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INTRODUCTION

Four Types of Textual Space and their Manifestations in Digital Narrative

Marie-Laure Ryan

The first thing that comes to mind, when we think about the relations of space to narrative, is the space in which characters live, act, and move—the space of the storyworld. Let's call it mimetic space (mimetic being taken here as synonymous with representational without implying that this representation must be faithful to reality). But the space of the storyworld is not the only kind of space that artistic and more particularly narrative texts can make significant. In Ryan, Foote and Azaryahu (2016), four types of textual space are defined:

1. The spatial form of the text
2. The space materially occupied by the text
3. The spatial context of the text
4. Mimetic space, or space of the storyworld

In this chapter, I will explore these four kinds of space, first in terms of their manifestations in print-based literature and second in terms of the digital narrative applications they have inspired, and of how these applications put into play the distinctive affordances of computer technology. For type 4, however, I will skip discussion of non-digital manifestations because they are too well known.

Spatial Form

The concept of spatial form was introduced in 1945 by the critic Joseph Frank to describe a type of literary meaning that emphasizes internal relations between parts of the text at the expense of temporal progression and of the tra-ditional narrative effects of suspense, curiosity, and surprise (Sternberg 1992). While Frank envisioned spatial form as a mode of organization typical of

twentieth-century novels by which readers must fit fragments together into a global pattern, as in James Joyce's *Ulysses*, it can also be conceived as the extension to prose narrative of a reading strategy typical of poetry which consists of constructing a network of relations—semantic, phonic, visual, thematic—between elements separated in the temporal flow of discourse. Frank's concept of spatial form relied on a metaphorical conception of space, built on the idea that it takes a complete apprehension of the text, like seeing a territory from a high point, to detect systems of analogies and oppositions. Spatial form can therefore be appreciated only retrospectively or, because of the limitations of memory, on a second or third reading.

But literature can shape space much more literally than through internal relations. Here I will extend the term of spatial form beyond Frank's conception by using it to describe the typographical realization of language and the arrangement of words on the page. With standard narrative texts, it does not matter whether the font is Garamond or Helvetia, the paper thin or thick, or the margins large or small, because the meaning of the text transcends its material support and visual realization. (Or if these features do matter, their effect is not verifiable, because it varies from reader to reader.) Poetry however has traditionally given more attention to visual presentation than prose. For instance, the seventeenth-century poem "Easter Wings" by George Herbert imitates the spread-out wings of an angel. In the nineteenth century Mallarmé's "Un Coup de Dés" and in the early twentieth century Apollinaire's *Calligrammes* reproduced visually the subject matter of the poem. Even when not representational, the spatial form of a poem attracts the eye before the mind reads the text. The word-image combinations of comics and graphic novels put great emphasis on the arrangement of frames on the page and, within each frame, on the visual relations between text and picture. Even novels become more and more dependent on spatial combinations of visual and verbal elements, as demonstrated by such experimental texts as *House of Leaves* by Mark Danielewski or *S* by J.J. Abrams and Doug Dorst.

The spatial organization of information takes two highly medium-specific forms in digital narrative. The first is known as the graphic user interface (GUI). The most distinctive feature of digital media is interactivity: the process by which users provide input to the computer, and the computer responds by displaying information, in a repeated feedback loop. In a GUI, users communicate with the computer by means of what Bolter and Grusin (1999, 31) call a hypermediated display: a screen divided into multiple areas, or windows, in which various types of information are displayed, such as textual, visual, or aural. Some of these windows contain information that form the target of the user's interest, while others are tools that enable users to access, create, or manipulate the target information. In a word processor, the target information is the text created by the user, while the tools are the functions on the toolbar, such as cut, paste, search, format page, and so on. In a computer game, the target information is the gameworld, or playfield, in which players perform actions,

and the tools are the menus that allow players to equip themselves for action or the icons (such as maps) that help them move around in the gameworld. Daniel Punday (2017, 93) calls these two types of information "primary" and "orienting" space, though they are spaces in different senses: the primary space is an experienced environment which users inhabit in make-believe, but the orienting space is simply an area of the screen—a window—through which tools can be accessed. Moreover, the tools are not always located outside the primary space, so that the two kinds of space are not necessarily distinct: in a hypertext, the links that allow navigation are underlined words belonging to the text that forms the user's focus of attention, and in a computer game, the tools may be objects found within the gameworld.

An even more medium-specific type of spatial form resides in the architecture of the underlying code that controls the navigation of the user through a digital text. Insofar as it determines the succession of textual or visual data on the screen, this architecture is temporal, but insofar as it can be represented on a diagram, it presents a spatial or topological configuration. In a standard print narrative, progression through the data is usually linear, since readers are supposed to scan the text line by line and page by page, but in a digital text, the system of choices that determines reading or viewing progression can take a variety of forms (Ryan 2015, ch. 7): the tree, typical of "choose your own adventures" texts, which allows the author to control the reader's itinerary, since there is only one way to reach the end of every branch; the wheel, a topological variant of the tree popular in commercial websites, because it allows returning to the home page in one click from every node in the system; the flowchart, common in games, because it makes it possible to reach the same node through multiple paths, allowing a variety of solutions to the problems presented to the player; and the network, or maze, common in hypertext narratives, which—in contrast to the tree—presents loops where users may be caught.

