Storying wild landscapes: Multimodal interactions with digital app-based heritage

To cite this article:

Smith, T.A., Dunkley, R.A. and Jones, S. (2022) Storying wild landscapes: Multimodal interactions with digital heritage, *International Journal of Heritage Studies.*

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Abstract

Digital interpretation in wild and remote landscapes is hugely challenging, yet offers enormous potential for widening access to heritage in these settings. We provide a critical evaluation of the Walking with Romans app, developed by the Brecon Beacons National Park Authority, to interpret two Scheduled Ancient Monuments: Y Pigwn Roman marching camp and Waun Ddu Fortlet (c. AD78). Analysis of digital interpretation has paid less attention to social and multimodal interactions, the spatial experience of digital technologies, and the challenges of achieving successful visits at remote sites. We explore how visitor talk responds to interpretive content while also accomplishing everyday social interactions, such as demonstrating togetherness, by analysing video footage from visits. We find that visitors do a considerable amount of shared work to interpret archaeological features, including the use of talk and other multimodal resources of embodied conduct and the app itself. Visitors demonstrate that terrain underfoot is an important resource for interpreting features and remembering earlier interpretive content. Heritage interpreters could consider how everyday sociability and subtle responses to landscape and terrain are woven into the experience of interpreting landscapes to enhance visitors' experiences of outdoor heritage sites.

Keywords: Digital Heritage; Multimodal; Social Interaction; Remote Landscapes; Roman Archaeology

1. Introduction

Far from its historical rooting focused upon visitor entertainment, heritage interpretation is a practice that 'enriches our lives through engaging emotions, enhancing experiences and deepening our understanding of places, people, events and objects from the past and present' (AHI 2007). Within rural contexts, such as National Parks and nature reserves, interpretative provision can 'strengthen and enrich affective and cognitive relationships between people and park resources' (Goodrich and Bixler 2012, 60). Increasingly, therefore, interpreters in rural contexts have a remit to provide meaningful experiences for visitors while also ensuring the long-term sustainability and aesthetics of the landscapes they are responsible for.

Within this context, digital technologies have made a significant impact on the practice of heritage interpretation. Debates about the influence of digital technologies on interpretation have continued since their introduction to museums. Walter's (1996) characterisation of the Roman Bath's Museum as a 'morgue' after the introduction of electronic guides, based on observing reduced social interactions, and Clew's (1996) response, instead highlighting increased attentiveness to exhibits, enhanced narrative, and tackling exclusions, provide an early example. It is now widely acknowledged that digital technologies can enhance interpretation (Hornecker and Ciolfi 2019), where the sophistication of devices, augmented reality (AR), virtual reality (VR), geo-location GPS, and online 'virtual visits' can address the challenges rural heritage interpretation. Digital interpretation also emerges in response to changing visitor expectations (Baggesen 2019), with knowledge and experiences increasingly acquired through digital media.

Although app design commonly draws on traditional forms of interpretive media, there is considerable creativity in app-based interpretation: AR games (Gottlieb 2018), interactive storytelling (Cushing and Cowan 2016; Kidd 2017), and participatory, citizen-science heritage experiences (Lake 2012). Concurrently, there has been interest in spatialised digital technologies under the banner of 'digital geohumanities' (Crang 2015; Pink and Fors 2017), with a focus on the role of digital objects in the construction of experience (Ash et al. 2018). Notwithstanding the wealth of evidence from museum settings (Hornecker and Ciolfi 2019; Wakkary et al. 2012), and despite the proliferation of heritage apps, evaluative research on outdoor heritage apps remains limited, with notable exceptions (Cushing and Cowan 2016; Kidd 2017; Poole 2017). The development of outdoor, site-specific apps remains expensive, such that extensive piloting and evaluation are often not conducted (Wicks 2015).

