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ARTICLE

The Archive in 360 with Volumetric Capture

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Abstract

This article reflects on the emergence of volumetric capture as a means to render human experience in three dimensions and how its applications in medicine, performance, and digital archiving are reshaping our relationship to documentation and embodiment. From 360-degree imagery to the advanced rendering techniques of Gaussian Splatting, these tools raise questions about the ethics of visualisation and the power to represent. This article draws on the work of scholars such as Taylor, Schneider, Kenderdine, Holling, and DeNora to challenge the notion of archives as neutral or static repositories and asks: in an age where our movements can be stored and repurposed, how do we navigate the tension between visibility and consent, between preservation and autonomy?

Keywords: 3D rendering; democratised archives; digital archives; ethics of representation; Gaussian Splatting; volumetric capture

Volumetric capturing techniques (such as photogrammetry, LiDAR scanning, and volumetric video) enable the creation of three-dimensional digital representations of physical spaces and bodies, reshaping how we document, interpret, and preserve the world around us. With their ability to record movement, affect, and spatial relationships in immersive detail (Figure 1), these technologies are generating new forms of archives while opening up ground for interdisciplinary experimentation: from performative artists pushing the boundaries of dance to medical professionals preserving demonstrations for future training, to musicians exploring innovative modes of expression, the creative-practical possibilities are vast. This cutting-edge technology is reshaping how we understand archives, knowledge production, and human engagement across fields like the arts, sciences, and public life.

1. From 2D to 3D

Recent developments in immersive media have introduced a range of technologies that enable new ways of documenting, preserving, and experiencing space, bodies, and performance. While sometimes discussed interchangeably, modalities such as 360-degree imagery, 3D modelling, and volumetric capturing differ in their technical processes and archival potential (Table 1).

This article focuses on volumetric capturing, as it enables the preservation of movement, spatial relationships, and embodied presence, offering a foundation for creating new forms

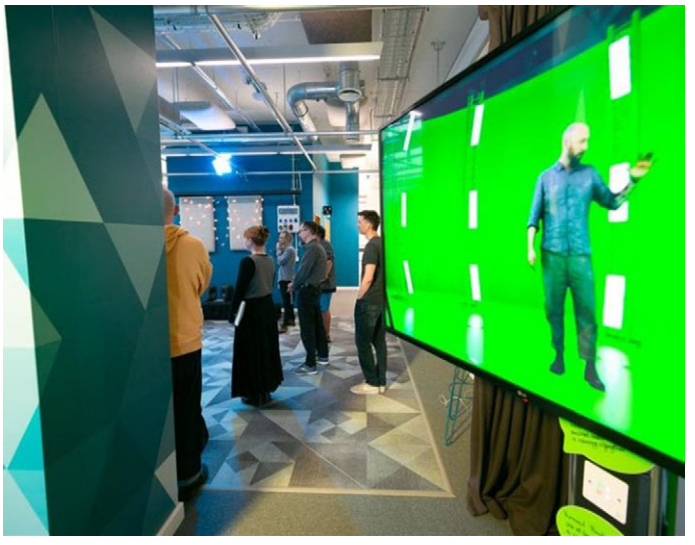

Figure 1. An example of volumetric capture in practice featuring Professor Lee Miller (MP4). Video by Georg Finch, Centre for Blended Realities, Falmouth University. To view the video, please visit https://doi.org/10.1017/pub.2025.10053.

Table 1 Immersive capture technologies and their archival potential, created by the author

	360-degree imagery	3D modelling	Volumetric capturing
Description	Panoramic photos/videos allowing users to look around from one point. Captures a full spherical view from a single location.	Digital reconstruction of objects/environments, creating a synthetic 3D representation.	Records 3D data of a dynamic scene over time using multiple cameras and sensors. Captures real-world geometry and appearance.
Output format	Equirectangular images/videos (often displayed interactively).	Static 3D meshes or models (formats like OBJ and FBX).	4D point clouds (3D + time) or animated mesh sequences.
Captures depth	No inherent depth information in the initial capture. Depth can be inferred/added through techniques such as stereoscopic 360, depth maps, or AI-based reconstruction, but it is not directly captured like in RGB-D or multi-camera volumetric systems.	Yes, the model contains 3D spatial information.	Yes, captures or infers 3D spatial information over time. Some systems use RGB-D sensors for direct depth capture, whereas others infer depth from 2D data using AI or photogrammetry.
Captures motion over time	Sometimes (in video form), capturing a 360° view of a dynamic event (but the environment itself is not changing in 3D).	No, typically creates static representations. Animation can be added as a separate process.	Yes, it is designed to capture and represent movement and changes in the scene over time.
Archival potential	Immersive documentation without inherent dimensionality of the captured environment. Good for conveying the experience of being in a place.	Useful for spatial preservation of static subjects and creating virtual assets.	Captures embodied and temporal qualities, ideal for performative archives, preserving dynamic events in 3D.

