Aristotelian Spatial Hypertext

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Abstract:

Philosophers often discuss the difference between theories that describe space as absolute (for example, Newton) or as relational (for example, Leibniz). Node and link hypertext creates a relational space, while most spatial hypertext either works with an absolute (background or container) space, or combines this with Leibnizian link networks. There is, however, a third sort of space, which we might call Aristotelian, which is polarized and oriented. Tinderbox can be pushed into exemplifying this sort of spatial hypertext, and we might imagine applications that do so more completely.

Some medieval philosophers defined material things as having "parts outside of parts," as opposed to immaterial or intellectual entities whose parts are not spatially distinct. The animality and the rationality in a human being are not spatially separated. The metaphors and the rhythm of a poem are not spatially separated. But the parts of a automobile engine, the halves of a clamshell, the houses in a suburb, stand outside one another. Space provides a field of externality for where-is relations among items that need not have any more intimate connection than next-to. Space offers dimensions for movement and location. It seems serenely indifferent to what orderings and classifyings we make within it.

That, at least, is the way the space of most spatial hypertext behaves. It is a blank geometrical receptive passivity.

The nature of space has been a matter of debate among philosophers and scientists for a long time. I want to explore how older notions of space might open up our ideas about spatial hypertext.

As modern science was beginning, two of its giants -- Gottfried Wilhelm Leibniz and Isaac Newton, who both invented the calculus -- fought over the nature of space. That conflict can be read in the famous correspondence between Leibniz and Samuel Clarke. (It is likely Newton either wrote or advised Clarke's letters.) [1]

In current jargon, the disagreement was between a relational and an absolute conception of space.

Newton's conception of absolute space is more familiar. Space (and time) are entities on their own, with their own properties, independent of whatever they might contain, providing a neutral field within which atoms move and rearrange themselves. Perfectly empty space is conceivable, and what fills space has no effect on the structure of space.

Newton's absolute space looks a lot like the expectant window of a spatial hypertext, flat and ready to receive.

Leibniz's conception of relational space is almost the reverse. Space has no independent reality. What primarily exists is the set of objects and their mutual influences and relations -- relations which are not in the first instance spatial, but are qualitative and causal, relations of clearness of perception and linkage. The spatial ordering of the objects is a consequent phenomenon dependent on these other relations. Perfectly empty space is inconceivable, since space is nothing but the relations among what fills it.

Leibniz's relational space behaves like a pure node-and-link hypertext -- not a Storyspace map but a set of links that is not located 'in' any other space. The link structure generates a spatiality of near and far, and perspectives from a given node toward other nodes. The Web has such a Leibnizian spatiality, though the vagaries of linking can make that spatiality's connectivity more contorted than Leibniz had in mind.

Storyspace, along with many other systems, mixes the two kinds of spatiality. Nodes and links offer one mode of connection and spatiality, while the map offers another in which nearness and association and containment work independent of linkage. The two modes can be put in tension with one another.

The idea for this essay originated from a comparison of Storyspace and Tinderbox. [5, 6] Both have the Newtonian map and the Leibnizian links. I began by wondering if the spatiality of Tinderbox could be more complex because of its added features.

Compared to Storyspace, Tinderbox has more attributes for each node, with more variation in color and size of nodes. This allows for greater spatial expressiveness. More importantly, Tinderbox allows aliases, so that nodes can appear in multiple locations. Aliases allow freeform gathering, associating, and locating. It also has agents that collect nodes by creating aliases. Agents add both Newtonian and Leibnizian twists, gathering and multiply locating and associating (by abstract attributes and by spatial nearness). There can be both more connectivity and more independence of parts.

However, both programs give undue dominance to the inclusion relations indicated in the outline view and in the levels on the map view. Tinderbox allows manually created aliases, but still puts restrictions them. While manually created aliases can be rearranged on the map, aliases collected by agents cannot be rearranged, thus limiting spatial flexibility. In an outline, or on the map, aliases can be made children of real entries, but one alias cannot be made the child of another alias. So there is no way to create multiple or alternative outlines or maps that have very different inclusion relations.

Both programs share a set of views (Map, Chart, Outline, Treemap). Tinderbox adds

three new views (Explorer, HTML, Nakakoji). Of these the Nakakoji has most spatial implications, since it introduces selective linearity. It takes slices, and as does HTML export, and puts into a linear space items that need not be together in one area of the hypertext map. (For instance, widely separated items in an outline or on a map can be collected by an agent and put into a linear Nakakoji view.)

Finally, however, and most significant for my investigation, Tinderbox offers what the program calls adornments. At first glance these adornments are a disappointment. They can help organize a screen, and aid classification, but they do not contain what is put on them. They can be moved separately (and this frequently happens when one clicks carelessly), and they cannot be sent to a lower level. As versions VKB containers they are poor substitutes. [9]

Genetically, Tinderbox adornments are not containers but elaborate versions of Web Squirrel labels. [4] I began to wonder what would happen if instead of thinking of the adornments as weak containers, I thought of them not as items in the node hierarchy, which containers would be, but as features of the background space. Then with their location, overlap and transparency, they begin make hypertext space Aristotelian.

