characters and Procedural Spaces*, at Georgia Tech and incorporated this feature in our basic design principle (e.g., Nitsche et al. 2006). Unlike other games, *Charbitat* generates game spaces based on the player's attributes and actions and not on predefined or random data. In the single-player prototype of *Charbitat*, the player controls a little girl on a quest through a vast—in fact endless—game world. As in other 3D adventure and exploration games, the hero is attacked by enemies, has to master the environment, and find certain key elements to overcome thresholds and to proceed. But in *Charbitat*, the way a player chooses to play (which enemies to kill, what path to chose) affects the gradual generation of the underlying game world.

The world of *Charbitat* is split up into tiles—each one about five hundred virtual meters across. Beyond the existing tiles is a sea of clouded emptiness. Whenever the hero reaches the borderline into this void and steps forward, a new tile is generated at that location. The player is creating the world as she plays through it. The result is an ever-expanding game space. This world is codefined by the player's behavior. Depending on the actions of the player, certain values attached to the hero change, and these values are then mapped

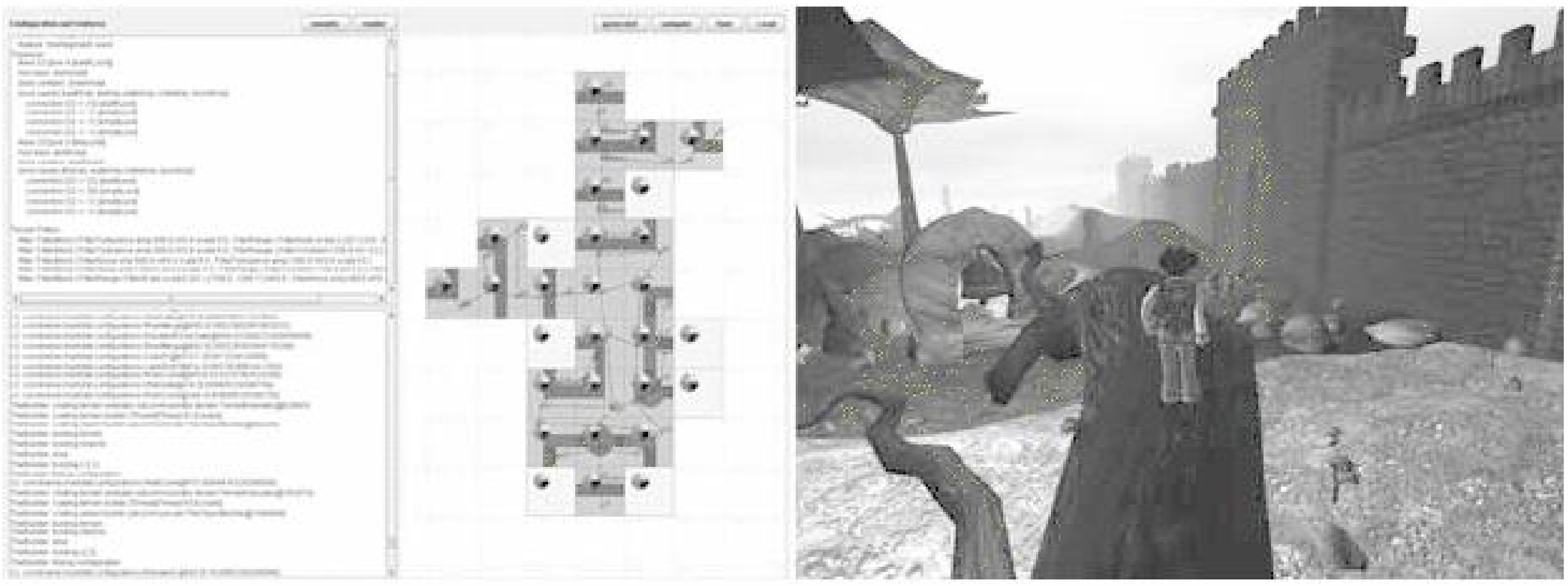

Figure 10.1 *Charbitat*: example of height-map generation and assembly into a tile-world in the underlying Java code (left) and actual screenshot of the 3D world (right)

onto the expanding game world. The in-game world is created for and in reference to the player while he or she is playing in it. Technically, *Charbitat* is a modification of the *Unreal* engine used for 3D world presentation and interaction, but whenever a new tile is needed, a parallel running Java application (coded by Calvin Ashmore) receives the variables from the game hero, generates a height map in dependency to these player attributes and the surrounding tiles, assembles the tiles in a grid-like map, and sends the information back to the *Unreal* engine, where the actual 3D world is processed.

The result is an ever-expanding game universe—a feature unavailable in physical space and outside Norberg-Schulz's definition. The challenges that such a space poses are manifold. Apart from a whole range of gameplay issues, we faced questions such as: How can we find our way in an infinite space? How can we structure context between regions in this world? While the virtual bridge of *Medal of Honor: Allied Assault* is in danger of becoming an arbitrary variable, the same rings true for infinite game spaces like that in *Charbitat*. What started as an experimental game dealing with new forms of 3D space generation had to become a project about the generation of context to avoid meaningless worlds. In the case of *Charbitat*, the content was arranged in procedurally generated key-lock puzzles that form basic quests used to block off some section of the world and send the player searching for the key to overcome these thresholds (Ashmore 2006; Ashmore and Nitsche 2007). The positioning of thresholds and keys to overcome them evolved into a conditional network of structural elements for the player's exploration of the game world. Enemies populate the virtual stage and dramatize the progress further and procedural camera work is applied to the spatial exploration.

Projects like *Charbitat* still refer to cultural spheres—in our case to references to Asian art and philosophy—but the space generation is player-driven instead of designer-dependent. Beyond making a space more *precise*, *complementing* it, and realizing it as a *symbol* and cultural object, players have become masters of experiential space itself as *destruction* and *creation* have become forms of interaction on virtual space. Whether it is the virtual bridge in *Medal of Honor* or the infinite game worlds of *Charbitat*, these titles still contextualize their spaces, filling them with evocative narrative elements and assisting forms of presentation to support a meaningful fictional plane on the player's side.

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11

Examples of Spatial Structures in Game Spaces

Even if players gain access to the space-generation process, some structure has to be provided either from the player or the system. A number of significant spatial structures will be discussed in this chapter to specify what practical shape the architectural references take in the world of video game spaces. These structures arrange the spatial units in their own way: paths, edges, and regions, as well as the use of textures, vistas, and colors, define their appearance and functionality. Based on the connection between the spatial logic of architecture and its implementation in game worlds, this chapter closes with an abstracted model for space-driven functionality. In many ways, this model is a large-scale version of the argument for evocative narrative elements in game spaces, one that projects them into larger terrains and levels.

"Playground" and "sandbox" are often used as metaphors for virtual spaces. Both are useful to describe certain capabilities of video game spaces, and both emphasize the placeness of game worlds. Yet these metaphors do not primarily describe a spatial structure. The massively multiplayer online world of *Second Life*, for example, provides tools for its users to create their own structure on patches of virtual property. The world functions like a giant sandbox that allows its inhabitants to form structures out of its rule system and already existent objects. Similarly, a given environment such as Liberty City in *Grand Theft Auto III* is seen as a playground because its open architecture allows for relatively free play. The differences between the two highlight the problems of the metaphors: they do not refer to the structures (initially open virtual flat terrain in *Second Life* versus a virtual city in *Grand Theft Auto III*) but focus on their use, which is very different in both cases.