Figure 2. Short clip (MP4) from *OverHerd*, directed by Georgia Gendall using volumetric capture, in partnership with the Centre for Blended Realities, Falmouth University. To view the video, please visit https://doi.org/10.1017/pub.2025.10053.

of motion-based and performative archives (Figure 2). As theorist and philosopher Maurice Merleau-Ponty suggests in his concept of lived experience, human perception and understanding are, at their core, physical, and in constant flux, always shaped by our physical and sensory engagement with the world.[1] And volumetric capture—which records objects or humans in three-dimensional space—offers a more immersive approach: it creates a dynamic, 360-degree record of people, movements, and environments, thus embracing the embodied nature of experience that Merleau-Ponty emphasises. This technology complements existing archival practices by offering a different mode of representing human life and action, one that captures its ambiguity through spatial and temporal depth. While this affirms the affective-experiential richness of volumetric data, current limitations in visual fidelity still challenge its archival robustness. Emerging techniques such as radiance field synthesis are increasingly mitigating this, suggesting a future where resolution may catch up with representational nuance.

While Merleau-Ponty's insights on embodiment offer an underpinning for understanding the relationship between body and space in archival practices, they represent just one avenue in a broader scholarly conversation. Contemporary discussions around archives (such as those exploring the forces at play in performance, memory, and digital reproduction) have introduced a range of approaches that expand beyond this framework. Scholars like Sarah Kenderdine have examined the fluidity of archives in motion, whereas Diana Taylor and Rebecca Schneider focus on how performance and bodily actions shape historical memory and archival preservation.[2] Similarly, Hanna Holling's work on conservation and materiality raises important questions about the nature of knowledge and its preservation over time.[3] These perspectives reflect how archival practices are evolving, as a rejection of traditional methods and also as an expansion of what archives can encompass: how they function and what they preserve.

[1] Merleau-Ponty and Landes 2012.
[2] See, for example, Bial and Brady 2025; Hou et al. 2022; Kirsch 2023.
[3] Hölling 2023.

2. From movement to medicine, from critical to democratised archiving

In disciplines such as dance and performance arts, where meaning is often embodied and conveyed through movement, volumetric capture allows for a more multidimensional view of performance. While traditional two-dimensional formats have long been a valuable way to archive these art forms, they can sometimes flatten the complexity and depth of physical expression.[4] Volumetric capture records the full 3D dimensions of movement, enabling artists and performers to revisit and interact with their actions.[5]

Volumetric capture also has the potential to transform fields beyond the arts, such as medical practice, by creating 3D instructional videos that document medical procedures (Figure 3). These recordings allow students, practitioners, and patients to explore anatomical demonstrations from multiple angles, offering a more immersive and accessible learning experience. This shift from traditional 2D visuals to interactive, embodied learning