Since the introduction of digital technologies to heritage sites, researchers and practitioners have commented on their implications for visitor social interactions, as interpretation moves away from information delivery to promoting participation (Wakkary et al. 2012). In museum settings, it is well-recognised that visiting is often a social occasion: sociability is a core aspect of visitor experiences (Hornecker and Ciolfi 2019). Yet much existing research treats sociability relatively straightforwardly, with only a few studies exploring experiential aspects, such as affective, empathetic and emotional experiences (Gallagher 2015; Poole 2017). Research to date has rarely examined the detailed unfolding of social interactions at outdoor heritage sites beyond noting that visitors tend to desire more opportunities for social interaction (Diaz et al., 2015) or that interviews reveal that social interaction can be promoted around digital interfaces (Economou et al. 2018).

Consequently, here we share findings from an evaluation of an outdoor heritage app titled 'Walking with Romans', which guides visitors around a remote Roman marching camp in the Brecon Beacons National Park. We consider: (1) the role of social and multimodal interactions in visitor experiences with digital heritage and; (2) the challenges of utilising digital interpretation in outdoor, remote sites and the effects of encounters with these challenges upon on-site interpretation. Adapting methods from environmental psychology and ethnomethodological analysis, we examine video footage of visitors. We discuss how visitors talk about heritage across the visit before delving into specific interactions during and after engagement with interpretive media. In doing so, we reflect upon digital apps as a resource to encourage meaningful encounters with landscapes.

2.1 Social and multimodal heritage interactions

The early fixation on the 'digital' in digital heritage interpretation has, in some cases, led to other multimodal visitor interactions being overlooked. Masters (2003) referred to this as the 'what would be cool to do' paradigm, which, focused on the medium of delivery, by-passes interpretative planning. Uzzell (1989, 35) cautioned - 'Does not the power, persuasiveness and significance of the message lie in the story itself rather than the ever more complicated technology we use to communicate it?'

While some argue that there is a lack of evidence to support the 'digital turn' (Rahaman and Kiang 2017), others demonstrate that digital interpretation can promote social interaction. Wakkary et al. (2012), in their *Kurio* project, found that family interactions were promoted through working together to repair a 'time map' in a museum. Economou et al. (2018) found that emotive language used in a museum-based app promoted empathy with characters, and

social interactions were encouraged among visitors who talked about character stories and gathered around screens. Kidd's (2017) digital heritage encounter, *With New Eyes I See*, which utilised outdoor spaces and smartphones, was shown to connect participants empathetically with characters through the intersection of the 'real' and 'virtual'. These studies, however, primarily rely on post-experience interviewing and do not examine interactions as they happen.

'Digital' experiences are not separate from the 'real' environment; they are multimodal in that they take place in 'real' physical environments, with other senses and resources (Kidd 2017), and are produced socially and collectively between visitors (Elwood and Mitchell 2015). Mobile digital technologies have become inseparable from everyday living. GPS tracking, for instance, has become ubiquitous and has a spatial and tangible component, that is, locating oneself on the ground. As such, digital devices become co-constituted in relation to the environment, and their use enables some to become 'newly attuned to the spatiality of their environment' (Pink and Fors 2017, 382). Visitor experiences are embodied, tangible and sociable encounters, and this must be considered within the design process of digital interpretive media.

Over the last decade studies of digital heritage have tended to focus on sociable interactions with digital interpretation rather than more incidental interactions. Visitors can value the 'ambiguity' of heritage features found in remote landscapes when unaccompanied by signage, enabling them to develop their own narratives and speculate (Galani et al. 2011), thereby encouraging sociable interactions. AR games (Gottlieb 2018; Poole 2017) and interactive storytelling (Kidd 2017) are social activities that necessitate interaction, yet these studies have only touched on the depth of interactions that take place with or alongside digital heritage. For example, some have found that avoiding screen-based design can encourage greater

engagement with the environment and other participants (Poole 2017) or that focusing on the purely audio-based interpretation of ruinous landscapes to prevent visual distractions also enhances engagement with the environment (Gallagher 2015). In this paper, we consider how seemingly incidental interactions that might seem ordinary or mundane can be relevant for interpreters and designers.