Another problematic spatial metaphor often used is the concept of a game space as a garden. The garden itself has grown into a metaphor, most famously perhaps in the "Garden of Eden," and the word has long spread beyond a simple description of a somehow landscaped piece of land. "Gardens are rhetorical landscapes" (Mitchell, Moore, and Turnbull 1988, 49) whose spatial arrangements suggest a quality that is absent in truly natural landscapes. This quality can differ widely. A garden of herbs serves a different purpose than a botanical garden, or a sacred garden, or a representative garden, or a narrative garden. These differences are implemented through different spatial designs. On the one hand, the garden "is a place that embodies the spirit of humanity in its association with nature" (Stein 1990, 40). On the other, one might see a form of garden in the temporal arrangement of cars on a parking lot, where almost every aspect is controlled by human construction (Groth 1990). A garden can be the smallest possible unit, for example a balcony, or a national park. In this way, a garden becomes a perceived quality itself. One person's dump might be another person's garden.

As a result it is exceedingly difficult to determine a single spatial definition of the garden. There are a great number of guidelines for the construction of gardens, from the Sakuteiki written in the eleventh century to the monthly publication of *Home & Garden* today. Neither describes a single spatial structure. Instead, gardens offer a conceptual filter through which one might experience space differently. They are individualistic pieces of art. The resulting spaces are often described as prime examples of "places," which is a quality that will be discussed in more detail in chapter 12. The garden and sandbox metaphors might not be very precise, but they are far from empty. Two elements of gardens are the completeness of their microcosms within given boundaries—which parallels the restrictions of a game world; and the gradual revelation of their specific quality through exploration—which resembles the exploration of a game level (Gingold 2003; L. N. Taylor 2006b). Gardens become the door into the introduction of architectural structure and debate about the analysis of game space. Another door would be urban planning, for example. Both suggest specific uses of space and point to the value of spatial structuring, but they do not suggest any precise spatial format.

11.1 Tracks and Rails

One distinguished spatial form in video games is the track. In its purest form it is realized as a single axis. Although digital media allow instant teleportation, this axis and the movement along it remain important enough for Benedikt to ask for a "principle of transit" for cyberspace: "This principle states that *travel between two points in cyberspace should occur phenomenally through all intervening points, no matter how fast (save with infinite speed), and should incur costs to the traveler proportional to some measure of the distance*" (1991, 168; italics in original).

The connection of points through movement in virtual space is elevated to a principle structure of cyberspace itself. In practice, this axis is transformed, twisted, and bent to structure movement along it. Racing games such as the *Gran Turismo* series incorporate visible racetracks and reconstructions of existing racecourses. The virtual levels mirror the real world's spatial limitations and the driving experience. They might simulate weather conditions, individual tire behavior, or road conditions, but they always lack other important elements of "real-world" racetrack design such as the safety of the spectators or the context of the site, environmental suitability, or corrosion of the track over time. They cannot aim for an architectural simulation but for a movement simulation and the overall game space's visceral impact. They reproduce the racing experience—the fast-paced, goal-oriented, and usually competitive striving to get ahead. Consequently, dominant features of the track focus on this visceral experience of racing space. The most basic racetracks feature straight lines with clear start and finish lines. Early Olympic races, for example, used stone markers to mark the starting point and end of a straight racetrack. The track itself excludes any visual diversions, obstacles, or intersections. Even competitors are confined to their own subsection of the track to exclude any interference. The structure aims to direct and confine movement and demands that the runner optimizes velocity and velocity only. "The racing track became the icon of modern functionalism, materializing the modern belief in the 'natural' hegemony of the straight line and the right angle. If this credo can be called the modern religion, then racing is its ritual" (Eichberg 2004, 3). The racetrack itself is a cultural place, much as the ancient Olympic games were a ritual that was tied to religious and spatial rites.

Oval tracks allow for a continuous race but keep the basic restrictions. Runners are only allowed to race on the designated path. Shortcuts or reversing direction at will are forbidden. The same applies to a pure video game racetrack: players have to minimize the time by optimizing mastery of track and interaction with the vehicle in *Gran Turismo 4* (Yamauchi 2004) or *Grand Prix Legends* (Cassidy et al. 1998) to win a race—not unlike a real racing driver. Players hardly notice the amazing backdrops of a track or the high-detail textures of the road in the latest *Gran Turismo* installment. They always strive forward to a destination beyond the current position.

The precision of any physical simulation in a game world is optional. The racing cars of *Grand Prix Legends* might attempt the accurate reproduction of

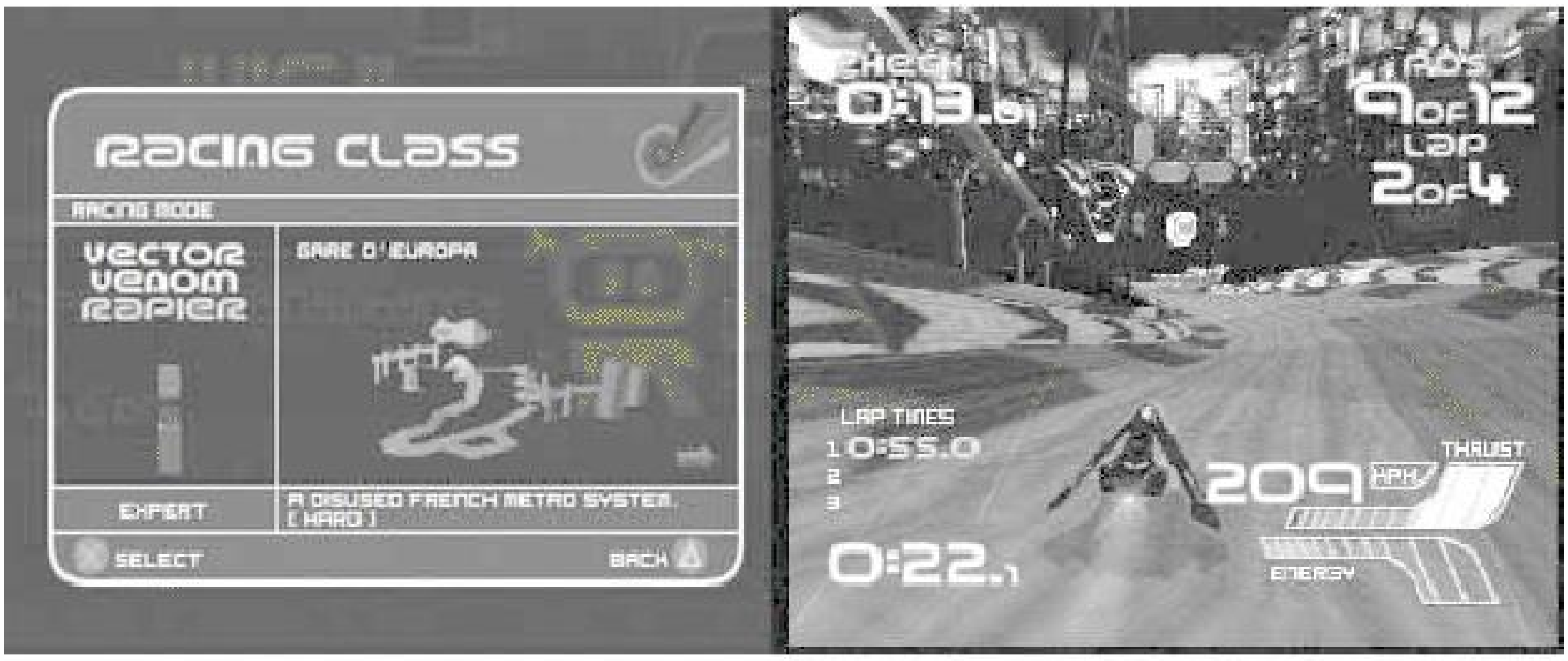

Figure 11.1 *Wipeout XL* (Burcombe 1996): the Gare D'Europe racetrack (left); *Wipeout XL* in-game view (right)