Here I would like to compare two hypertext narratives in terms of how their underlying spatial architecture affects the experience of the reader. The first (Figure 1.1) is *Twelve Blue* by Michael Joyce, a text from the 1990s, which unfortunately is not adapted to contemporary screens: Figure 1.1 is therefore a reconstruction of the interface and not an authentic screen shot. The text consists of about 150 fragments (or lexias); to move from one fragment to the next, the user clicks on one of 12 differently colored threads, shown on the left. Each choice leads to a different lexia (shown on the right); then, 12 more choices are presented, many of which lead back to previously visited fragments. This looping back or recycling of nodes avoids an exponential proliferation of elements. Figure 1.1 shows the interface presented to the reader, but not the underlying architecture: if the global structure of the text were represented on a diagram, this diagram would consist of 150 nodes, each connected to 12 others (not to mention some additional links contained in the text, marked by underlined words). This architecture gives lots of choices to the reader, but the
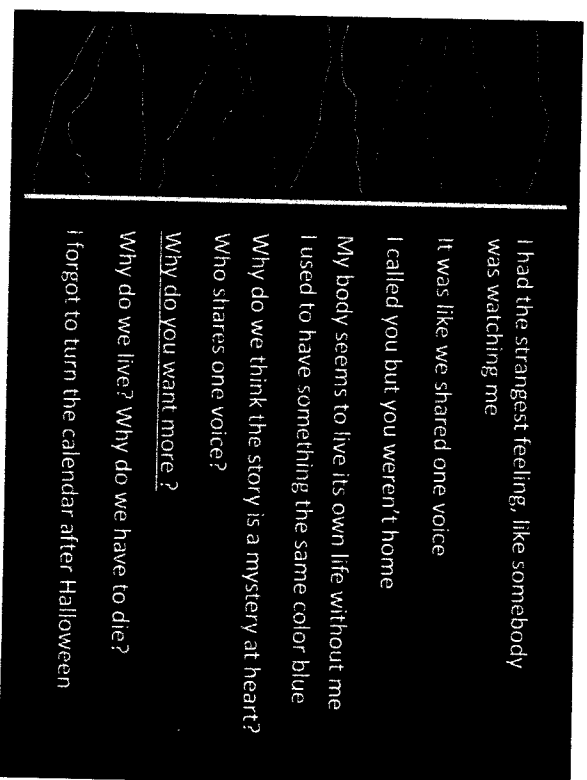
I had the strangest feeling, like somebody was watching me

It was like we shared one voice

I called you but you weren't home

My body seems to live its own life without me

I used to have something the same color blue

Why do we think the story is a mystery at heart?

Who shares one voice?

Why do you want more?

Why do we live? Why do we have to die?

i forgot to turn the calendar after Halloween

FIGURE I.1 The interface of Michael Joyce's *Twelve Blue*. (Recreated by Marie-Laure Ryan).

choices are blind, because there is no reason to click on one thread rather than on another. The author determines the reader's passage from one fragment to another by placing links between them, but he cannot determine the reader's global itinerary. The lack of control over the path of the reader prevents this type of spatial architecture from allowing the temporal effects of suspense, curiosity, and surprise. Nor is it compatible with a dramatic structure (often known as "Aristotelian") of exposition, conflict, and resolution, because the loops, as well as the sheer complexity of the system, prevent the reader from reaching an endpoint. As a network-based narrative, *Twelve Blue* frustrates interest in temporal development and redirects attention toward thematic relations between the various lexias. Instead of an overarching plot, the text presents a number of small stories concerning multiple characters whose lives intersect with each other. These stories illustrate recurring themes, such as water, drowning, love, family relations, and multiple shades of blue. None of the strands provides closure; rather, meaning arises from the juxtaposition of fragments into a synthetic totality. The spatial architecture of *Twelve Blue* thus supports the kind of semantic organization and reading strategy that Frank describes as spatial form.

While the readers of *Twelve Blue* progress blindly and do not know how much of the text they have seen (instead of closure, the text offers a sense of exhaustion when readers run in circles and cannot access new fragments), my second example of underlying architecture, a French hypertext by Daniel Bouillot titled *Annalena*, is much more user-friendly, in the sense that it seeks a compromise between freedom of choice and a global narrative structure leading to a satisfactory

ending. *Annalena* tells the story of Pierre, a photographer who travels from Paris to Antibes to take pictures of the brilliant light of the French Riviera. On his way, he takes a mysterious hitchhiker named Anna. During his stay in Antibes, Pierre runs several times into Anna, and she initiates him into the landscape as well as into the work of the painter Nicolas de Staël, who lived in Antibes and committed suicide by throwing himself from a roof. Anna convinces Pierre that the true way to capture the light of the Mediterranean is through painting, not photography. Pierre falls in love with Anna as much as with the places she helps him discover, and he tries to capture her by taking her photo unbeknownst to her. In so doing, he violates a taboo and she disappears forever from his life. The diagram on Figure I.2 represents the spatial architecture of the text. It begins with an introduction (D) narrating Pierre's trip from Paris to Antibes and his meeting with Anna. Then, readers reach node IC, a slightly overexposed photo of Antibes (to signify the inferiority of photography) on which they click randomly. Depending on where they click on the screen, they activate an episode which unfolds linearly: each screen contains only one link, and after completing the sequence, readers return to node IC. After each episode, a whole area of the Antibes photo turns into a painting with much richer colors. The process repeats itself 19 times for the 19 episodes, each of which contains an autonomous episode, so that they can be read in any order. At any point in the reading, users know exactly how much they have read and how much remains to be read. When all the episodes have been visited, the photograph is fully transformed into a painting, in accord with the thematics of the text, and an epilogue (node F) puts an end to the narrative arc, giving users the satisfaction of having concluded their journey.