The detail of group interactions during museum visits (Fukuda and Burdelshi 219) or on guided tours (Mondada 2017) has been a focus of human-computer interaction (HCI) and ethnomethodological studies. They reveal how groups 'accomplish' their visit together and the sequential order of 'doing visits'. For example, individuals are regularly interrupted whilst reading exhibits by those they visit with, yet these interruptions have an essential role in group coherence (Tolmie et al. 2014). A critical tension exists between visiting as a group and the wishes of individuals to engage with interpretive material. A significant research gap emerges concerning how group interactions, physical movements, and engagement with outdoor heritage sites are accomplished simultaneously. Our paper contributes to this gap, illustrating how these tensions change over the course of a visit. We explore how digital heritage encounters 'encourage' social interactions rather than focusing on interactions between people and heritage captured within traditional measures, such as 'dwell time'.

2.2 Interpretation in remote landscapes

Heritage in outdoor, rural and 'wild' sites can prove challenging to interpret. Digital media has the potential to render remote artefacts, sites and landscapes more accessible. Existing studies of heritage apps have focused on urban locations (Gottlieb 2018; Kidd 2017), or within museums (Tolmie et al. 2014). There has been less attention to rural locations, somewhat

surprising given that organisations in rural settings, such as National Park Authorities in the UK, are tasked with offering interactive experiences and interpretation for visitors (Merson et al. 2016). National organisations, such as English Heritage and The National Trust, have developed ‘handbook’ apps, providing basic visiting information (Wicks 2015). Others offer interpretive ‘tours’, such as the app examined in this paper. At a broader scale, apps can be used to share heritage at a distance, through ‘virtual visits’. The Frasan app, which explores archaeological objects from the island of Tiree, in north west Scotland, is one such example (Squires 2014).

One of the under-explored matters of 'access' to outdoor heritage is the navigational challenges for visitors. Although visitors can enjoy the ‘challenge’ of getting lost (Mazel et al. 2012), those whose work is to interpret complex, outdoor sites primarily want visitors to get the most from their visit, and not get completely ‘lost’ in the process. Indeed, the visitor experience model that many interpreters draw on (Brochu and Merriman 2003), advises that visitors’ basic needs must be met (including knowing where they are), before they can be receptive to interpretation. One challenge is the visibility and ‘findability’ of heritage features. Many outdoor and remote sites are not proactively managed, lacking signposting and interpretation boards, in some cases for aesthetic or conservation reasons (Galani et al. 2011). Digital technologies have the potential for enhancing visitation at such sites. Mazel et al. (2012), for example, note that Northumberland rock-art is difficult to see from a distance nor easily noticed ‘close up’, given its location proximate to the ground, often covered by vegetation. Spatially-linked digital media may therefore enhance their ‘findability’. The seasonality of outdoor landscapes, and differences in weather, vegetation and access, may also be important for their ‘ease’ of visitation (McGookin et al., 2017). Few studies have explored navigating remote sites using digital devices, but those that do (Smith et al. 2020) highlight how navigation is only one

task that must be woven into other group interactions. Studies of app-based navigation in urban environments show that groups do considerable work to locate themselves (Laurier et al. 2016). In contrast, in rural spaces, many of the easily-orientable features of urban landscapes are absent. Therefore, the navigation of outdoor heritage sites may play a significant role in the heritage experience.

Despite the benefits proposed so far, some feel that the presence of digital technologies is itself disruptive (Meekins 2007) or may 'upstage' the heritage attraction (Merson et al. 2016). However, visitors are rarely passive recipients of interpretive media and are often engaged in their own critical landscape interpretation. Indeed, audio tours, such as the experimental 'audio drift' developed in Gallagher's (2015) study, blending voice and environmental field recordings and with no 'stopping points' such that visitors 'drift' through the site, can enable visitors to engage creatively through their undirected wanderings. Gallagher argues that this makes walkers 'co-creators' of landscapes, making and re-making paths, rather than following pre-determined routes. If the central tenant of effective interpretative provision is the communication of a story (Tilden 1977), then, as Lorimer and Parr (2014) argue, shared experiences of journeys can work to re-tell stories, highlighting the significance of sociable interactions between visitors, both during and after a journey through landscape, for interpretation. Digital interpretations, like all interpretations of heritage, are forms of storytelling, and we consider later how these stories are 're-told' by visitors.