the historic engines but the hovering spaceship racers of the *Wipeout* or *F-Zero* series replace the Formula 1 physics with far less realistic models. Where they lack the necessary physical involvement that provided the tension in the realistic track design, they add a range of other features to the track to increase dramatic engagement. These include a flurry of bright colors to increase the perception of speed, twisted tracks not unlike those of a rollercoaster, exaggerated sound design, and far jumps to emphasize speed.

This results in different layouts for the necessary racetracks. While real Formula 1 tracks have to consider the limitations of the cars and conditions for the site, the new racing vehicles allow for new spatial layouts. Because the racing ships in *Wipeout* allow spectacular jumps, gaps appear; their ability for sudden turns allows an increase in sharp curves; looping and extreme deformations of the track became available; the absence of audiences led to floating tracks through futuristic environments. Despite all those changes, the basic premise of the race is kept intact: that of competitive spatial advance along a strictly predefined track. In many ways the unrealistic racing games are more elaborate in their spatial adaptation of the race experience than their "realistic" counterparts. The games might not be able to realize the factual physical racing components, but their tracks are designed to balance this through an emphasis on a spectacular restaging of the racing experience. These racing games remediate the racetrack into the virtual. Their track layouts emphasize moves such as drifting, jumping, and sliding, to capture, intensify, and lengthen key racing moments.

But games have adopted the metaphor of the track also in other form. So-called rail-shooters move or guide the player along invisible tracks that allow little divergence from a given path. The world might appear to be accessible but can be navigated only in the confines of a very limited set track. Because this track's layout might not be clear initially to the player, this kind of approach includes an element of discovery. It is a guided journey along which the individual points are important. As a result, the game space changes completely. Instead of the highly functional and obviously restricting racetrack, the invisible rail often uses a range of methods to engage the player with the track itself. These structures keep the rail interesting and engaging instead of pointing only to the goal. In one obvious racetrack design, the position of other competitors during a race is immediately visible. No obstacles are in place and no divergence from the given path is allowed. Invisible rails add excitement to the game experience by breaking these rules and guiding the player along some form of interactive theme-park attraction. Variations might occur, but the spatial design for the de facto exploration remains limited. Any player of the early *Medal of Honor* titles is taken on a ride along prescripted events and battles that demand not sheer speed but a range of different interactions. Speed might be part of the equation and time limits might apply, but time is not the single most important value. The game world is not optimized for velocity alone but for a variety of interactions. The track turns into something like an adventure obstacle course.

What emerges, in the case of *Medal of Honor*, is a new primary objective: exploration and survival in an often highly dramatized environment. Visibility can change constantly through the use of dynamic presentation and the functionality, and conditions of the game space change constantly too as objects appear and pathways change. Developers restrict players' progress to a given path (or limited paths) to manage the complexity of these encounters and arrange them as dramatically as possible. But the restrictions are not simply production-driven, unwanted necessitites but can be used as valuable structural directives. In my battles through *Medal of Honor*'s World War II scenario I find my way blocked by minefields, ripped open by explosions, and hidden in a fog of war. These limitations can provide valuable structure for a player's experience. Krzywinska has pointed out that "through the juxtaposition of being in and out of control, horror-based videogames facilitate the visceral and oscillating pleasures/unpleasures of anxiety and expectation" (2002, 217). She expands the question of control to horror-specific conditions but the same basic juxtaposition is at work in *Medal of Honor*. Being tied to the path of fate through the game world might restrict the player's impact on the world as such, but it is a valuable part of shaping the player's involvement.

Galyean suggested an abstract concept of a possible spatial structure for narrative in virtual spaces. He distinguishes between a "plot level," "presentation level," and "viewer level" in his design approach. The plot level contains the "high level goals, intentions, and events of the story" and is detached from the rest of the environment (1995, 31). He suggests a "river analogy" to shape the events effectively on the plot level: "Instead of linking a sequence or branches and nodes, I suggest that paths through a narrative be more like a river flowing through a landscape. The audience is a boat floating down this river with some latitude and control, while also being pushed and pulled by the predefined flow of the water. . . . This constrains the user to stay within the banks of the river while giving him/her the ability for continuous interaction" (ibid., 58–59).

Although the river is introduced as an analogy and not necessarily as a direct spatial structure, it implies spatial structuring of the exploration along a limited number of given path(s). One does not know where the journey might end and how to master the surprises behind the next bend of the river because the structure and the ingredients of the space might change at any given moment.

The restrictions of tracks and rails might affect the range of available choices and restrict interactive access to a shadow of its potential, but if the restriction is a meaningful part of the desired experience, then these spatial forms offer valid structural means to the game world. Whether they show their structure through enhanced visual cues, as in the *Wipeout* series, or hide them with even more visual distractions, as in the *Medal of Honor* series, tracks implement a guiding force in the game world. The interaction with this structure can vary from sheer speed to gradual exploration, but the spatial construct allows for a dramatic shaping of this interaction. This is the difference between the jumps in *Wipeout* and the unexpected yet prescripted events in *Medal of Honor*. Tracks thus can locate the spatiotemporal conditions for any such appearance very precisely as they restrict exploration beyond the given boundaries. They map a dramatic structure onto lines.

11.2 Labyrinths and Mazes

The growing complexity of track arrangements leads into the discussion of another important spatial form in digital media: the labyrinth. Labyrinths play with the notion of hierarchy as they lack outstanding visual cues that can support orientation and instead often feature repetitive rhythms of recurring patterns. At the same time, and unlike the hidden rails of *Medal of Honor*, the labyrinth usually puts its restriction on display. Exceptions are mirror-and-glass mazes where even the walls have to be found. Architectural theorist Kevin Lynch agrees that exploration of the unknown—as seen in the hidden rails and the labyrinth's paths—can provide joy: "This is so, however, only under two conditions. First, there must be no danger of losing basic form or orientation, of never coming out. The surprise must occur in an over-all framework; the confusions must be small regions in a visible whole. Furthermore, the labyrinth or mystery must in itself have some form that can be explored and in time be apprehended. Complete chaos without hint of connection is never pleasurable" (1960, 5–6).

As with the design of tracks, the spatial arrangement of the labyrinth needs structure to be pleasurable. Eco argued that there are three types of labyrinths, to which this chapter adds a fourth type:

- The *linear* or *unicursal* labyrinth that consists of one single path.
- The maze that offers branching and *multicursal* forms.
- The *net* or *rhizome* in which each point can be connected to any other point (Eco 1984).
- The *logic maze*, a conditional maze that depends on changing access conditions that shape the available space.

