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GETTING TO THE POINT: MAKING, WAYFARING, LOSS AND MEMORY AS MEANING-MAKING IN VIRTUAL ARCHAEOLOGY

LLEGANDO AL PUNTO: FABRICACIÓN, EXPEDICIÓN, PÉRDIDA Y MEMORIA COMO CONSTRUCCIÓN DEL SIGNIFICADO EN ARQUEOLOGÍA VIRTUAL

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Abstract:

The initial construction of a digital virtual object is the three-dimensional (3D) point. Using the notions of making, wayfaring, meshwork and agency, this discussion focuses on Ingold's (2011) theoretical approach to these comments as a means for the construction of archaeological knowledge as applied to the 3D virtual landscape. It will demonstrate that 3D points, whether constructed or captured, can be considered to be agents within an actor network, have agency and are subject to memory and loss within the digital archaeological record. By their interconnections they become a meshwork that can exchange and retain unique attributes of materiality. As such, they challenge our notions of meaning-making beyond the rote actions of visualizing within archaeology to a form that is more theoretically deeper. By viewing the construction and capture and the production of 3D or 2D visual data through a different lens but within theoretical archaeological terms, we can begin to understand our role in the creation of meaning within virtual archaeology.

Key words: virtual archaeology, digital archaeology, 3D modelling, making, wayfaring, agency

Resumen:

La construcción inicial de un objeto digital y virtual es el punto tridimensional (3D). La discusión en el uso de la noción de fabricación, expedición, malla y agencia, se centra en el enfoque teórico de Ingold (2011) y en estos comentarios como un medio para la construcción del conocimiento arqueológico aplicado al paisaje virtual en 3D. Se demostrará que los puntos 3D, ya sean construidos o capturados, pueden ser considerados como agentes dentro de una red de actores, que tienen agencia y están sujetos a la memoria y a la pérdida dentro del registro arqueológico digital. Por sus interconexiones, se convierten en una malla que puede intercambiar y conservar los atributos únicos de importancia relativa. Como tal, desafían nuestras nociones de significado de decisiones más allá de las acciones rutinarias de visualizar dentro de la arqueología una forma más teórica y más profunda. Al ver la captura y la producción de datos visuales 3D o 2D a través de una óptica diferente, pero dentro de los términos teóricos arqueológicos, podemos empezar a entender nuestro papel en la creación de significado dentro de la arqueología virtual.

Palabras clave: arqueología virtual, arqueología digital, modelado en 3D, fabricación, expedición, agencia

1. Introduction

As both a professional computer animator and a trained archaeologist, I have struggled with negotiating how archaeologists are "make-meaning" within virtual archaeology. My dilemma is manifested primarily because a theoretical model has yet to emerge in virtual archaeology (see Beale & Reilly, 2014; Huggett, 2012, 2015). However, Tim Ingold's notions of making, wayfaring, meshwork and agency (2011) combined with traditional interpretations of actor network theory (Latour, 2005), memory (Moshenska, 2008) and loss (Tzortzopoulou-Gregory, 2010), provides a unique opportunity to examine virtual archaeological knowledge construction from an alternative "makers" perspective (see Ingold, 2013).

For Ingold, "making is a correspondence between maker and material" (Ingold, 2013, p. xi). As archaeologists, our palette, if you like, is the excavation itself (see Ingold, 2013). It is a negotiation between the physicality of the material and landscape with the construction of interpretation and meaning-making through the act of revealing the past (see Ingold, 2013; Wylie, 2002). However, if we take a phenomenological approach and envision the mindset of the maker of the material revealed, the correspondence is not only contextual but temporal as well (see Spector, 1993; Watts, 2009). One would assume then that the virtual construction of archaeological landscapes produces a duality in which being maker in the virtual space helps to understand making in the physical archaeological space, temporally and contextually.