We have thus far discussed two under-explored topics: the social and multimodal interactions that occur around digital interpretation; and the challenges of digital interpretation in rural, wild, outdoor sites. We now describe the methods of our study.

3. The 'Walking with Romans' app

The heritage app that is the focus of this paper, titled 'Walking with Romans' (WWR), was developed by Living data @ mclays for the Brecon Beacons National Park Authority in 2013. The app was delivered as part of Cadw's Heritage Tourism Project, funded by the European Regional Development Fund through the Welsh Government. It was awarded a Discover Heritage Award from the Association for Heritage Interpretation in 2015. The project aimed to encourage visitation and improve visitor experiences at two remote, lesser-visited Scheduled Ancient Monuments: Y Pigwn Roman marching camp and Waun Ddu Fortlet, built circa AD78.

Interpretation at the sites is challenging: the archaeological features of the earthworks are difficult to distinguish in the upland moorland vegetation; the camp is large in scale but difficult to view from a single spot; and 'reading' the physical landscape is complicated by more recent tilestone quarrying. The interpretive planners felt that panels would be intrusive, whilst the remote location was also challenging. An interactive app was chosen to overcome these challenges, providing pre-visit information, navigational assistance, a guided tour (including an audio-narrative and animated reconstructions), and follow-on information for other Roman sites. The tour uses digital mapping from Google Maps with a custom overlay of archaeological features (figure 1). Visitors follow their location with a GPS 'you are here' dot on the map. As they progress, they activate audio and video content at 18 points. Professional scriptwriters developed the conversational audio script in conjunction with input from Roman military historian Dr Kate Gilliver at Cardiff University. The humorous script features exchanges between a local guide, 'Rory', in the present day, and 'Primus', a Roman soldier who appears as a ghost and gives first-hand insights into campaign life and camp building. There are

computer-generated video reconstructions of the camp at several locations and 360 panoramic photographs.

Quantitative data was collated by the developer showing downloads and on-site use. These data showed increasing site access: from 03/2014-11/2015, there was, on average, one app use on-site per day, a significant increase in visitation. From 2013-to 2015, there were just under 5,000 downloads across 43 countries, indicating that 'virtual visits' were taking place.