As will be explained in the following paragraphs, the three first forms coexist in video game spaces and apply spatial structure to position narrative elements within them. This effect will be illustrated in a discussion of the video game *Zanzarah: The Hidden Portal* (Nitsche 2002). I was involved in the title's production and had full access to the design documents. This allows a complete look at the construction of the game's space beyond the player's experience and into the factual maps and level design decisions (Nitsche 2007b).

The dramatic setting of *Zanzarah: The Hidden Portal* mirrors many other fantasy settings for video games, movies, and novels. I control a teenage girl, Amy, who has been called from her "real" home in London to save a magical

Figure 11.2 Unicursal: Chartres cathedral, twelfth- to thirteenth-century labyrinth (left); multicursal: Hampton Court maze, planted 1702 (right)

parallel world: Zanzarah. While exploring the game universe, I realize that the overall game world is divided into three main sections: (1) the London "reality"; (2) the magic quest world of Zanzarah; and (3) the separate world of the virtual fairies, which can be accessed via the quest world. Throughout the overall quest I find hints that flesh out an underlying backstory. It seems that these three worlds were once united but got separated. Their discontinuity is the source of all evil. The main objective for Amy and me is to reunite the separated worlds through her unique ability to access all of them and fight evil on every level.

Zanzarah's main game world, which hosts the central quest, is an example of a multicursal maze where players can explore the world freely but may become lost. These levels include forests, gardens, or cave structures that provide ample opportunity to lose one's way. In these levels, the player meets various evocative narrative elements such as characters, thresholds, and useful objects. Their arrangement within the maze provides a certain structure for the player's exploration and sets new directions. The game often sends players on extended searches and they have to retrace their steps and return to former locations, crisscrossing paths already taken as they progress.

In order to progress through the game, I have to fulfill certain tasks that unlock more options within a growing network of accessible locations. In many ways, this arrangement of narrative elements presents a unicursal path overlaid onto the maze. Their conditional combination is the main quest the designer has envisioned for an "implied player." Although not strictly linear—there are parallel options/tracks available and manifold distractions—this projected quest winds through the world with many elements of a unicursal path. A simple walk-through would document this path's various twists and turns and force it into a linear description. In practice, players have to

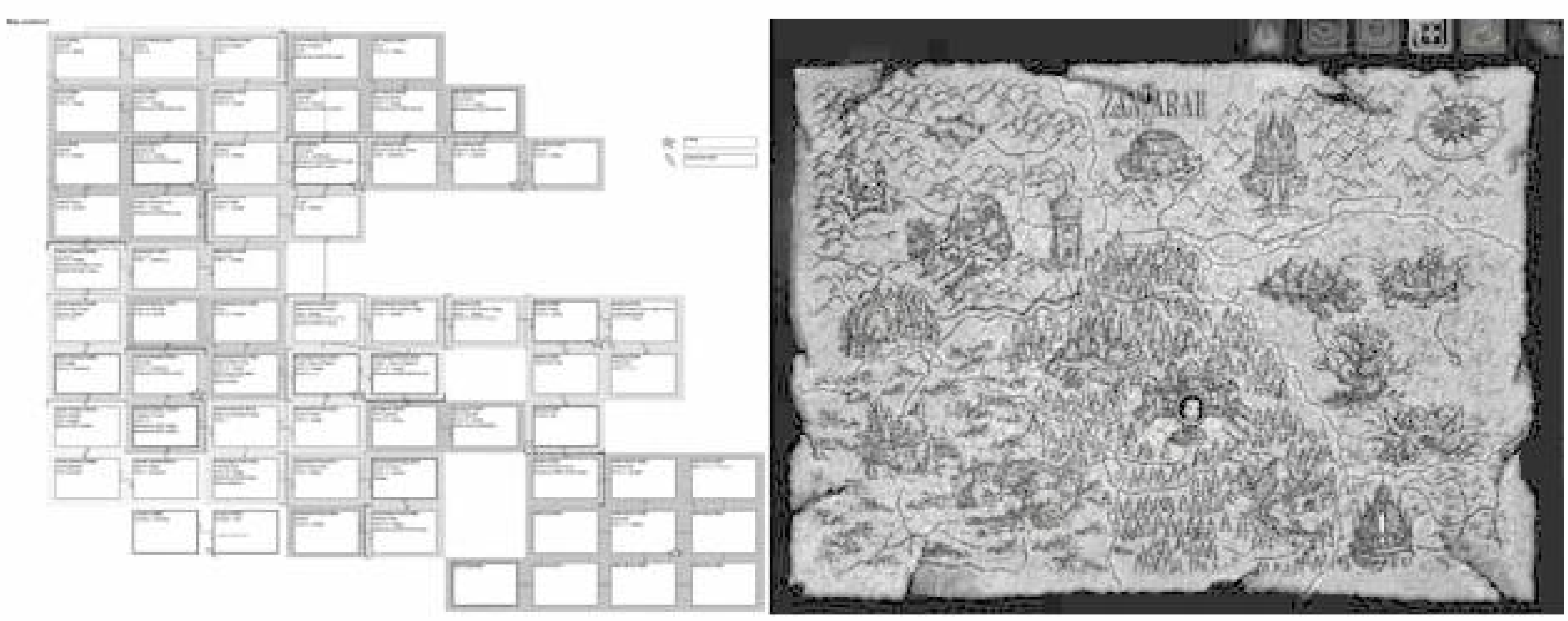

Figure 11.3 *Zanzarah* design document: excerpt of the rule-defined game space (left); in-game map (right)

constantly negotiate whether to strictly follow this solution or divert from the main quest and explore more options. Occasionally, it is even necessary to leave the main path. Amy's fighting powers depend on the development of all the fairies she collects during her travels through Zanzarah. These fairies start off as weak low-level characters but can be developed and improved through continued training and fighting. Certain faerie conditions can be the key to overcoming a specific obstacle or hostile enemy character; thus I have to increase my faerie arsenal. The best way to do that is to roam through the game world sections that have been unlocked so far and find new challenges and fights to train my fairies. I have to divert from the main quest to reach a certain condition in order to proceed.

At other occasions, players might be confused about what the central quest is and diverge into different adventures. The preimplanted quest might be seen as Ariadne's thread laid out by the designer through the game world and picked up by the player—or left aside.

Information and evocative elements are spread in a certain pattern that helps to shape the gaming experience. Using maze-like structures was a logical consequence of the gameplay implementation. *Zanzarah* certainly did not follow a fundamental pattern or academic framework but was implemented with a "gut feeling" for what seemed right and feasible.

As discussed earlier, the monomyth is one possible guideline for such a shape. *Zanzarah*, like many other titles, includes key elements of this unicursal pattern. The separation between the "real" London and the "fantastic" world of magic simulates the passing into the world of the adventure, the design document mainly assembles thresholds that have to be overcome with the help of either certain abilities or items, many non-player characters have specific pieces of information to help the player locate the preplanned quest, and the ultimate reward in *Zanzarah* is the reconnection of the separated worlds—a healing of the initial wound. To clarify: these are the preplanned evocative elements and not the game's "story." Any player's personal experience and narrative comprehension of the game world differs from this path and is generated only through individual play. However, the reference to monomythical motifs in the layout of the pre-envisioned quest illustrates how designers can map one on the other.