The lesson to be drawn from the comparison of these two types of underlying architecture is that in order to maintain narrative tension, it is necessary to limit the choices of the reader. When the choices are so numerous that the author does not control the long-range succession of elements, interest must shift from following a temporal development to the detection of spatial relations.
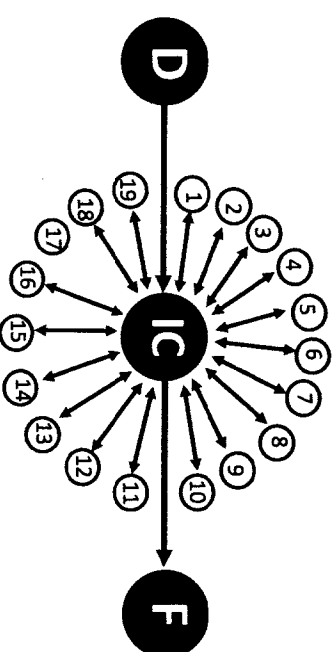

FIGURE I.2 The architecture of Daniel Bouillot's *Annalena*.

While the reader of *Annalena* wants to know how it ends, the reader of *Twelve Blue* finds satisfaction in the lyrical structure of the text.

The Space Materially Occupied by the Text

This space is the space of the physical support of the text. It can present zero, one, two, or three spatial dimensions: zero for oral texts (unless one counts the body of the storyteller); one for moving lines of text, such as ticker tape style news on TV or public buildings; two, the default case, for pages; three, but with one very short dimension, for engraved inscriptions or Braille texts; and a full three for books, if one considers their thickness, which tells the reader how much has been read and remains to be read. Literature has recently begun to play with the dimensionality of texts in creative ways. For instance, the novel *S* by J.J. Abrams and Doug Dorst is full of detachable flat objects inserted between the pages that can be considered two-and-a-half-dimensional because the third dimension is very limited: postcards, written notes, newspapers, and a wheel for decoding hidden messages. In *Bats of the Republic* by Zachary Thomas Dodson, a long band of text contained in an envelope must be twisted by the reader into a three-dimensional Moebius strip to reveal a secret connection between two seemingly distinct stories. And in *Tree of Codes* by Jonathan Safran Foer, a book is sculpted into a three-dimensional object made of plateaus and valleys (Figure I.3). Foer took an existing text, a translation of *Street of Crocodiles* by the Polish author and Holocaust victim Bruno Schulz, and created a new text by cutting out part of each page and retaining only selected words. The cut out parts often overlap with the holes of the next few pages, so that readers can see not only the words on the page they are reading ("page-words," in Katherine Hayles's terminology [2013]), but also words or sometimes individual letters located in deeper layers of the text ("hole-words"). These signs appear at the bottom of crevasses cut through the thickness of the book. Since it would take a superhuman grasp of complexity for the author to foresee and control them, they represent a random element, an informational noise that breaks the syntax of the page words. Judging by the responses on Amazon, some readers hide the hole words by sliding a white sheet of paper behind the page they are reading, while others try to make sense of the noise. Needless to say only the first kind of readers manages to retrieve some kind of narrative meaning, but at the expense of the depth of the text.

In digital texts, the idea of a material support is problematic, because the text exists as code and data inscribed as zeros and ones on a microchip hidden in the memory of the computer; it is only when the code is executed that the text becomes accessible to the user, either as display on a screen or as virtual image. While a flat screen can only convey a sense of depth through perspective, virtual reality (VR) technology can simulate three-dimensionality through holographic display and stereoscopic effects. One type of support that allows a genuine three-dimensional virtual experience is the Cave Automatic Virtual Environment (CAVE) system of Brown University, a cube of 2.5-meter sides

FIGURE I.3   Three-dimensional print writing: *Tree of Codes*, by Jonathan Safran Foer.
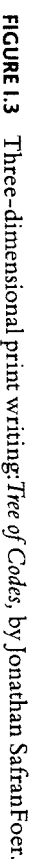
mainly used for scientific visualization, but also available for literary experiments. An example of such experiment is a text titled *Screen* by Noah Wardrip-Fruin and his colleagues (Figure I.4). The general theme of the text is memory loss, and memory is represented by the CAVE, in the middle of which the user is located. Fragments of texts, representing personal experiences, appear on the walls. As long as the words are readable, the experiences they relate are accessible to memory; but after a while, words begin to fall off from the walls. Users throw them back on the walls, using their hands like ping-pong rackets, and initially succeed in putting them back in place. But the words fall down faster and faster, as in the game *Tetris*, and when the user no longer manages to catch them, they fall on the ground and break. The length of the experience depends on the user's ability to catch the falling words, but sooner or later nothing is left on the walls and amnesia is complete. This inevitable ending makes *Screen* indifferent to the meaning of words: different texts, personalized to represent the experiences of different users, could be used as data, because we are all threatened by the nightmare of memory loss. It is, moreover, unlikely that the user, entirely absorbed by the task of catching the words and putting them back in place, will have time to read them; in this installation, words are turned into opaque objects. The narrativity of *Screen*, if it exists at all, is not a meaning signified by its particular words, but rather, a meaning symbolically enacted through the corporeal interaction of the user with the materiality of words. As Rita Raley writes of three-dimensional (3D) textuality, "this is less a reading experience than an anti-reading experience."