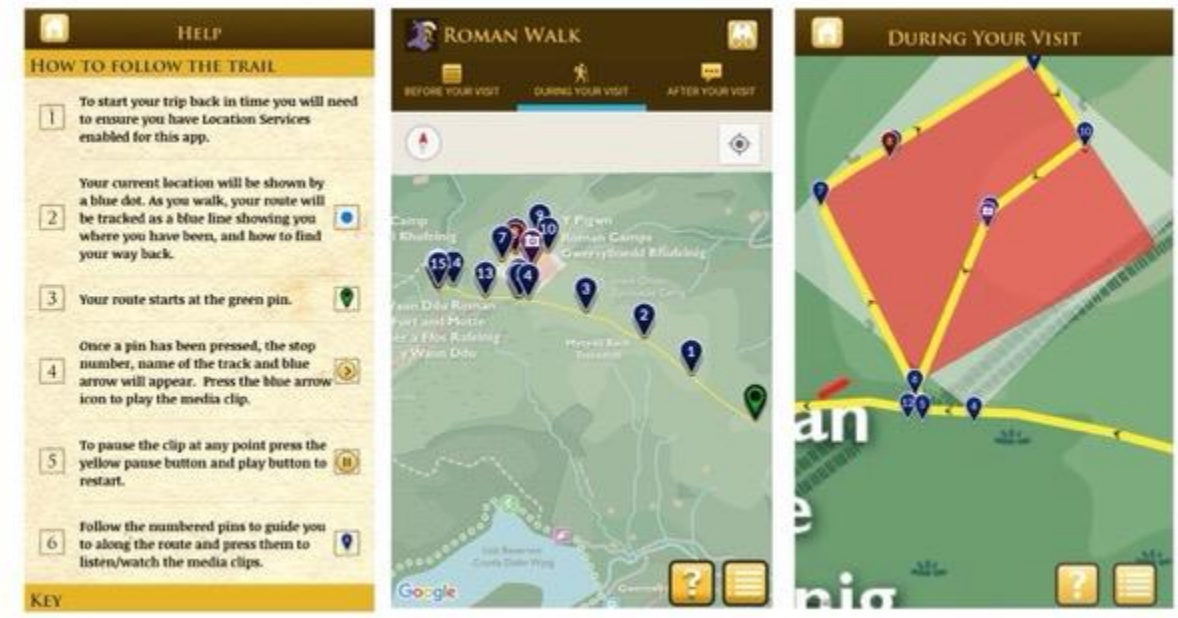

Figure 1: Screenshots of the WWR app: [A] Instructions with 'you are here' dot; [B] Overview map, with audio and video stops; [C] Detailed view of Y Pigwn camp.

4. Methods

There have been calls for methods to explore the interface between people, technologies and landscape in non-deterministic ways (Ash et al., 2018). This study aimed to understand experiences with the WWR app, without pre-determined expectations of what they would look like. Previous qualitative studies of digital interpretation have relied on post-experience

questionnaires and interviews (e.g. Poole 2017). However, post-experience methods show that visitors often do not recall details of interactions (Merson et al., 2016). Our study employed the filming of visitors and recording GPS traces, followed by post-experience interviews, although the interviews are not reported in this paper. We recruited eight groups of between 2-4 participants to trial the app. Seven of these groups were adults of different ages, whilst one group was a family with small children. The family is excluded from the data, as their visit differed significantly in format. All participants are anonymised in this paper. Each group was equipped with on-body video cameras worn on chest-harnesses, enabling filming without the researchers present. On-body cameras shoot in a torso-facing direction and do not always capture the faces and bodies of participants. Therefore, we are not "looking through their eyes or feeling with their bodies" (Pink 2015, 250) but gaining a different perspective from a researcher-held camera position. The groups took between 2-4 hours to complete their visits, generating over 24 hours of video footage.

Using video enabled us to capture and re-watch the detail of interactions without the researcher being 'distracting'. Whilst it is commonly assumed that cameras influence participant conduct, participant 'reactivity' is often very minimal (Heath et al. 2010). We found that participants quickly 'relaxed', only on rare occasions acknowledging the camera. That the camera can be 'forgotten' carries ethical risks, including revealing confidential information (Wilson 2017) and risks to third parties unknowingly recorded (Shipp et al. 2014). Participants were trained in camera etiquette, including switching cameras on and off and footage with confidential information deleted.

Our analysis adopts two approaches: an evaluation of conversations during the entire visit, adapting studies in environmental psychology, and detailed analysis of events adapting the

techniques of ethnomethodology and conversation analysis (EMCA). Previous studies of interactions in natural environments have measured the 'quality' of conversations through analysis of turn-taking, length of communications, and responsiveness (Cameron-Faulkner et al., 2018). Others have counted the number of contacts between interpreters and visitors (Merson et al. 2016). Our study adopts a half-way approach: given the duration of our corpus of footage, fine-grained analysis of meaningfully linked conversational turns was beyond our study. We focus on the number of new talk 'episodes' over the visit and code the overall content of these episodes.

All video data was watched and transcribed. Each talk episode was qualitatively assessed for its primary topic, whilst making no distinction between conversations of different lengths, effectively cataloguing each episode (Heath et al. 2010). We developed an iterative and emergent coding system to assign to each episode (Hepburn and Potter, 2021). This coding system was formulated around the extent to which conversations were linked to the interpretation of the heritage features and those that were not. This analysis provided a cumulative overview of how the talk was related to the interpretive content throughout the visit.