Finally, *Zanzarah* also offers a reference to the concept of the net in the quest world's connection with the numerous battles that happen along the way. Every battle is staged within closed environments that are part of the third section in the game: the fairy realm. Players access these spatially distinct pockets via teleportation and have to face enemy characters in a first-person shooter setting.

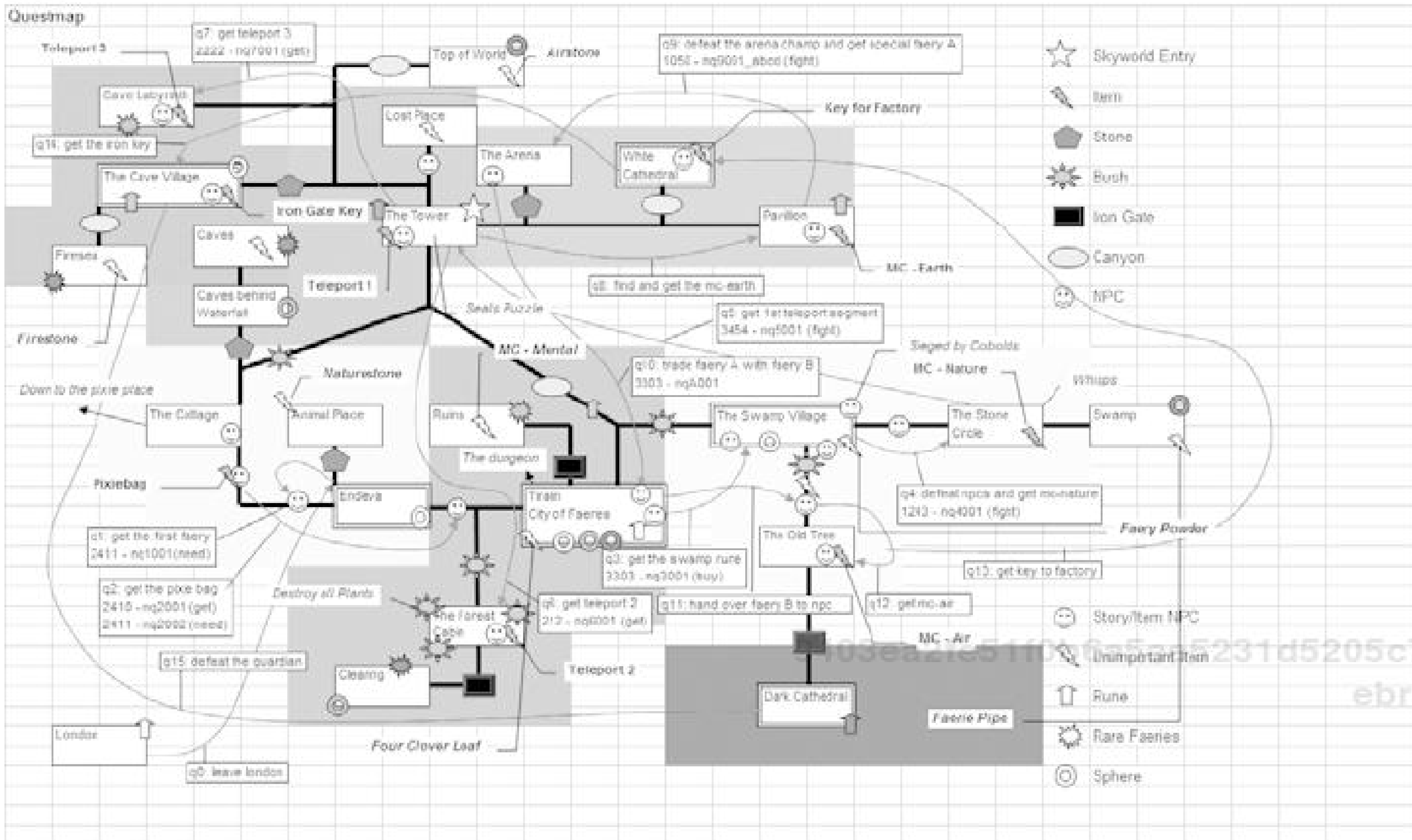

Figure 11.4 *Zanzarah* (design document excerpt) illustrating quests within the game world: curved lines indicate origin of a quest and the area that allows for its completion; icons represent specific entities such as characters, treasures, and blocking threshold guardians

I steer Amy past an unsuspicious rock formation in the Northern icy lands of Zanzarah, when a tiny aggressive faerie jumps right out of the solid virtual rock and challenges me. If I accept the challenge the camera follows the fairy as she returns back into the virtual rock. The control scheme changes from the exploring Amy to the fighting fairies, and I find myself in a different subworld that seems to be somehow interwoven with the main quest world. Depending on the outcome of the fight, I am teleported back into the quest world or the "real" world of the London home.

Teleportation and the almost arbitrary encounter of the battle arenas in the quest world carry the notion of the net, where any point of the world can be connected to any other location. Notably, all three labyrinthine forms exist in parallel and players have to travel through all of them in order to play *Zanzarah* to its full extent. This parallel use of the various forms answers to Aarseth's call for a reformulation of the labyrinth in digital interactive media (1997, 5–9). Aarseth refers to Doob (1990) when he suggests that parallel use of different labyrinthine forms points back to older medieval interpretations of the concept of the labyrinth. Any player of *Zanzarah* encounters a similar spatial understanding through the sheer multiplicity of the maze formats. How *Zanzarah*'s game space interconnects paths, connections, and single locations points to the concept of "striated" and "smooth" spaces.

Deleuze and Guattari established a distinction into striated and smooth space illustrated by the different tokens of two board games: "The 'smooth' space of Go, as against the 'striated' space of chess. . . . The difference is that chess codes and decodes space, whereas Go proceeds altogether differently, territorializing or deterritorializing it" (Deleuze and Guattari 1987, 353). An important difference is their understanding of lines and points: "The smooth and the striated are distinguished first of all by an inverse relation between the point and the line (in the case of the striated, the line is between two points, while in the smooth, the point is between two lines)" (ibid., 480). The principles of smooth and striated are applied to a wide variety of fields, including presentation ("Smooth is both the object of a close vision par excellence and the element of a haptic space. . . . Striated, on the contrary, relates to a more distant vision, and a more optical space" [ibid., 493]), music, and navigation (ibid., 477). They grow from and feed into a wider discussion of social phenomena.

Borrowing the initial distinction, one can observe that a game world like *Zanzarah*'s combines both types. It demands a player to constantly switch from one spatial approach to another. This flexibility is fully expected by Deleuze and Guattari, who envisioned both spatial concepts in constant transition into each other. It has also been traced in other games like *Civilization* (L. N. Taylor 2006a), and Ryan comes to a comparable conclusion for hypertext (2001b, 262). Again, the constant renegotiation of the player's position is key and the multilayered quality of the game space opens it up for dynamic engagement.