While the user of *Screen* remains aware of the CAVE as the container in which text is projected, most instantiations of VR technology render the notion of "space materially occupied by the text" inoperative, and replace it with a contrast between the virtual space of the world represented by the text and the real space in which the text is projected and experienced. An example of this contrast is Alejandro Iñárritu's VR installation *Carne y Arena*, which represents the experience of migrants trying to cross the US/Mexico border in the Arizona desert, while being chased by the border patrol. As a user, you are ushered into a large room where, after being fitted with a VR helmet, you experience a 6½-minute simulation that puts you in a dark desert landscape; gradually, migrants come into view; then a helicopter hovers over them in a deafening noise; the people scamper around, terrorized, while fragments of dialogue are heard in both Spanish and English. The helicopter moves away, and a period of calm ensues. Then the police return, yell orders, point guns, and unleash attack dogs. Chaos breaks out. You are blinded by an intense light, but when you try to turn away to regain your sight, you are frozen in place. You realize that you are one of the migrants and that you have been caught by the border patrol. At this point, the simulation comes to an end. Until then, you can move around the scene and observe the events from various angles and at a variable distance; but if you come too close to the walls, an attendant gently pulls you back and redirects you toward the center of the room. Her friendliness, which stands in sharp contrast to the hostility of the border patrol, temporarily breaks the illusion but prevents you from bumping into real objects. Even though VR
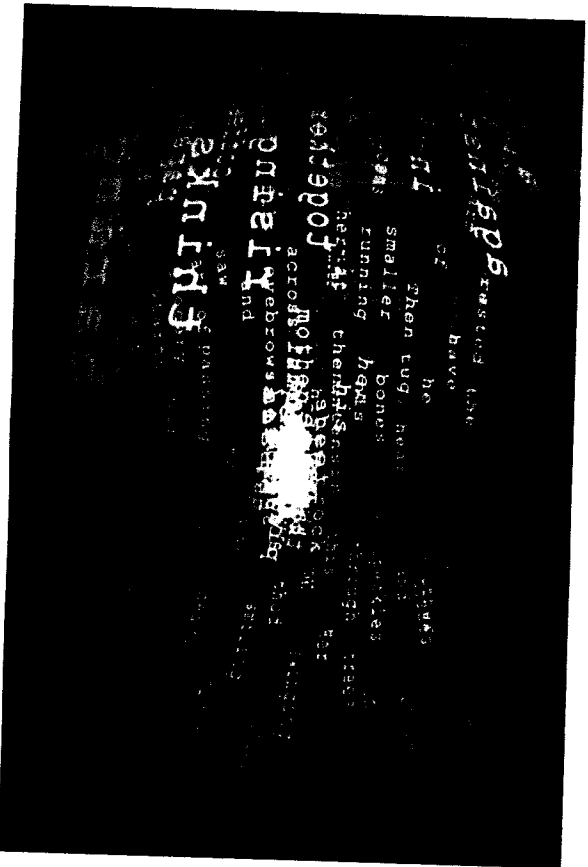

FIGURE I.4 Three-dimensional digital writing: *Screen*, by Noah Wardrip-Fruin *et al*

technology cancels awareness of the material world (in contrast to augmented reality [AR]), it cannot cancel its existence, since it remains dependent on real space for the display of the virtual world.

The Spatial Context of the Text

By spatial context, I mean the physical space where the material support of the text is located and from where the story can be accessed. By facilitating the multiplication of copies, the invention of print has made narrative texts relatively mobile compared to manuscripts: you can take a book almost anywhere and books can take you anywhere in imagination. The relation between the spatial referent of the text (i.e. the place that the text tells about) and the spatial context is normally variable; but in a type of narrative widely known as "locative," or "location-aware," or "site-specific," this relation is fixed, and the story must be accessed in the presence of its spatial referent. Consider this inscription commemorating an event in WWII: "The memory of France, and the city of Seyssel, invite the passer-by to remember the fights of June 22, 1940," followed by a brief narrative of the events that took place there. In such an inscription, the "where" of the story coincides with the "where" of the reader's location, a coincidence which turns this particular "where" into a special place of almost sacred significance. The text would lose most of its emotional impact, and therefore of its meaning, if the plaque were moved to a museum elsewhere.

Location-specific narrative permeated our urban landscapes long before digital technology gave it a boost and a name. We may not think of grave inscriptions as stories, but they present a clear beginning and ending and the middle is left to the imagination. A more elaborate form of site-specific narrative is found in the design of historical and heritage sites. Kenneth Foote (Ryan et al. 2016, Chapter 7) distinguishes several ways in which narratives of historical events can be "draped" across real spaces. In "point narratives," stories are told from a single location in space where the events took place; in "sequential narratives," events took place in a relatively broad area, and visitors follow a designed narrative trail that takes them through the story from beginning to end; in "area narratives," the story covers a large expanse, and visitors move freely around it or see only parts. The design of narrative information must consequently take these variations into consideration. The main support of non-digital locative narrative is written signs or engraved plaques, but it can also take the form of oral storytelling or of dramatic enactment. In so-called "cemetery crawls," costumed performers positioned on graves bring the past to life by narrating or enacting the lives of the most notorious dead. In the 1950s, a type of night-time spectacle known as *Son et lumière* was developed to tell the stories of history-rich buildings such as the Loire castles or the palace of Versailles. These spectacles brought to life kings, queens, royal mistresses, and other significant figures through dialogue, music, and light effects. In

contrast to historical and heritage sites, whose purpose is to convey reliable factual knowledge, the *Son et lumière* spectacles dramatized history through a blend of fact and fiction, similar to what is found in historical novels. Fully fictional stories rarely occur in the non-digital forms of locative narratives, arguably because it takes the official approval of cultural authorities to install material signs in public locations, and authorities prefer to commemorate historical events because they represent a common past, but literary fiction can be made site-specific through the phenomenon of literary tourism. Beginning in the late nineteenth century (Bulson 2009), readers have flocked to Dickens's London, Joyce's Dublin, or Proust's Combray, driven by the conflicting desires to see the places described in literary works as they are in themselves and to experience these places through the eyes of the author, who is credited with the ability to capture their essence.