In addition, we examined sequences of conversation and action in depth, with particular sequences transcribed in detail, following conventions of EMCA analysis (Heath et al. 2010). This analysis focuses on the detailed sequential organisation of embodied actions and talk. We identified 'fragments' of video footage, which exemplified the codes between 10 minutes and 30 seconds. The researchers then re-watched these fragments multiple times to explore how, for example, participants responded to interpretive content, identified archaeological features, struggled with navigation, or conducted everyday conversations. We present examples of this analysis below, adapting the comic-book presentation style of Laurier (2014). These graphic

transcripts have the presentational advantage of integrating video images and audio, rather than situating transcripts and video extracts side-by-side. They can be used to sensitise readers to the timing and spacing of spoken words and embodied practices, although they lose some of the precise timing of transcripts (Laurier 2014).

For both approaches, there are limitations to what can be assumed from observable behaviour (Clews 1996). Following principles of EMCA, we do not assume that from observable behaviour, we can know what participants 'think'. Instead, this technique reveals how participants publicly make available their troubles, display and respond to emotions, and orchestrate interactions in-the-moment (Hepburn and Potter 2021).

5. Analysis: Talk across the Journey

The coding structure for episodes of talk is outlined in table 1. Each code represents an emergent talk-type found to be repeated across the groups.

Table 1: Coding Structure

Type	Code	Description
Roman-Relevant Talk	**Ra**	Relevant talk during audio/video clip playback
	Rc	Relevant talk not during playback referencing last clip played
	Re	Relevant talk not during playback, not specific to last clip
	Rp	Relevant talk not during playback linked to past clip – but not most recent clip
	L	Laughter during playback
	Mm	In-audio/video short remark or responsive 'Mmm'
	T	Read out title of audio/video clip
	O	Discussion of other app feature (not audio playback – e.g. 'dress your Roman')
Nav. Talk	**Nv**	Navigational talk
Unrelated Talk	**Ru**	Unrelated talk during audio/video clip playback
	Nr	Unrelated talk: any other time
	F	Talk related to app functions (e.g. problems and errors)
	A	Talk commenting on the App (e.g. evaluative)
	Sp	Talk related to spotting something of interest in the environment
	B	Talk related to bog or natural obstacle / feature

We divided our codes into three talk-types: (1) Roman-Relevant talk; (2) Navigational talk and; (3) Unrelated talk. Roman-relevant talk encompasses all conversations related to the interpretive app content. Navigational talk was significant and warranted its own category. 'Unrelated talk' included any conversations not related to the interpretative content.

Episodes of talk for each code were tallied for the 18 tour stops (figure 2). All talk episodes occurring between the playing of a clip (e.g. clip one) and the playing of the next clip (clip two) were allocated to the first (clip one), as Roman-related conversations primarily referred to the previous clip. NB: distance on-the-ground between each stop is not consistent, although some are evenly spaced (figure 1). All seven groups visited stops 0-12, but only four groups continued to the fortlet and stops 13-17.