Supporting this openness, each world in *Zanzarah* can itself become a narrative element, a distinct part of the player's experience. All three worlds offer not only different interactive features but are also presented in different ways. The "real" London home is a form of player inventory where important elements are stored and have to be picked up to continue the game. It is presented in sepia colors and the camera is a typical following camera that also affects the directional movement of the avatar. The "quest" world uses the same camera but offers the main narrative elements in the form of characters, puzzles, thresholds, and collectible items. It is presented in full color. Finally, the "battle" sections switch the player to a first-person point of view and lack any quest elements. They concentrate entirely on the fighting action. These battle locations in *Zanzarah* differ significantly from the labyrinthine structures and take more the form of arenas.

The quality of any labyrinth or maze is also dependent on the form of its presentation. In classical architectural labyrinths and mazes Ching's visual properties ("shape/size/color/texture/position/orientation/visual inertia" [1979, 51]) exist, often in monotonous repetition without significant differentiation, and spatial cues are minimized (as in mirror or glass mazes). This is what complicates the reading of the space and makes navigation in a labyrinth so difficult.

Because game spaces depend on the camera, the legibility of any maze, thus, also depends on the camera work. The hallways of *DOOM* are reduced to 2D labyrinths presented in a 3D first-person point of view from within the maze. Once the camera delivers an all-revealing overhead view of the structure (see, e.g., in *Pac-Man*), the function of the structure changes. Switching the camera from the first-person point of view to the overhead navigable map view in *DOOM* (as outlined in chapter 7) also changes the space from a clearly forward-directed trajectory through the corridors to an all-including regional overview. Smooth and striated meet again in this constant double-exploration of the game world.

The *Pac-Man* maze is experienced in its whole condition at once, which mirrors the representation in arenas that often have wide-open vistas that try to simplify the spatial perception. In the arena the task is to solve a set problem, such as a fight, a dance, or some other form of skillful performance. The presentation of the skill dominates over a less predictable exploration of space. A labyrinth, shown in an overhead view, mimics this focus on skills and reduction of spatial exploration because every path is revealed, no surprises lurk behind dark corners. The task in a labyrinth, shown in an overhead view, is comparable because every path is revealed. Players cannot get lost; instead the game space becomes a puzzle to solve with all pieces visible and all paths laid out. The challenge is the best possible performance in a fully presented space.

Logic or multistate mazes address this challenge and complicate it through logical puzzles. One does not solve the task simply by navigating or dealing with some objectives encountered in the space, but through careful analysis of the implemented conditions between spaces as such (Pegg 2003). The labyrinth/game space is completely revealed but is a complex puzzle in itself that needs to be processed. Consequently, the various forms that these puzzles can take have been used for learning (Madden and Howley 2003), and embedded in their logical systems one can find computational problem-solving strategies (Hearn 2006).

Roger Abbott, a pioneer of the logic maze, created multistate walk-through mazes as navigable attractions. Notably, one of his references for the logic maze is the "Colossal Cave" game space of the original *Adventure* with its conditional linking and the option for changing conditions (for discussions of *Adventure*, see, e.g., Nelson 1995 or Jerz 2007). Indeed, the conditions of the mazes remind one of hypertextual node structures, as seen, for example, in Abbott's *Bureaucratic Maze* (2003). The maze is built around five physical desks located in an open room—like spatial nodes on a free playing field. Each desk has an own label.

When you enter the maze you are given a form that says, "Take this to the desk labeled *Human Resources.*" You look for the desk with the nameplate *Human Resources*, you hand in your form to the bureaucrat at that desk, and he gives you another form. This one says, "Take this form to *Information Management* or *Marketing.*" Hmm, there is now a choice. Let's say you decide to go to Information Management. You hand in your form and receive one that says, "Take this form to *Employee Benefits* or *Marketing.*" You decide on Employee Benefits where you receive a form saying, "Take this form to *Corporate Compliance* or *Human Resources.*" (Abbott 2005)

Labyrinths emerge not only as structures that form one typical form of game levels, but also as results of the exploration of virtual space. The virtual journeys of players criss-crossing the available space can be interpreted as the creation process of a labyrinth of experienced locations. Their movements form a spatial practice, and this practice leads to a labyrinthine space. To keep this structure as dynamic as Abbott suggests, these game worlds need to be highly procedural. The procedural world generation in *Charbitat*, for example, might be able to provide the necessary complexity and dynamic world. The narrative model of the quest emerges again from the conditions that structure the movement that are spatially restricted and thereby shape the player's experience. As such, labyrinths remain compact, evocative narrative environments.

11.3 Arenas

Arenas are mostly open structures with one dominating demarcation line: the surrounding enclosement, which is essentially a datum in Ching's definition. In contrast to the labyrinth, they feature few visual clues that draw attention to the place as such. Instead, they provide the canvas for a performance. Whether it is a football pitch, a boxing ring, or the coliseum, arenas provide relatively free movement in a contained space with high visibility, while labyrinths restrain movement to a complex space that complicates comprehension. As a result, the arena's spatial arrangement often supports events such as battles, dances, or speeches that demand skillful operation of the avatar, often in collaboration or competition with others. Stone, for example, highlights arenas' value when she refers to video games as "*arenas for social experience*" (1998, 15; italics in original). In contrast, the space of the labyrinth can itself become the very opponent to overcome, and individual mastery of the maze can dominate any social engagement.

We cannot simplify the labyrinth as solely a challenge to the individual and the arena as strictly a place for social activity. Too many cooperation modes in games from *Gauntlet* (Porter 1985) to *Dungeon Siege* (C. Taylor 2002) engage players in co-op play in the exploration and conquest of mazes and labyrinths. But arenas display their own spatial intricacies.

In *Zanzarah* arenas are used to stage the fighting sequences. They are separate locations outside the quest world with a different interaction design. Multiplayer functionality is reduced to these arenas, and players meet in only these secluded environments to prove their mastery in ongoing battles.

Arenas' spatial conditions differ wildly from labyrinths or tracks. Labyrinths offer few orientating reference points in a repetitive and disorientating structure; pure racetracks offer little else but these orientation points that mark start and end position, invisible rails hide their own shape behind numerous of those markers along the way. However, a virtual arena is often less exploratory and more of a contained location. Arenas in games either reduce their functionality to a sheer backdrop (as seen, for example in the arenas of many classic fighting games such as *Tekken* or *Virtua Fighter*), or they include objects in their design that follow specific rules to address spatial balance. A game such as *Quake III: Arena* can become frustrating if one player or one team gains an unfair advantage through spatial design. Instead, no player is allowed to get a lead over another through the game world alone. All players in a *Quake III: Arena* match have to be able to reach the supporting items in time and use them. Height condition, visibility patterns, distances to objects—every element of spatial design is balanced.

The result can be a kind of mirrored game world where both sides start at opposing, yet equally designed ends of a map to guarantee a fair setup. *Quake III*'s map *The Longest Yard* is a "capture the flag" environment in which two opposing teams of players try to reach the base of the other team, steal their flag, and bring it to their own base. Collaboration and individual skills during the attack are the keys to success, as neither side has any advantage over the other in the architecture of the game world. *The Longest Yard* map even features equal lighting conditions to balance visibility. Both sides have main lights at their bases; no player can hide in a specific shadow spot or sneak through hidden passages. At the same time, the level consists of numerous jumping pads and small platforms floating in open space. Any navigation error is immediately punished with certain virtual death, and mastery of space is a

Figure 11.5 *Zanzarah*: a spatially restricted battle arena (left); the open spaces of the quest world (right)

necessity. This game world is a classic arena combined with spatial challenges that are meticulously balanced.