The advent of digital technology and the development of GPS systems made it possible for site-specific narratives to get rid of the permanent physical markers that had to be approved by the authorities and that favored officially sanctioned versions of history. Now everybody could, in principle, upload narrative content in the cloud and attach it to certain locations. As site-specific narratives multiplied, they also diversified not only in terms of the type of data involved (which now includes images projected through AR technology as well as textual narrative), but also in terms of genre. According to Scott Ruston's useful typology (2010), the three major types of locative narrative are spatial annotation projects, games, and mobile narrative experiences.

A classic example of spatial annotation is *[Murmur]*, a project initially developed for Toronto, but expanded to other cities such as Montreal, Vancouver, and San Jose, California. Inspired by treasure hunts, by Baudelaire's notion of *flânerie* (wandering through a city off the main traffic paths with a mind open to random discoveries) and by Debord's notion of *dérive* (dropping ones usual reasons for moving and "letting [oneself] be drawn by the attractions of the terrain and the encounters [one] finds there" (Wikipedia, Dérive entry), *[Murmur]* encourages people to explore the city in search of stories. Users receive a map showing where stories are offered and they reach these locations by selecting their own itineraries. Once there, a visible sign shaped like an ear shows a phone number that they can call to get narrative content. No GPS is therefore needed, and technically, the project only depends on digital technology to the extent that it uses mobile phones. The purpose of *[Murmur]* is to capture the *genius loci* of a city, not by taking users to its main tourist attractions or by commemorating the deeds of the personalities considered important, as does official history, but by collecting stories told by ordinary people about ordinary places. As the authors of the project write:

The city is full of stories, and some of them happen in parking lots and bungalows, diners and front lawns. The smallest, greyest, or most

nondescript buildings can be transformed by the stories that live in it. Once heard, these stories can change the way people think about a place and the city at large.

[Locative Hypertext]

Urbanism is particularly well adapted to locative narrative because cities are continually evolving landscapes. We have all experienced the transformation of farmland into a freeway or shopping center, the gentrification of an old, decrepit neighborhood or the social revival of a decayed city center through green spaces and pedestrian malls. Many of the stories of *[Murmur]* recount how neighborhoods have changed and how ethnic specificity has been replaced by soulless expensive dwellings that the original inhabitants cannot afford. By digging into this urban archaeology, *[Murmur]* creates what human geographers call a sense of place: for it is the memories that tie people to certain buildings, neighborhood, communities, and the stories that capture these memories that turn the grey, seemingly undifferentiated spaces of the city into a web of lived places.

Location-based games, our second type of locative "narratives" (scare quotes explained below) follow a basic formula. The playground is the real world; the game is persistent, in the sense that it can be played at any time; the purpose of the game is to find and then to kill or capture creatures whose image is superposed upon the real world through AR technology. The position of the creatures, as well as that of the player, is shown on a map that tracks the movement of the player through GPS techniques. The more creatures you catch or kill, the more points you acquire and the more you rise in the game hierarchy. These games, which include *BotFighters* (2001–2005), *Ingress* (2013), and the tremendously popular *Pokémon Go* (2016), are credited with promoting physical activity and with allowing players to discover their city, for the creatures and strategic areas are often placed by the game designers near interesting landmarks. On the negative side, they have been accused of causing accidents, users being sometimes too focused on their cell phone screen to notice incoming traffic. The games differ from each other through additional rules that complicate gameplay and through the visual appearance of the creatures, but their narrative content is too rudimentary to be a source of interest. In *BotFighters*, which is probably the first location-based games, the players are robots in some futuristic world and their mission is simply to locate and destroy other players. In *Ingress*, according to Wikipedia:

An unknown, transdimensional force called Exotic Matter (XM) was discovered as a byproduct of the Higgs Boson research (Large Hadron Collider) by a team of scientists at CERN in Switzerland. This substance has been associated with the Shapers, a mysterious phenomenon or alien race.

The basic us. vs. them structure of competitive games is dramatized as a fight between two factions: the Enlighted, who believe that harnessing (XM) energy is beneficial to mankind, and the Resistance, who see XM as a potential threat to humanity and want to destroy it. Players select one of these two factions and see each other accordingly as either allies or enemies, but since the game is persistent, the story cannot end. *Pokémon Go* does not even try to narrativize the player's activity. The creatures encountered (there are 146 of them) differ from each other through their names, appearances, preferred habitat (for instance, near the water), and how many pieces of candy they bring for being captured, but they have no personality or biography, even though it would have been easy to tell their stories on a companion website. The game designers must have thought that an overload of narrative information would be distracting players from the game goals, and given the success of the game, one cannot argue with their decision.

Ruston's third category, "mobile narrative experiences" (which can hybridize with the other two, as in Chapter 3 of this book), differs from locative games in that it makes narrative into a focus of attention rather than using it as an incentive to play, and from spatial annotation in that the project is spanned by a global narrative arc rather than consisting of little stories. Moreover, the narrative is fictional rather than factual, even though it refers to real locations. Harnessing the narrative potential of mobile technology is the ambition of the research project "Ambient literature," a "two-year collaboration between UWE Bristol, Bath Spa University and the University of Birmingham, established to investigate the locational and technological future of the book." (Book must be broadly understood as the technological support of literature rather than narrowly as bound collection of pages, for the texts developed by the project use cell phones rather than print.) Traditional literature is context free; the book and the story it tells are the same wherever you take them. Ambient literature wants to give significance to the context by mobilizing the resources of digital technology to make texts dependent on their spatial environment. This context awareness can be understood in two ways: as pulling data from the surroundings and bringing it into the text so that it will tell a different story to different readers situated in different contexts or as taking readers to the locations referred to in the text in order to stage an encounter between the spatial referent and its description. An example of the former is Kate Pullinger's *Breathe*:

> *Breathe* is a literary experience delivered through your smartphone that responds to your presence by internalizing the world around you. Using APIs – application programming interfaces – the story leverages data about you, including place, weather, time, in order to create an experience that is personal and uncanny.