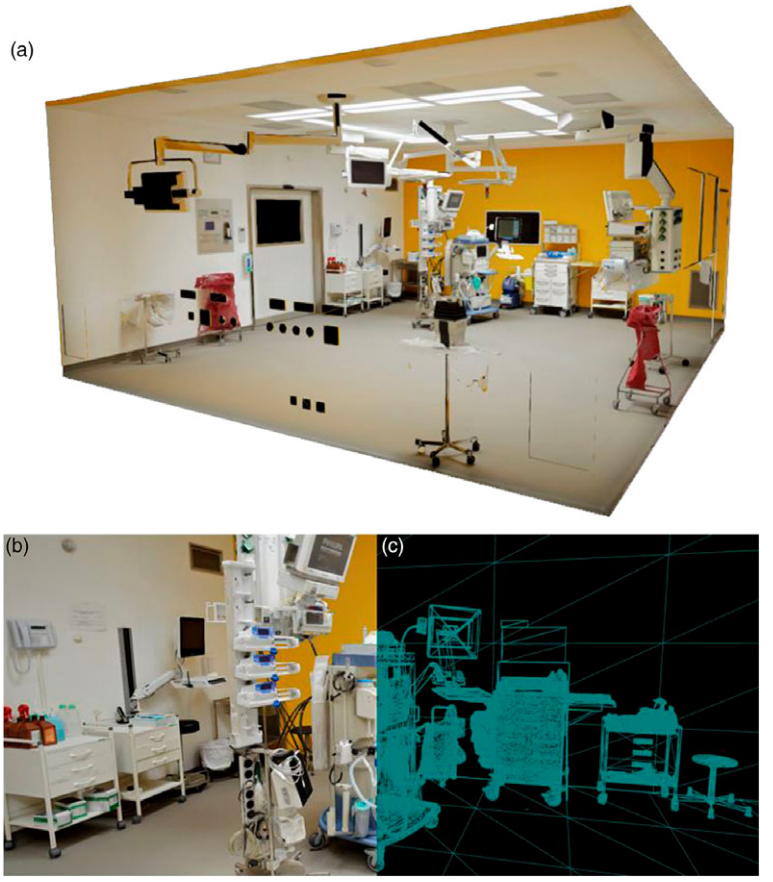

Figure 3. Reconstructed operating room model at Campus Mitte, Charité, Universitätsmedizin Berlin using photogrammetry (a); detailed perspective (b) with wireframe model overlay (c). *Source*: Queisner et al. (2022).[6].

[4] Moss et al. 2024.
[5] Grayburn et al. 2019.
[6] Queisner et al. 2022.

mirrors the hands-on nature of medical practice, and by capturing procedures in volumetric detail, medical archives are evolving into multi-sensory educational tools.

At the same time, this growing use of digital archives sparks an ongoing debate about democratised versus critical archives. Democratised archives refer to the idea that archives should be widely accessible, allowing people to engage with, contribute to, and (re)interpret historical and cultural materials.[7] This approach emphasises inclusivity, making archival resources available to broader audiences and giving more people the opportunity to shape how history is recorded. And critical archives focus on the importance of preserving context, authenticity, and the refined details of the materials being archived. This perspective raises questions about who controls the archival process and how power dynamics shape what gets preserved, who has access, and whose voices are prioritised. In the context of volumetric capture, these debates are relevant as the technology could both democratise access to previously ephemeral performances and challenge traditional forms of archiving by unveiling new avenues for engaging with and interpreting history; however, it also requires careful consideration of how these digital representations are managed, including the technical infrastructures that sustain them.[8] Format standardisation, hardware dependence, and the need for constant maintenance all shape who can access and sustain these archives, often excluding those without the necessary technical infrastructure or skills.

3. Rendering remains: Museums, materiality, and the power to represent

Volumetric capture is also shifting the landscape of archiving in museums. Museums (with their focus on physical objects) can sometimes find it difficult to represent the full richness of cultural practices and environments.[9] Volumetric capture enables cultural institutions to go beyond these limitations by creating 3D models of scenes and objects, allowing for more immersive, interactive representations of history and culture. This technological shift still raises important questions in the ongoing debate between democratised and critical archives as it introduces a participatory mode of storytelling where visitors can explore digital reconstructions of ancient cities or engage with performances from cultures, thus fostering a more lasting connection to the lived experiences of the past.[10]

This shift once again raises concerns about the control of the method of documentation and the governing forces involved in determining which narratives are included and whose voices are amplified. These issues are central to discussions of new materialism for museology and experimental museology, which emphasise the importance of considering the technological, experiential aspects of archiving and also the ethical and political implications of who gets to decide how history is represented.[11] Volumetric capture, therefore, might not serve as a formal replacement, but it could loosely complement existing archival frameworks, offering an alternative means of engaging with cultural heritage that invites innovation and reflection. As such, it underscores the importance of exploring how new archival technologies intersect with existing debates about representation, access, and authority in the preservation of cultural knowledge.[12]

[7] Giglitto 2023.
[8] Giglitto 2023; Humbel 2022.
[9] Karaduman, Alan, and Yiğit 2023.
[10] Bozorgi and Lischer-Katz 2020.
[11] Achiam et al. 2021; Haldrup et al. 2021.
[12] Lischer-Katz, Braggs, and Carter 2024.