But balancing a map does not depend on such mirrored spatial conditions. The most acknowledged, most played maps of the *Half-Life* modification *Counter-Strike* are not symmetrical. These structurally unequal maps can be balanced through different objects and objectives within the map. How to balance level design has been the point of many debates not only between players but also creators (Tagliaferri 1996) and analysts (Bartle 2004; Byrne 2005). The balance of these complex arenas is ultimately a work of art that emerges from the game design process. The different forms of balancing can be illustrated with basic differences in spatial design in *Quake III*'s "capture the flag" mode and *Counter-Strike*.

Both games pose two teams in opposition to each other, navigating the game world to reach certain locations and fulfill certain tasks there. *The Longest Yard* sets them up as opposing teams with exactly the same task for both sides. In contrast, *Counter-Strike* divides the teams into one of counter-terrorists and one of terrorists with different objectives to achieve against each other. Where counter-terrorists have to infiltrate the hijackers' hideout, free the virtual hostages, and lead them to safety, terrorists have to hold their position and keep their hostages captive; where terrorist have to attack, plant a bomb in a designated area, and prevent counter-terrorists from defusing it, counter-terrorists have to prevent this undertaking; where counter-terrorists have to guide a single virtual VIP to a safe spot, terrorists constantly ambush their attempts. *Counter-Strike* teams have opposing goals but not diametrically so. The level structures incorporate these differences. Consequently, they do not offer any mirrored stages but balance the spatial interaction asymmetrically. Access, visibility, and navigability are variable throughout the environ-

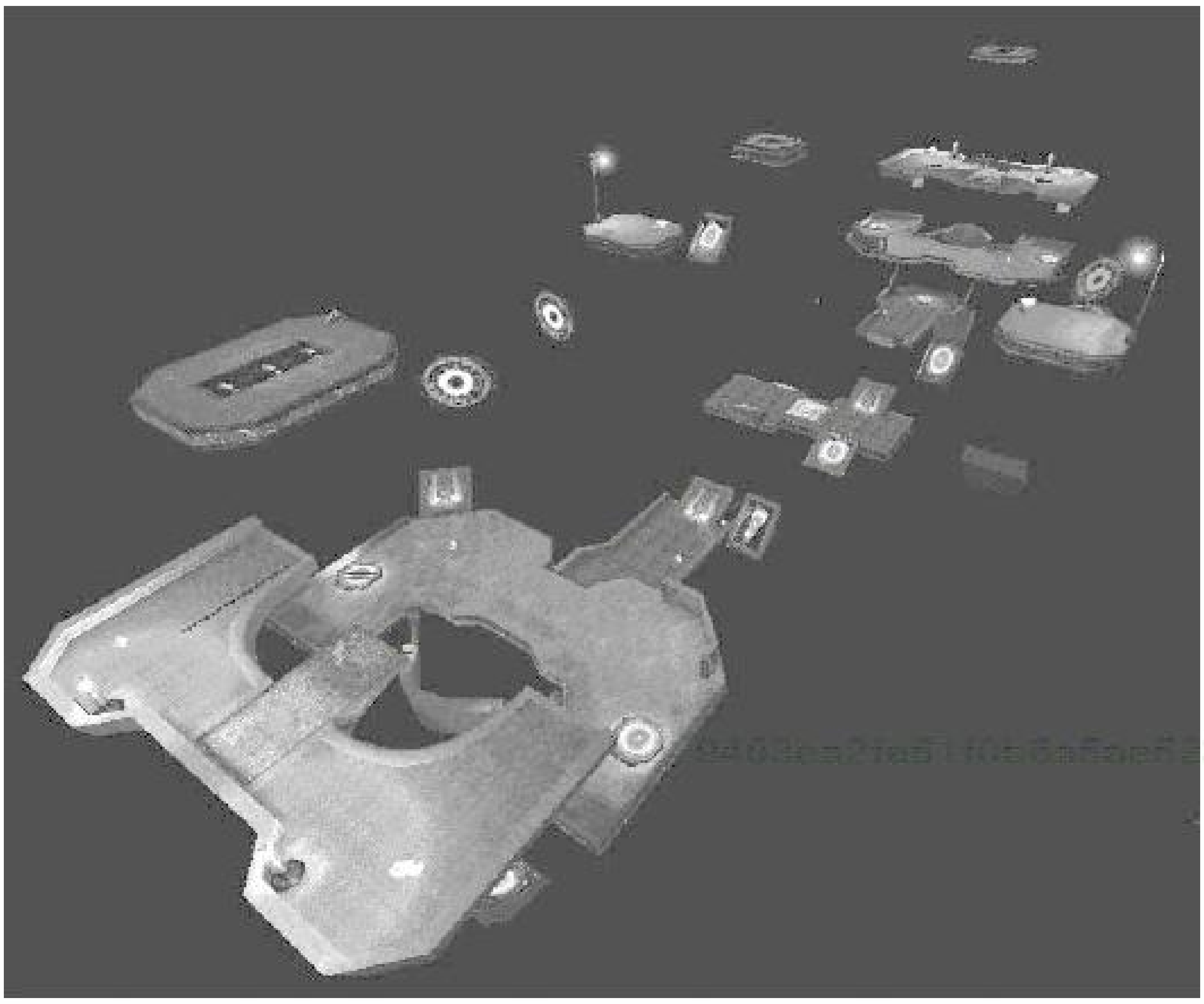

Figure 11.6 *Quake III: Arena* in the *The Longest Yard* map; mirrored spatial structures for opposing teams

ment and far from symmetrical. For example, terrorists hold hostages usually in virtual interiors and the counter-terrorist coming to the rescue often has to pass some open territory to get there, often exposed to virtual snipers. Alternative routes might be single-path structures that can become central choke points of condensed action.

The *cs_militia* map of *Counter-Strike* was created by Andrew Aumann and uses a hostage-rescue setting. It clearly can be dissected into tracks, open arena-like spaces, and even small maze-like interiors that illustrate the dynamics of such an asymmetrical map. In contrast, players of *Quake III: Arena*'s *The Longest Yard* always start with the same predisposition, the same opposing goal, and the same spatial configuration. Tactics in *The Longest Yard* still depend on spatial design. For example, the level features special sniping platforms, but this design is equal on both ends of the map, and action differs because of varying spatial behavior not because of asymmetric level architecture.