An example of the second strategy is James Attlee's *A Cartographer's Confession*. The author describes the plot as follows:

> My story concerns a young boy and his mother who arrive in [London] as refugees at the end of the second world war, who find a home among a community of market traders and who are then separated; it follows that boy's attempt to manage both the city and his loss by becoming a cartographer and ultimately by confronting the part of his history that has caused him pain, resulting in a violent denouement. Against this narrative is set a non-fictional account of events in the winter of 1931. These two narratives, one fiction the other non-fiction, play against each other.
> (*Writing the City*)

But the real subject matter (or main character) of the story is the London of the late 1940s and early 1950s, a London scarred by the war with low buildings, streets devoid of traffic, and numerous outdoor food markets. The cell phone app takes readers (or rather, hearers) to the plot locations and enhances their experience with multimodal documents that allows them to compare the prosperous present-day London with the London of the 1940s, such as vintage photos, illustrations, videos, newspaper articles dealing with the site, and soundscapes specifically created for the project. One problem with this kind of project is respecting the basic linearity of narrative time and of causal relations while granting users some freedom in their choice of itinerary. This is done in *Cartographer's Confession* by structuring the narrative as a series of semi-independent flashbacks that can be heard or read in a relatively free order. Another solution to this problem would be to use mobile technology to augment a standard print narrative. The user would first read the story in a book and would then visit the principal plot locations with the help of an app which would provide additional site-specific information. But whether the locative app is the main support of the story or an augmentation, site-specific fiction limits its audience to a certain region, and ambient literature is therefore unlikely to overtake the book.

By superposing the setting of a fictional story upon an actual spatial context, mobile technology blurs the boundary between category 3 and the next category.

Mimetic Space or the Space of the Storyworld

Scholars who have addressed the issue of the representation of space in narrative such as Ronen (1986) and Zoran (1984) have generally focused on the case of language-based literary fiction. But narrative can be supported by a variety of media, and media differ widely in how they convey an experience of

space. Take language, the principal narrative medium; if it wants to represent a specific spatial setting, such as a house, room, or city, it must describe it item by item and readers must reassemble these elements in their minds in order to form a global representation of the setting in question. Moreover, even though language is temporal, it does not make it easy to represent movement though space as a gradual progression: if a character in a novel is said to walk out of the house and into the garden or to travel from Paris to London, the character experiences space point by point, but the text describes the event as instantaneous and the reader's imagination only visualizes the beginning and the end of the trip. With still pictures, spatial settings can be shown all at once instead of being described feature by feature, but the representation of movement must be divided into distinct moments separated by gaps, as done in graphic novels. Moving pictures, by contrast, are able to represent a continuous movement though space, not just by filming moving objects, but also by placing the camera on a mobile support. With digital media, users can not only experience space as evolving surroundings, they can inhabit it by identifying with an avatar and by controlling its movements. They can also modify their point of view, for instance, by getting closer to objects or by turning around, so as to experience space under different angles. But navigation in digital environment is not entirely free, because the smooth image of space presented on the screen hides a structured organization determined by the code (Nitsche 2008). In a computer game, it may be impossible to stray away from a path and to walk cross-country, even though the screen image shows no obvious obstacles to doing so, because the code creates an invisible barrier; conversely, it may be possible to walk through walls, thanks to a bug in the code which can lead to a shortcut known as a "cheat."

Enacting geographer Yi-Fu Tuan's distinction between space and place, most computer games are based on a contrast between inert space and active places. In standard adventure games as well as in massively multiplayer online role-playing games (MMORGs) such as *War of Warcraft*, players are wandering knights who travel through vast expanses of land where nothing happens, except for changes of scenery, in the hope of finding hot spots where they meet non-playing characters who give them "quests," that is, missions that will give them a chance to demonstrate their skills. In this game model, travel through space is subordinated to finding opportunities for action, since it is only by fulfilling difficult tasks that players can gain experience and advance in the game. But in another type of game, the relation between the journey and the game goals is inverted, and the experience of space takes precedence over the performance of tasks.

An example of this priority is *The Path*, an indie game by Michaël Samyn and Aureia Harvey, inspired by the fairy tale of "Little Red Riding Hood." The user selects one of six girls of different ages and is told to take her to the grandmother's house by following the path. But if the player stays on the path,

she will get too easily to the grandmother's house, she won't see anything of the woods, and the game will conclude with a "failure" message. Ironically, the game wants the player's character to disobey the directions, to leave the path, and to get lost in the woods. Early in the game, the woods charm the player with their fog-shrouded landscapes, their fantastic vegetation, and their strange, slightly disturbing atmosphere. But after wandering for a while with nothing happening (it is a very slow game), the player feels frustrated of getting nowhere, and the woods become a prison. The more the player progresses, the more the landscape repeats itself and the more she moves in circles. But once in a while a faint light appears on the horizon, promising a different landscape. It is the anticipation of the pleasure of finally getting somewhere that motivates the player to persevere in her journey through the sameness of the woods. But when she finally reaches a distinct place, her avatar meets the wolf and a violent death, which is shown in a cut scene. The fulfillment of the player's desire to reach a final destination, rather than wandering forever in the woods, has ambiguous consequences, since on one hand it spells doom for the avatar, but on the other it means success for the player.