Ingold points to an exercise called "walking the plank" in which he invites readers to engage in the simple act of sawing a piece of wood (Ingold, 2011, p. 51-62). As simple as it might sound, there are a series of interconnected processes both physical and mental that enable the ability for the maker to not only make but also "be" within the synergies of the tool and the material (see Ingold, 2011, 2013). In the first stage the user formulates a mental image of what they would like to create in the act of making. This mental construction is based on the

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cumulative organization of knowledge already formed and the influences, agency and authority the user imbues within. Next, tools are chosen and there is a "coupling of action" in which the user and the tool become one, but influencing the other (Ingold, 2011). Lastly the material to be worked is added to the symbiotic chain of interdependent elements. The materiality of the material worked upon plays an enormous role in not only how the tools are used, but also in influencing changes or course corrections of the mental image as represented by the final product (Ingold 2007, 2013). As such the user, the tools and the material all contribute to not only the construction of a new end product but also in the formation of new knowledge. Making is not about the act itself, but the interplay between the knowledge creator, the tools and the materiality of the construction material on hand. Ingold is clear that the making process is informed by the world in which the maker lives. That all materials and tools have their own life and contrary to the notion that we as makers impose our reality on the world itself, it is opposite. The conditions of the material, the tool, the environment, aptly dictate the outcomes of the maker's mental map. Ingold demonstrates that the material and the materiality of the medium the maker chooses to work with, has substantial impact on the final outcome of the object, whether it be digital or physical.

Little attention is applied to the complexitities of seemingly inconsequential micro-decisions that are made at the digital level and how that affects the overall construction of archaeological knowledge in 3D virtual space. Thus the goal is to recognize that the act of building within a virtual environment, requires a conscious individual acknowledgement that the environment, skills, tools, and materials deployed in the crafting of new 3D Computer Generated Imagery (CGI) is meaning-making and thus theoretically grounded. However, let us apply Ingold's notions practically in the construction of 3D objects within virtual space to determine if there is a theoretical fit.

2. Wayfaring as a theoretical beginning

To really understand the impact of the 3D CGI digital taskscape within the archaeological landscape, one needs to envision a virtual world, empty of senses, a black void of infinite 3D space, entirely dependent on user input, direction and purpose. A habitat totally dependent on the coming into being, capture or importing of a single point, surface or object for any form of wayfaring to begin. This requires a paradigm shift of unparalleled magnitude, as this virtual world is a meshwork of organic, ever evolving tissue, influenced by an infinitie number of infinitesimal of inputs, properties or attributes. By breaking down the virtual world to its most elementary nucleus, namely a *point*, archaeologists can begin to understand the ramifications and rewards of virtual archaeological methods, while formulating a new theoretical language to enhance the understanding of what digital means to archaeological study.

A point in 3D space leads a curious existence. Without it, there is no marker or reference within the landscape. Visualization within archaeology has always been based on a point, so to speak. Humanists, the early archaeologists of the modern age, spent years using points, lines and renderings to bring antiquities, namely sculptures and architecture back to their contemporaries from faraway lands, preserving a visual history of the cultures past (Belozerskaya, 2009). Points on maps became methods of *wayfaring* for explorers seeking new discoveries, but also connected by ancient and new pathways (Ingold, 2011). While ancient explorers used the physical environment to navigate, within 3D space a point becomes a *waypoint* for the digital explorer. Once the digital explorer understands his/her habitat, then the process of wayfaring begins.

How do we as archaeologists, develop research methodologies to enable the point's contribution, understand its power, and ultimately determine its validity in the field of archaeological research? Wayfaring is one notion that may have a direct impact on how virtual archaeologist might find a base to start. As described by Ingold, wayfaring is a subjective process in which human and non-human beings inhabit the world (2011, p. 143). Wayfaring is living, moving constantly, weaving, and interacting within an organic habitat of experiences, pathways and landscapes (Ingold 2011, p. 12-13). In the same sense, points within 3D CGI space exhibit the same characteristics. It is from this viewpoint that we will look at wayfaring and waypoints within the digital archaeological context.

Points, pixels and voxels, can occupy 2D or 3D space. In its purest form, the binary code that creates a point digitally is basically saying, "I'm here", or more specifically, "I'm on". It can be stationary or have movement, store endless amounts of physical and temporal data, as well as be connected to other points to create a *meshwork* or *network* of interrelated lines, surfaces, objects and ultimately, 3D computer generated images from 3D models (Fig. 1).

Figure 1: A meshwork polygonal rendering of a 3D object.

