Geographic Orientation & Disorientation

Getting Lost and Getting Found in Real and Information Spaces

By Daniel R. Montello

FRANK COLLIER DROVE OFF early one Friday morning in July 1988. He had an appointment with his dentist near Birmingham, Alabama, about an hour's drive from his home. Some seventeen hours and 600 miles later, officers stopped Mr. Collier, heading west in the eastbound lane of State Highway 32, outside Muncie, Indiana. Apparently Mr. Collier was unable to find his dentist's office, so he turned around and headed home. But somehow he turned north instead of south onto Interstate 65, taking it all the way to Indianapolis. After leaving there, he again turned north instead of south. He could have ended up in Canada if the officers hadn't stopped him.

Mr. Collier was lost—*geographically disoriented* as it is technically known. Getting lost can certainly be annoying, and it can make for an amusing story. But the personal and public cost of geographic disorientation goes well beyond a little frustration and embarrassment. People lose millions of hours and miss appointments walking and driving around looking for their destinations. Getting lost wastes gas, generates more auto emissions, and increases traffic congestion. Searching for lost people can cost a lot of money, particularly when locating them requires search-and-rescue professionals.

Getting lost can be life-threatening as well. Many people die each year from dangers encountered while trying to find their way, whether from thirst, weather extremes, or injury; they also fall prey to robbery and assault. Lost children are abducted and Alzheimer's patients walk off in a haze of disorientation, sometimes never to be found alive. The 1993 series of attacks on tourists in Florida, three of which were fatal, have been partially credited to poor roadside signs that left tourists wandering aimlessly in places they should have avoided. And we should never forget the toll that geographic disorientation takes on marital bliss; how many divorces have been catalyzed by arguments over who didn't know where they were going and who refused to ask for directions?

Geographical disorientation occurs when people are *uncertain* about where they are or where they need to go to get to some destination. Critically, one must first have a destination—a place to go—in order to be lost. A tourist who steps out of his hotel room to take a stroll before dinner is not going any place in particular. A person engaged in such goal-free travel cannot be lost because he does not care where he is or where he is going. However, as soon as he decides to return to his hotel, he becomes lost when he realizes that he is unsure of the way back. Thus, getting lost is a *believed* mismatch between a goal and the knowledge required to reach that goal. I stress *believed*; the objective truth about location and heading is a separate issue. People don't act lost or seek help unless they feel confused or uncertain.

Getting lost involves several issues of practical concern. Architects and planners are concerned with the design of comprehensible places. Search-and-rescue professionals want to improve their search efficiency by increasing their understanding of the behaviors of lost persons. Educators want to know how to teach children to avoid getting lost and how to be found safely if they do get lost. Cartographers and others want to improve the communication of navigation instructions. To do this, they must understand how the format and modality in which spatial information is displayed affects the way people comprehend information, so that they can improve the communication of navigation instructions. Engineers want to design maximally effective and efficient electronic navigation systems for use in automobiles and public places.

Getting Lost in Information Spaces

People are often said to get lost in databases and other information systems. Strictly speaking, this disorientation is only metaphorical; besides the two-dimensional space of the monitor screen, the space of such systems is not real physical space. Nonetheless, not only lay people, but researchers and other professionals, speak about information *spaces*, *navigating* the Web, and so on. And there is interest in applying theories of orientation and navigation in real spaces to information spaces.

It's instructive to consider how this metaphor is useful and how it can mislead us.

The metaphor of spatiality clearly applies widely. *Navigating* a problem can be described as any situation where multiple decisions must be made over time to reach an ultimate solution (a *destination*). Similarly, one must take a correct sequence of turns to reach a geographic location, perform a correct sequence of calculations to solve a math problem, or click on a correct sequence of links to reach an internet location.

The metaphor is limited, however, because information spaces, including the way we comprehend them, are not like real spaces. The geographical space of human existence is a three-dimensional volume that, for most purposes, is effectively an irregular two-dimensional surface. Real space is continuous but broken into partially discrete regions by surface features, and by human activities and beliefs. We comprehend real space by looking and listening (and smelling, touching, etc.), and we move our body around by walking, driving, and flying. It generally costs more to travel or communicate with places that are further apart, whether that cost is measured in hours, dollars, or calories. This leads to the fundamental property of geographic space known as *distance* decay: more distant places tend to interact less than closer places.

Most information spaces are only minimally spatial in these ways. The Web, for instance, is a one-dimensional sequence of pages temporally in front or behind a current page (only two arrows are given to navigate the Web). It involves very little concept of distance other than the number of links. People can hyperlink from site to site, effectively skipping over space and time, eliminating distance decay. The Web can be conceptualized in terms of branching structures of course, but there is no concept of direction between pages, and users apparently cannot, or do not, bother to hold much of this branching structure in mind. There is no need to when a person can simply read links off the screen or even waste a few seconds retyping a search query. Clearly, people can get "lost and found" in information space quite differently than in real space.

Why Do People Get Lost?

We can identify three sets of factors that explain why people get lost: psychological, environmental, and informational factors.