Games like *The Path* that require no other skills than moving around the gameworld are known as walking simulators. These games connect a story to a landscape and the player unlocks the narrative by exploring the gameworld. The relative interest of the landscape and of the story and the strength of the connections between the two is variable. In *The Stanley Parable*, the player moves through an empty office building motivated by curiosity about what happened to Stanley, an employee whose job consists of pressing buttons on a computer keyboard as instructed by data on the screen. One day the screen remains blank, and totally disoriented by this lack of guidance, Stanley leaves his office and wanders aimlessly through the building. Finding how it ends (there are six different outcomes) is the player's main reason for moving through a dull maze of corridors, rooms, and doors that offers no aesthetic gratification. In *What Remains of Edith Finch*, by contrast, interest is fairly evenly divided between the landscape and the story. The gameworld is varied and beautiful, and by entering a mansion, finding secret rooms and examining objects, notes and diaries left by the characters, the player discovers a macabre story about a family haunted by a curse that kills all of its members: a story literally told by the things that fill the storyworld. In *Dear Esther*, by contrast, the story is relatively divorced from the environment to be explored and from the rare objects found in the game world, but the game offers a stunning landscape simulation. Moving through its world is almost like hiking on a windswept island off the coast of Scotland: blades of grass, sound of crashing waves, texture of driftwood and pebbles on the beaches, stalactites and stalagmites in a cave are so realistically rendered that players only miss the smell of the ocean and cold blasts of wind on their face—though the wind can be heard as well as seen in the swaying of the grass. Once in a

while, when players traverse hidden hot spots, they hear fragments of a rather cryptic story about a dead woman named Esther and a car crash on an island with no roads told by a delirious narrator who may or may not be a ghost and whose past is unknown. The story not only blurs dream and reality, its elements are randomized, so that it will differ with every replay of the game. The cost of this randomization is a loss of connection between landscape features and narrative information, since the communicated information is not dependent on specific locations. All this makes *Dear Esther* into an everchanging, antinarrative text that offers no certainty. But the player is too absorbed in the task of finding a way through the landscape to really pay attention to the story. Even though the landscape looks smooth, the player's movements are starkly restricted by the code, and completing a chapter is more a matter of solving a maze than of absorbing narrative information. *Dear Esther* is all atmosphere, but totally devoid of narrative tension.

Virtual reality, the most life-like form of space representation, enhances the user's experience of simulated environments by making them three-dimensional and panoramic, and by letting people interact with the display by using their own body rather than by manipulating external controls. Through its ability to continually calculate and update the position of the user's body and by modifying the display accordingly, VR technology turns space exploration into a first-person truly embodied experience. The most promising applications of VR technology are indeed spatial experiences, such as climbing mountains without danger of falling, exploring underwater worlds, flying airplanes, flying like a bird, or visiting archeological sites and viewing them from various angles.

Yet, while VR can provide an amazing sense of being there in a variety of environments, this does not make it into a particularly efficient or powerful narrative medium. The narrative possibilities and limitations of VR are illustrated by a VRwandlung, a project developed by the Goethe-Institut Prague based on Kafka's "Metamorphosis" (no longer available). The project exploits VR's ability to manipulate the brain's image of the body and to lead to alternative experiences of embodiment by putting the user in the situation of Gregor Samsa, who one day wakes up and discovers that he has been transformed into a giant insect. An important theme in Kafka's story is Gregor's progressive acquaintance with his new body, how he uses it to move around his room, and how space is reconfigured to fulfill the needs of an insect body. For instance, Gregor can now hide under the bed to spare his mother the awful sight of his body and he can crawl on the walls to entertain himself. This theme is uniquely suited to the affordances of VR. Ideally, users should be able to experience what it feels like to control a body with six legs and giant antennae that impede their movements. They should be able to explore the room. And if they move in front of the mirror, they should also discover their new body from a third-person perspective. But even if VRwandlung succeeds in putting users in an

insect body, it does not grant them agency beyond the ability to move around the room, and it does not recreate the human conflicts that make Kafka's story so poignant.

I am not saying that narrativity and VR are totally incompatible. VRwandlung could create virtual characters who would interact with the user and bring the project closer to Kafka's story; but this would be at the cost of the user's freedom of action, for participants would have to be steered along a certain plot line. One can also imagine artistic VR projects that would create surreal landscapes, where users would interact with magical objects rendered in three dimensions, would enter into bodies widely different from their own, and would cause unpredictable transformations by simply pointing at things. This would be like a dream, a hallucination, but dreams are fluid, ever-morphing experiences that rarely maintain narrative coherence. No medium can outdo VR in creating dynamic interactive environments and in conveying a sense of their presence, but there is more to narrative than spatial immersion; this is why VR developers prefer to call their creations "experiences" rather than stories. An influential school in narratology equates narrativity with "experientiality" (Fludernik 1996) and a feeling of "what it is like" (Herman 2009) at the expense of plot, but there is a world of difference between climbing Mt Everest—the topic of *Everest VR*, an ultra-realistic VR game that conveys a powerful sense of being there, but gives little freedom to the player—and having to choose between summiting Everest and rescuing other climbers caught in a storm. The first is a spatial experience, the second a narratively designed spatial experience. So far, VR has specialized in the former.