The Longest Yard might be a clearer arena structure than *cs_militia*, but experienced players of both maps know the spaces in great detail. Because these maps are played again and again, neither offers any exploration or surprising details after the initial encounters. Thus, a player's approach to *cs_*

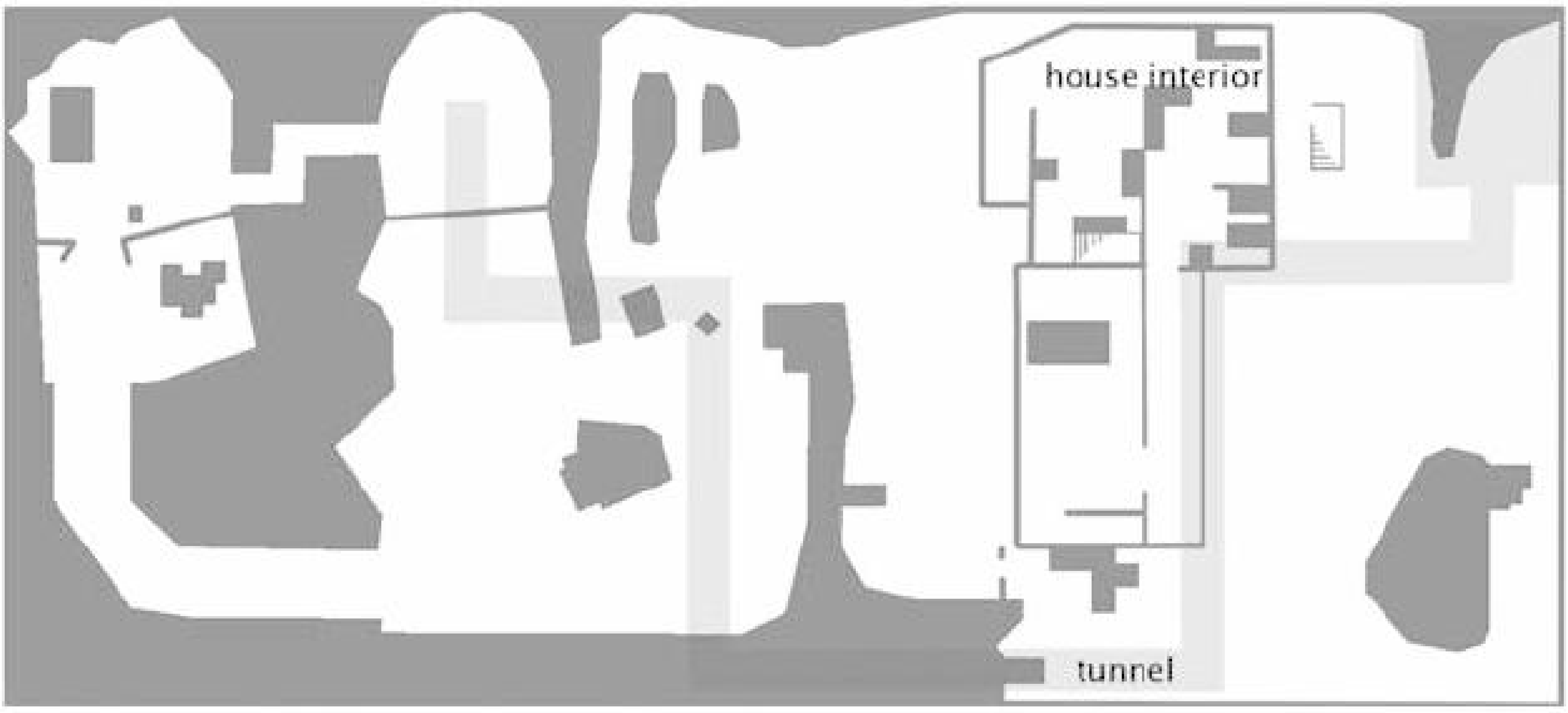

Figure 11.7 *Counter-Strike*: a simplified view of the *cs_militia* map ground level and tunnel system

militia mirrors an arena principle, although its structure is a mixture of various forms. Where the gaming condition is not equal, there the spatial conditions must not be equal or they would continuously favor one side.

11.4 Driven by Space

So far, architectural structures have been combined from the smallest possible level (see Ching 1979) to the larger contextualization of space (see Norberg-Schulz 1980). Tracks/rails, labyrinths/mazes, and arenas come to life through these architectural details and foster certain forms of interaction. While this arrangement might not be complete—for example, a different argument might work at the level of the room and house and concentrate more on relations of inside and outside—it nevertheless provides a set of spatial patterns.

Through such patterning, space structures the evocative narrative elements and a player's experience of them. This space dependency might be called the space-driven model for content assembly. It provides an abstract model for space as the structural force of interactive events. Here, the virtual stage becomes a canvas, and the structures used within it, the tracks, rails, mazes, arenas, or others, are large-scale evocative narrative elements. Logical connections are still crucial but are combined with their spatial context.

The space-driven model for content structuring tries to simplify and abstract the phenomena outlined in sections 11.1 to 11.3 to search for a way of designing new game worlds and analyzing and evaluating existing models. Spatial logic is seen as an additional guiding force for behavior and can be applied to exploit the narrative potential of virtual spaces. The focus here is on the use of space that shapes possible events and their visualization. In contrast to physical space, where architects can hope to incorporate features that evoke connotations and patterns of behavior in visitors, game designers can shape the functionality available at any given location more directly and therefore determine more precisely the characteristics of the event space.

Possibilities of engagement are directly built into the spatial structure. They are "emplaced," as Foucault would have argued (1998), by their distance and relation to each other. Through emplacement, a game world designer can create what Warren Spector termed "possibility spaces" (see Jenkins and Squire 2002, 70) in a spatial sense. These provide intriguing problems and tasks as well as means to solve these problems and complete the tasks. The concept of the possibility space originated in math and is here applied to virtual architecture. In this case, a possibility space describes the options made available to the player through spatial conditions at a given moment in the game experience. The deeper such a possibility space is, the more options are provided. These options can be realized by the player into actions.

Heim argues along the same lines, stating that a "good virtual environment . . . is not an object seen in and for itself but an environment that blends into the user's activities" (2001, 6). Heim argues for an active spatial structure that provides the interaction with an "atmospheric flow," which, according to him, can influence user behavior. Heim exemplifies his statement with the online worlds of *V-Zones* (n.n. 1995–) and *Active Worlds* (n.n. 1995–; Heim 2001). However, both of these platforms are technically limited in their "blending" into user activities and are not goal-driven games but environments for communication and virtual meetings. More goal-related environments often use stronger spatial structuring.

To provide a simple example, one can refer back to Norberg-Schulz's and Heidegger's example of the bridge. Bridges can be found in many game worlds, although gravity is optional and bridges could be one of those structures that become obsolete once characters can fly or jump over any obstacle. Instead, they often have been adapted as spatial structural objects to channel interaction. A virtual bridge's positioning, creation, and use become variables as the building process, uncovering, and usability of such a structure become conditions of the dramatic setting of the game, as seen in the preceding *Medal of Honor* case. Here, we will add another game realization of a bridge structure.

In *The Legend of Zelda: Majora's Mask* (Miyamoto 2000), I will eventually direct my exploring and questing hero-character to a bridge that cannot be crossed because of a constant wind that blows me over the edge. Only after I have resolved more quests and found more items to improve my abilities can I use those new features that reveal to me the source of the problem: a giant becomes visible whose breath causes the wind. I have to deal with this obstacle before I can use the bridge as a path. The spatial design and the conditions that regulate access to the bridge are evocative narrative elements that demand and structure further exploration of the virtual space. In *Medal of Honor* I defend the structure itself in a single and distinct level, while in *The Legend of Zelda: Majora's Mask* I experience it as one spatial element in a continuous world that consists of a tightly woven net of evocative narrative elements.

Ultimately, the space-driven model provides an abstraction of the spatial structures discussed, but it helps to highlight space's importance in the creation and management of any "possibility space" that otherwise might be seen as a merely conditional, rule-based interaction design question. Rules of the game can be written into the playing field, and when game space is structured, rules are structured to shape possible actions in this environment. To highlight and contextualize this simple but important fact requires the spatial model.