Figure 4. A 3D Gaussian Splatting work (MP4) generated by the author during a workshop session led by Han Abbiss using Scaniverse, Centre for Blended Realities, Falmouth University. To view the video, please visit https://doi.org/10.1017/pub.2025.10053.

4. The ethics of capturing flesh and form

Along similar lines within neighbouring disciplines (while not a capture method itself), 3D Gaussian Splatting has emerged as a powerful rendering technique that builds upon the outputs of volumetric capture (Figure 4). It creates detailed 3D representations of spaces and bodies, revolutionising how we experience and interact with physical environments. However, as this technology becomes more widespread, it raises ontological questions about how we represent and "know" people and places. By transforming physicality into digital models, Gaussian Splatting alters the way we interact with the world, creating a new form of materiality that prompts ethical considerations around data sovereignty, ownership, and, once again, access, particularly when capturing intimate human experiences and spaces. Indeed, the emergence of platforms like Niantic's Pokémon Go, which leverages data capture to build a worldwide spatial model, further highlights these concerns.[13] Such pervasive digital representations of physical reality amplify the need to address the ethical implications of how these models are created, owned, and accessed.

Within the auditory arts (as a culturally and historically situated practice), Tia DeNora's work on the embodied nature of musical performance opens up further lines of inquiry by emphasising how music is intrinsically linked to the body's movement and the surrounding environment (Figure 5).[14] Gaussian Splatting allows for the documentation of not only sound but also the physicality of performance (the gestures, body movements, and energy that

[13] Brachmann and Prisacariu 2024.
[14] DeNora 2016.

Figure 5. Visual demonstration of volumetric capture and reconstruction, adapted from Young et al. (2022).

shape the musical experience), and this technological shift could expand on DeNora's concept of music as an embodied experience by offering a multi-sensory, immersive way to interpret and engage with music. However, the ethical and political implications of digitally capturing such intimate, bodily actions raise questions about representational rights, surveillance concerns, and influence over the dissemination of these embodied representations.

5. The future of everything?

Drawing on the work of scholars like Bruno Latour, who explores the entanglement of humans and non-humans in the shaping of knowledge, it invites the question: How does the integration of volumetric capture technology reframe the very nature of knowledge itself? Latour's notion of *actants*—that all entities, human and technological, contribute to knowledge-making—suggests that in observing these developments, we witness not only the evolution of archives but also the transformation of the knowledge-production process itself.[15] By enabling knowledge to exist as a dynamic, three-dimensional experience (rather than as a static document), we are entering a new age where knowledge is no longer confined to the past but is unfailingly reshaped and reimagined in real time.

This potentially brings us to an intriguing question: How will the intersection of human agency and technological innovation redefine the boundaries between the real and the virtual, the tangible and the ephemeral? As Latour posits, we must reconsider what constitutes knowledge in an era where technologies challenge the traditional boundaries of archival systems. With these new tools, can we expand the notion of knowledge to include *embodied* and *interactive* forms of engagement? Volumetric capture is preserving history and also participating in the creation and transformation of knowledge itself. It invites us to reconsider the future of knowledge as one that is participatory, inclusive, and, above all, contingent on the ongoing interaction between humans and

[15] Latour 1996.

technologies. What does it mean for knowledge to be *lived*, not just *stored*, especially as technology enables new sensory dimensions (such as scent) in capturing and presenting experience?

Dr Lance Peng explores marginalised stories through unsettling frameworks like hauntology (Derrida), monster culture (Cohen) and mnemohistory (Assmann), looking at how hidden, forgotten narratives linger, return, invite us to see history, culture and memory in fresh and sometimes unexpected ways. His research is interested not in polished truths but in messy, unresolved knowledges, the kind carried by ghosts, monsters, fragmented memories. For Lance, scholarship is an archive and also a haunted house full of creaks, shadows, whispers and he believes research should embrace this mess because it is in the cracks and glitches that new ways of knowing actually emerge.

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