Conclusion

Digital technology brings something new to each of the types of space defined above, though with some types, it is more productive than with others. It redefines type 1, spatial form, as interface design and as the underlying architecture that determines the user's progression through the text. Space 2 is the least productive, both in old and new media, but VR technology such as the CAVE can give some material, three-dimensional substance to words and turn them into objects that the user manipulates. By tying narrative texts to certain location, GPS-based mobile technology and AR effects gives visibility to space 3, the spatial context of the text, which is normally taken for granted or considered irrelevant to the reading or hearing experience. But the strongest impact of digital technology on narrative concerns the most significant of the four kinds of spaces, the space of the storyworld. While other media merely represent space, the computer provides a lived, first-person experience of space by turning it into a habitable environment with which the user can interact and which can be navigated either through the substitute body of an avatar manipulated by external controls or, in the case of some VR applications, through

the user's own body. None of these innovations would be possible if digital texts depended exclusively on language, as does the traditional conception of literature. It is to the extent that it orchestrates diverse modes of signification and absorbs all media that digital technology can produce new forms of art and new spatial experiences.

Works Cited

Abrams, J.J., et Doug Dorst. S. New York: Little Brown (Mulholland Books), 2013.

Ambient Literature. https://research.ambientlit.com/

Attlee, James. A Cartographer's Confession. https://research.ambientlit.com/cartographersconfession

———. Writing the City: Interview with Emma Whittaker. https://research.ambientlit.com/index.php/2017/07/22/writing-the-city-james-attlee-explains-his-approach-to-his-first-ambient-literature-commission/

Bolter, Jay David, and Richard Grusin. Remediation: Understanding New Media. Cambridge, MA: MIT Press, 1999.

BotFighters. Computer Game. It's Alive Mobile Games, 2001.

Bouillot, Daniel. Annalena. http://www.lisiere.com/annalena/

Bulson, Eric. Novels, Maps, Modernity: The Spatial Imagination, 1850–2000. London: Routledge, 2009.

Danielewski, Mark. House of Leaves. New York: Pantheon, 2000.

Dear Esther. Computer Game. Produced by Dan Pinchbeck. The Chinese Room and Curve Digital, 2012.

Dérive (Guy Debord). Wikipedia Entry. https://en.wikipedia.org/wiki/D%C3%A9rive

Dodson, Zachary Thomas. Bats of the Republic. New York: Doubleday, 2015.

Electronic Literature Organization. http://collection.eliterature.org/

Everest VR. Computer Game. Solfar Studios RVX, 2016.

Fludernik, Monika. Towards a 'Natural' Narratology. London: Routledge, 1996.

Foer, Jonathan Safran. Tree of Codes. Visual Editions, 2010.

Frank, Joseph. The Idea of Spatial Form. New Brunswick: Rutgers University Press, 1991 [1945].

Hayles, N. Katherine. "Combining Close and Distant Reading: Jonathan Safran Foer's Tree of Codes and the Aesthetic of Bookishness." PMLA 128.1 (2013): 226–231.

Herman, David. Basic Elements of Narrative. Mahwah, NJ: Wiley-Blackwell, 2009.

Iñárritu Gónzalez, Alejandro. Carne y Arena (Virtually Present, Physically Invisible). VR installation, 2017. Trailer at https://www.youtube.com/watch?v=zF-foCK30WE

Ingress. Computer Game. Niantic, 2013–present.

Joyce, Michael. Twelve Blue. http://collection.eliterature.org/1/works/joyce__twelve_blue.html

Locative Hypertext. http://www.eastgate.com/locative/ [Murmur]. http://murmur.toronto.ca/about.php [No longer available; see instead http://cfccreates.com/productions/76-murmur]. See also Locative Hypertext.

Nitsche, Michael. Video GamesSpaces: Image, Play and Structure in 3D Worlds. Cambridge, MA: MIT Press, 2008.

Pokémon Go. Computer Game. Niantic, 2016–present.

Pullinger, Kate. Breathe. https://research.ambientlit.com/

Punday, Daniel. "Space Across Narrative Media: Toward an Archaeology of Narratology." Narrative 25.1 (2017): 92–112.

Raley, Rita. "Editor's Introduction: Writing.3D." The Iowa Review Web, 2006. https://elmcip.net/node/1445 [No longer accessible]

Ronen, Ruth. "Space in Fiction." Poetics Today 7.3 (1986): 421–438.

Ryan, Marie-Laure. Narrative as Virtual Reality 2: Revisiting Immersion and Interactivity in Literature and Electronic Media. Baltimore, MD: Johns Hopkins University Press, 2015.

Ryan, Marie-Laure, Kenneth Foote and Maoz Azaryahu. Narrating Space/Spatializing Narrative: Where Narrative Theory and Geography Meet. Columbus: Ohio State University Press, 2016.

Sternberg, Meir. "Telling in Time (II): Chronology, Teleology, Narrativity." Poetics Today 13.3 (1992): 463–541.

The Path. Computer Game. Tales of Tales, 2009. (Auriea Harvey et Michaël Samyn). http://tale-of-tales.com/ThePath/

The Stanley Parable. Computer Game. Written by Davey Wreden and William Pugh.

Tuan, Yi-Fu. Space and Place: The Perspective of Experience. Minneapolis: University of Minnesota Press, 1977.

VReanding. The Metamorphosis VR (Goethe Institut, Prague), online: https://www.youtube.com/watch?v=ML8H69E6zB0

Wardrip-Fruin, Noah, et al. Screen. http://collection.eliterature.org/2/works/wardrip-fruin_screen.html

What Remains of Edith Finch. Computer Game. Directed by Ian Dallas, produced by Alvin Nelson and Michael Fallik. Annapurna Interactive, 2017.

Zhai, Philip. Get Real: A Philosophical Adventure in Virtual Reality. New York: Rowman & Littlefield, 1999.

Zoran, Gabriel. "Towards a Theory of Space in Narrative." Poetics Today 5.2 (1984): 309–336.