In its digital 2D or 3D form, a point is only a point within a vectorized digital environment such that its micro and macro visual representation is infinitely rounded or spherical (Fig. 2). As a 2D object, it occupies X and Y space, with its 3D counterpart adding Z or depth to its dimensions. Both 2D and 3D points can be animated in a fluid motion respectively in their dimensions and various degrees thereof. Amongst the myriad of other attributes they can possess, the point has the ability to take on colour, shade or textures, which can also be animated. Ingold calls these attributes *properties* (2011, p. 29-30).

Unlike a pixel, which is a square, rasterized and a singularly 2D representation of images that must work with multiple pixels to create a visual representation of a point, a vectorized point is a unique single entity. Pixels occupy space, but are less organic in their movement. They are restricted to rigid constraints of moving from

Figure 2: A vectorized point in 2D.

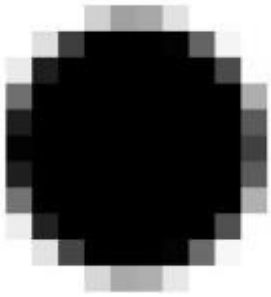

Figure 3: A rasterized point in 2D.

one pixel to another. Visually a pixel is not infinite, which means its visual representation at the micro level becomes lost (Fig. 3).

Voxels in the form of 3D graphics are a curious blend of attributes from points and pixels within 3D space. They are as interrelational as pixels however they occupy and manipulate volume and elements within X, Y and Z space (Fig. 4). These are characterized as a solid form within a 3D space. A voxel is a 3D pixel, which oddly enough is also material volume defined in physical space as well (Reilly, 2015).

Figure 4: A network of voxels within a 3D environment (source: FORWARD, http://naarvoren.nl/artikel/3d).

While a point in reality can have many meanings and visual representations, my own bias as a 3D specialist leans towards the assumption that a "point" is only a point in a CGI space when perfectly round, infinitely visually sustained and occupied within a vectorized environment. Thus, in moving forward to discuss points in 3D space, I propose that we adopt this bias as a means of fully understanding the capabilities and pitfalls within computer aided 3D archaeological research.

3. 3D points and improvisation within the taskscape

To get to the point when using digital techniques such as 3D scanning, Ground Penetrating Radar (GPR), Geographical Information Systems (GIS), or even creating entirely new virtual CGI models, a point is the key element in the visualization of data. As archaeologists we rely on a complex set of digital instructions to capture the "likeness" of a coordinate position, site or an artifact. These instructions are based on rational assumptions that are programmed into the software and hardwired into the hardware of the tools we use. For GPR, they take into account the density of the ground material, or the satellite triangulation in GIS or even the presumed height of the survey equipment out in the field. Hence the existence of a captured point becomes arbitrary and dependent on the initial design of the equipment and the application to any one application of the tool set.

Upon capturing the point, the user is given a mass of data, both visual and technical and presumably partially representative of a part of the object or application it has just sampled (Fig. 5). One makes the presumption because the technology does what it is told; it captures data. In layman's terms we call this a *point cloud*.

Figure 5: A point cloud image of a 3D object.

After the capture stage, it is now our responsibility to sift through the data to determine the relevancy of each point and its interconnectiveness with the rest of the points and data within that cloud. We can rely on the technology to "clean up" or optimize this mass, but doing so begins the subjective process of *improvisation* (Ingold, 2011, p. 216). One would argue that this process begins the moment that the technology attempts to objectively capture data of any type, but I see the human decision to manipulate freshly captured data as the starting point to when this data is first given *meaning*.

The technology in question is inherently biased. During a scanning process, it will record or capture any data, whether relevant or not. At the capture stage, the user has the ability to set standards for the collection of data, which in most cases eliminates material that is unassociated with the object, survey, or site being captured. However, this technology and process is based on a programmer's assumptions potentially made years in advance and, in the case of most archaeological applications of any technology, was written by people who have never experienced the archaeological process.

An important point is that the data captured is never entirely complete. It is a digitization. It is representative, and is the start of a long chain of improvisations that end with data or assumptions exponentially distant from their original source.