For Aristotle space is not relational, but neither is it a neutral container. Taken on its own, it includes polarities, privileged locations, absolute directions and gradients. [2]

To understand Aristotelian space we need to start with the idea of natural motion. Fundamental to Aristotelian physics is the distinction between natural and violent motions. Different kinds of matter (the four familiar elements plus a fifth) naturally "want to move" in different directions. A motion is specified (and made possible) by where it is headed, not where it starts from. The earth element, for instance, naturally tends to move toward the center of the cosmos. What we experience as gravity is not due to any pull but due to the effort of items containing the earth element to get as close as possible to the center of the cosmos. (That is why what we, but not Aristotle, would call our planet has a spherical shape.) Aristotle suggests that if by some means you were to push the Earth away from the center of the cosmos, it would move back, because that is where the stuff of which it is made wants to be.

The other four elements naturally move linearly away from the center, to their own regions (springs flow up and over the earth, air escapes and hovers, fire rises, the fifth element moves circularly around the center. If unmixed and left to go their way undisturbed, the elements would form concentric spheres with earth at the center, surrounded consecutively by water, air, fire, and the fifth element. Even now the elements are more or less in those locations, but the four lower elements mix and move, through processes brought about by the rotation of the heavens and the inclined course of the sun. (Aristotle also thinks that under causal influences the four elements may transform into one another, so there is no danger of stasis and total separation.)

"Violent" motion is any motion different from the natural motion of an element. Such

motion always has an outside cause. Stones naturally move toward the center of the cosmos, but I can pick up a stone and move it in other ways. Violent motion is "unnatural" in the sense that it is not what an element would do if pure and left to itself, but violent motion is still part of the "natural" course of the cosmos, as when plants raise up water or birds fly off with seeds or humans build up walls and houses.

Aristotle has no notion of pure geometrical space. His regions and zones are not superimposed upon some basic flat Euclidean space -- in that respect his cosmos is closer to Einstein than to Newton. (It would be another essay to think about how spatial hypertext might incorporate something like Einstein's notion of curved space or the quantum notions of a wild and disorderly space at small scales.)

In most current spatial hypertexts we work with a neutral Euclidean window on which different kinds of items are arranged in spatial orders of classifications and containments. An Aristotelian space would make an additional distinction between the structuring of space itself and the arrangement or behavior of objects in that space.

We can distinguish two kinds of spatial structure. There is topology, or connectivity, which Aristotle does not discuss, and which could be complex on its own: imagine a spatial hypertext on a Möbius strip or one, like some old computer games, where moving off the left edge brings you in on the right edge.

Aristotle's space does not have any unusual connectivity, but an Aristotelian spaces could have a strange topology. However, the distinctively Aristotelian features are not topological; they are zones and gradients and poles that influence the "natural" motion of items within the space.

If there were different gradients in a hypertext space, then depending on the items and their 'natural' tendencies in the space (perhaps aided by some agents), things could move in their natural directions. But also, as in Aristotle's world, items could be set in 'unnatural' places yet retain a trace of their natural motion or tendencies -- as stones can be set on but walls but remain liable to fall off.

We could ask, though, whether, If the user first sets up zones and gradients, then adds items, this is really a new kind of spatiality, or merely the arrangement of a new class of fundamental objects in a neutral Euclidean space? We should acknowledge that once the concept of a purely geometrical space has been developed, it cannot be just forgotten and space read only as concrete Aristotelian zones. [8] But it is also true that the concept of purely geometrical space is itself an abstraction from a more primal experience of space as textured and zoned. [7] Also, there is an important psychological and methodological difference between the action of setting up a relatively permanent landscape and the action of moving things about or letting things roll about on their own within the landscape.

Here are some examples:
-- Imagine, for instance, a gradient color that was used as a background to influence

emergent structure.
-- Or a patterned spatial background with directions.
-- Or a set of poles or sinks.
-- Real desktops are Aristotelian spaces. There are variations in lighting, in zones of accessibility, in position relative to significant objects off the desk, that influence what kinds of meaning can be emerging in different zones of the desktop.
-- Imagine an image used to texture a whole space, or a photo background used as a memory palace.
-- VKB could take on Aristotelian features if as items were moved about they encountered resistances in certain directions, or changed in some visible way as they entered different zones.
-- Tinderbox could do similar things, and its agents could perform more spatial effects than gathering and including. The move to a different level could put one into a different Aristotelian space.
-- Storyspace could have similar features, and perhaps links could be affected by the quality of the underlying space, becoming easier or harder to make, or having different animated transitions, or acquiring automatic types or limited ranges in certain zones.
-- A Jazz hypertext could be developed with strong Aristotelian features. [3]
-- A spatial hypertext could, unlike Aristotle's world, include different sub-spaces with radically different Aristotelian qualities, not necessarily different topologies but different kinds of textures or zones or gradients.

Our spatial hypertexts could, though, go beyond Aristotle by allowing multiple locations for single items. Imagine that agents can pull not the object but one of its aliases into a 'natural' location, while the object goes elsewhere. Or that a compound object could, because it is made of different elements, have aliases automatically generated that move naturally along different gradients or toward different poles. Then assume that we can work with this 'natural' arrangement, embellishing or altering it. What could we do with this kind of multiple connectivity and locations? What kinds of emergent structurings would be possible?

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