Psychological factors

Psychological factors may be short-term or long-term. Short-term psychological factors include fatigue, anxiety, illness, intoxication, and so on. The mechanism of these short-term factors mostly comes down to attention; factors that reduce attention or distract us from specific relevant information increase our chances of getting lost. A friend once said, "I could not miss" the turnoff to the bike path, but he did not think of the corral on the other side of the road that held my attention as I biked past the entrance. Similarly, web pages can distract users by highlighting less relevant information just as much as, or more than, relevant information.

Long-term psychological factors are characteristics of people that tend to persist over time and make each of us individuals. They arise out of an interaction of inherited traits with experiences, including explicit training. We differ in knowledge, intellectual abilities, and personality dispositions. Some people know specific strategies for maintaining orientation, such as the "look-back" strategy where a traveler stops every so often to turn around and take a mental snapshot of the view they will see on the return journey. (Try it, it works!) Other long-term factors relating to how people get lost involve personality; for instance, sensation-seekers are more likely to explore new places and develop new spatial knowledge.

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Evidence suggests that people vary in their "sense of direction," which is the ability to reason about distances and directions on the earth's surface. People who reason well in this manner are said to use a *survey* style of navigating. People who do not reason well in this way, but instead focus on getting to destinations via a specific sequences of places and turns, are said to employ a *route* style. The route style works perfectly well in many situations but is of limited use when creative navigation is required; these people do well to stay away from shortcuts and detours. In information spaces, only route navigation really applies.

Environmental factors

A second set of factors that contributes to people getting lost involves the structure and appearance of the environment. In his 1981 article in the journal *Environment and Behavior*, Weisman identified four influences on what he called "legibility"—the degree to which a particular environment facilitates orientation and wayfinding. *Visibility* is the extent to which a person at one place can see other places, with greater visibility leading to greater legibility. Similarly, environments with more *differentiated* appearance are more legible. This differentiation can be based on size, color, architectural style, or other properties. The presence of clear and distinctive landmarks, such as tall statues, helps here. Third, the *complexity* of layout configuration, such as of the street network, affects legibility, although researchers continue to explore specifically how this works. Researchers have had some success extending these influences, especially differentiation, to orientation in information spaces. The fourth environmental influence identified by Weisman was *signage*, which belongs with the third set of factors that I called informational.

Informational factors

Information for orientation is provided by various systems of signs and symbols, including road signs, maps, verbal route directions, and more. There are equivalents in information spaces, of course, such as clear web page titles, descriptive links, and site maps. Increasingly, information systems are realized in computerized technology like online mapping and direction sites, GPS-enabled cell phones, and in-vehicle navigation systems. These technologies combine GPS (Global Positioning System) and geographic information databases that represent the layout of places.

Many researchers have investigated what makes navigational information clear and useful.

It is solidly established, for instance, that most people find maps used during navigation, including you-are-here maps, to be confusing when the forward direction of travel is not represented as "up" on the map. Also, maps intended for navigation should focus on network connectivity and downplay metric relations, although users with a better sense of direction apparently benefit from the metric information.

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Researchers are also exploring ways to overcome the limits of reading navigation maps on tiny cell phone screens. Although various solutions have been proposed, such as automatic panning to new surrounds after one has moved, no solution has completely succeeded in overcoming the difficulties of displaying small and highly generalized map images.

Educating Users and Designing Systems to Support Orientation

Attempts to reduce the problems of disorientation can focus on any of the three sets of orientation factors we identified above. Training can help people with a poor sense of direction, and many people benefit from learning specific navigational strategies such as the look-back strategy. Buildings and neighborhoods can be designed to capitalize on what we know about environmental influences on orientation. For instance, creating a different design and look can benefit public spaces by giving them a more differentiated appearance. This is clearly true for information spaces, as well. Research continues on the design of navigation systems that incorporate maps and/or verbal directions. What information should be provided to travelers, how should interfaces be designed, and how should people be trained to use them? One particular challenge is how to accommodate people with different needs and abilities.

Finally, a cautionary note is in order. New digital technologies are a great boon to oriented travel, and their widespread dissemination will certainly continue. But they will not spell the end of geographic disorientation as a human phenomenon. "Never get lost again!" advertises a handheld GPS device. Don't believe it. Like other technologies, these devices will malfunction, lose power, or just plain break. Satellite signals do not penetrate all objects, and they have limited value inside buildings and in natural or urban canyons. Even when these technologies function properly, they do not guarantee orientation. Possessing a complete and accurate map or set of directions has never prevented any person from getting lost, and it never will. People have a wide range of abilities to maintain orientation, and to interpret maps and verbal directions. Apparently, some people almost always *can* miss it.

What's more, navigational technologies can engender overconfidence. People do not plan like they used to, and dead batteries in the Canadian Rockies give new meaning to the word "unprepared." Why pay attention to landmarks you pass or the position of the sun when you have technology to see you through? Likewise, people do not bother to pay attention to their location in information space when they believe they can simply re-enter their search words. When it comes to navigational skill, you "use it or lose it." We can expect that the widespread use of the digital navigational technologies of today and tomorrow will diminish our ability to maintain our sense of where we are in this complex world. And to find our way to the dentist. UX

About the Author:

Daniel R. Montello is a professor of geography and affiliated professor of psychology at the University of California, Santa Barbara, where he has been on the faculty since 1992. Dan has published widely on spatial, environmental, and geographic perception, cognition, affect, and behavior. He co-edits the journal Spatial Cognition and Computation.

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