4. Agency, actor network and wayfaring in points

How many archaeologists have sat staring at the mass of points on their computer, fretting about where to go next? A point cloud is akin to an archaeological dig in itself, a particle upon a particle of virtual artifacts, some relevant and some completely arbitrary. I relate this initial process of making from the digital material somewhat to the physicality of sculpting. The sculptor starts with a material and either builds or reduces its mass. He/she works by physically visualizing a temporal image. Based on the type of material, the environment or even the remembrance of the temporal image, the end product is extensively "worked" but highly improvised from the original impetus (Ingold, 2011, p. 216). Each improvisation, from the selection of the material, its fundamental physical makeup, to the end product, has been given agency (Gosden, 2005, p. 196). As discussed previously, the technical methodology will capture everything allowed by the user. Once captured, we have to sift through the coaleasced particles into assembled layers and in most cases, arbitrarily realize the data into a manageable and recognizable form.

That single point, in a mass of millions is powerful. Its neighbour and the point at the furthest position away are all interconnected and equally important. In many cases we are reducing point numbers by determining which are necessary or not to visualize. Sometimes we add points, as our perception of the final image is not what was captured. Like a sculptor, we manipulate the material to meet our aesthetic and artistic needs. In the case of 3D visualization, a point is like an agent within an actor network (see Latour, 2005 and Knappett, 2008, p. 141-142). Although you only need to join two points to make a line or what in CGI terminology is called a *spline*, one requires a minimum of three points to make a surface or a *polygon*. To make a second surface, all one needs is an additional point and so on. These networks of interconnected triangulated surfaces create the visual shell or *mesh network* of the object we have just captured (Fig. 6).

Within these meshworks, points can transmit unique attributes or properties to other points, or can share and blend attributes with other points (Ingold, 2011). At its basic form, points take on the qualities of a node. They can retain their own unique, user defined, properties while transmitting or passing through data from other points throughout the meshwork of points and surfaces (Ingold, 2011; Knappett, 2008). Points thus retain agency while also working within an actor network as well as forming a meshwork (Gosden, 2005; Knappett, 2008). It is a symbiotic relationship that can be altered with the simple deletion of a point.

Points can take on characteristics of wayfaring. If a point is deemed irrelevant at a particular time, ignoring it will cause forgetting, and forgetting will likely result in the co-opting of its existence or deletion. Only later, when the networks and meshworks are broken, does remembrance take hold and we are forced to retrace our steps to reintroduce a discarded point (see Moshenska, 2009; Tzortzopoulou-Gregory, 2010). However, if that point lives in a *procedural* network, rather than a linear one, wayfaring becomes organic in the CGI visualization process where remembering and forgetting is negated through a visual interactive and historical state.

Procedural networks within 3D visualization are a dynamic building block. One starts with an input like a point cloud, and attaches operators that do very specific tasks, such as the deleting or connecting of a point that is added to the model to visualize the data. As the original material input is reworked digitally, each operator provides a map or a waypoint, which is dynamically linked, to the operation prior and post. This dynamic mapping allows the user flexibility to change any operation, like the deleting of a point, without destroying the history of the end product. Dynamically, this helps to maintain the originality of the data captured while rapidly prototyping, or easily visualizing, multiple organic changes to determine a best fit.

5. Artistic wayfaring

The technologist, archaeologist or artist who is tasked to make sense of the captured digital landscape, relies on training, instinct and creativity (see Forte, 2011; Frischer, 2011). As Ingold points out, artists are "itinerant wayfarers" making their way through the taskscape (2011, p. 216). In many ways, the artist is interpreting the cloud of points against the actual landscape. Through slight variations, although seemingly repetitive (Ingold, 2011, p. 50-62), the artist is changing the material and visual nature of the object, continuously correcting (Ingold, 2011, p. 217) what it is being referenced. Ingold states; "*any formal resemblance between the copy and model is not given in advance, but*

Figure 6: A polygon meshwork of a 3D object.

Figure 7: A surface rendered image of a 3D object.

is rather a horizon of attainment, to be judged in etrospect" (2011, p. 216). However, unlike the artist, the archaeologist wants an exact digital orthothetic sample, unstylized and free of improvisation (Fig. 7).

Like the hunter-gatherer who has wandered off in search of better hunting or gathering, artistic wayfaring like the digital point themselves, are dynamic and always in a state of movement. It is this dynamic process, when working with the data and manipulating it within the taskscape, that we must recognize as something entirely new in its final form. The original path is altered and organically, the point has been given new agency.

6. Discussion

From the moment of data capture, the 3D vectorized point in its pure form is a waypoint. It is given agency when artistic wayfaring begins, yet it also retains characteristics of an actor network, when combined with other captured waypoints. Its interconnectivity creates a wayfaring meshwork, which can transmit and retain unique properties or attributes. Through forgetting and remembering, multiple waypoints, when joined, become a new virtual object built through millions of improvisations by itinerant wayfaring. The final digital artifact is thus defined not by its original source, but by the waypoints and the processes that have moulded it.

Our notions of "accuracy" within the digital taskscape are challenged by the simple process of choosing those points that have importance and thus agency and those that do not. As archaeologists these negotiations of memory and loss of potentially useful data are reflected in our angst as it relates to agency, authority and transparency within the digital representation of archaeological knowledge. In this process of making, and as makers who make course corrections at wayfaring points, the decisions made embody elements of power, agency and authority which draws into the question of the authenticity of the representative virtual form created. As such, as a virtual artisan wayfarer, I embody and assert a technical, creative, theoretical and archaeological expertise. This creates a unique perspective to archaeological meaning-making that requires me to be reflexive of the power, agency and implicit authority I embed in the process of making within virtual space. Thus as a wayfaring artist, I need to transparently negotiate the process between virtual builder, viewer and archaeologist, in order to reveal and acknowledge the continuous correcting that occurs as decisions are made virtually through the construction of archaeological knowledge within the 3D environment.

Although both the London and Seville Charters address these issues in virtual archaeology as broader communities of practice (see Denard, 2012; Carrillo Gea, Toval, Fernández Alemán, Nicolás, & Flores, 2013; Pletinckx, 2011) they are methodologically based. There is however no individually centric theoretical applications for which archaeologists can envision themselves while within the maker, knowledge construction mode. By employing Ingold's notions of making, there is recognition that virtual archaeology is not entirely artistically driven. Paul Reilly (1985) viewed virtual archaeology in a dualistic form, in which the archaeological data drove the visual representation of that data. Ingold provides a means in which that duality can be explored and tested at the knowledge creation level that recognizes that by making within digital environments, we are creating new knowledge.

7. Conclusions

The goal of this discussion is to demonstrate that even in the simple act of constructing or forgetting data within 3D virtual space, the act is theoretically grounded. The actions and course corrections taken within 3D taskscapes play enormous roles in the interpretation of archaeological data and when that interpreted data is visualized those visualizations can be powerful tools for knowledge construction and dissemination. Those tools, the environment in which our virtual taskscape occurs and the skills and authority we bring to the task of knowledge creation, all contribute to the agency of a point, the network of modeled interconnections and the visualization of those networks within 3D space. The virtual environment is both immaterial and materially laden, relying solely on the interpretation of the physical archaeological record, but virtually.

By focusing on a point and by limiting my discussion to this core-building element within 3D space, I have attempted to draw our attention to the complexities that a single representative agent plays within a network of knowledge construction. In many ways, this exemplifies a larger discussion around the acquisition of archaeological material and our inability as archaeologists to let go of the data, *i.e*., the physical artefacts. Do all data points represent a holistic and fuller interpretation of the archaeological landscape, or can we be selective both in the virtual and material worlds as to what data representations are important or not?

I assert that there is a theoretical fit in terms of Ingold's notions of making, wayfaring, taskscape, agency and meshworks within virtual environments. As such, virtual archaeology practitioners should consider their actions within virtual space as being representative of the decisions and actions they would take in the physical archaeological landscape. In doing so, a solid theoretical grounding begins, allowing for a richer exploration of the archaeological data and a subsequent better-informed visualization through new knowledge construction within virtual space.

This has been a personal journey of theoretical exploration. Although I had not intended to reference Tim Ingold as much as I have, his observations do lend themselves organically to the task of developing theories suitable for virtual archaeology. It is in this spirit, I have taken Ingold's theories and reworked them to suit my purpose in understanding how virtual archaeology is not only a methodological but also a theoretical approach to archaeological knowledge construction.

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