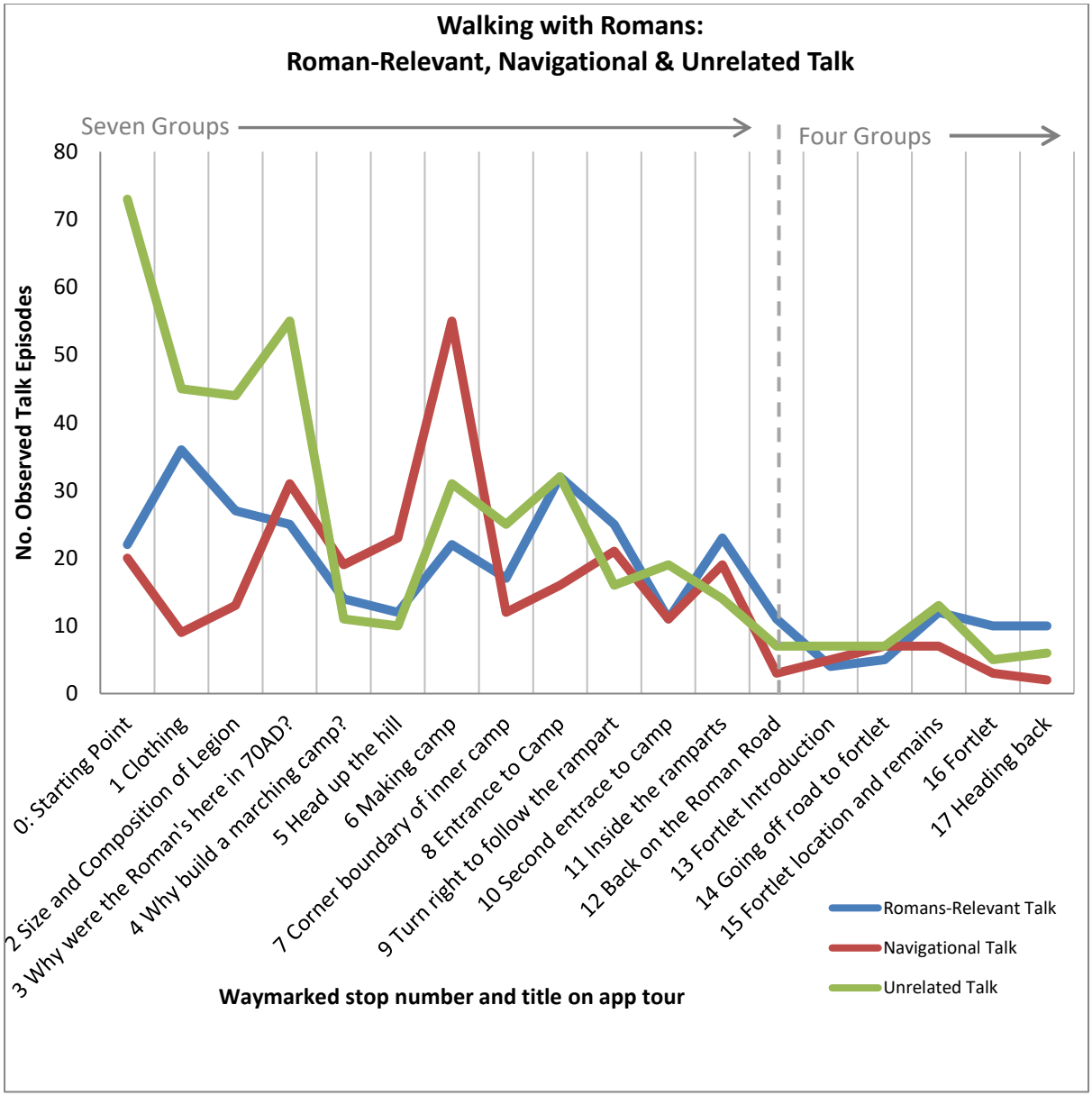

Figure 2: Observed episodes of talk during the WWR tour

We are mindful that figure 2 should not be over-interpreted as illustrating relationships between interpretive content and talk episodes. Instead we view it as offering a 'way in' to where conversations take place, whilst considering the ebbs and flows, or peaks and troughs in conversation (Lorimer and Parr 2014) in relation to the interpretive content, and journeys taken through the landscape.

There are some opening observations we make from figure 2. First, talk types are not mutually exclusive: talk related to the interpretive content does not 'displace' unrelated talk as visitors engage with the app, or struggle with navigation around the site. Certain talk-types are more prevalent at different stages of the tour. Talk unrelated to the interpretive content dominates at the beginning as our participants set out along the track to Y Pigwn, receding as participants progressed to stops three and four. However, this is not associated with increased Roman-relevant talk, i.e. non-relevant talk is not displaced by a sudden interest in the interpretive content. Instead, all talk types are relatively low at stops three and four. Roman-relevant talk also ebbs and flows as the journey progresses, with more relevant conversations at stop one, less at stops three and four, high again at stops eight and eleven. These last two stops include CGI-reconstruction videos, and stop eight is a striking archaeological feature of the camp: a Clavicula, or curved rampart of the camp entrance. Other studies suggest that visitor attention can be focused on well-timed revelations or archaeological 'reveals' (Merson et al. 2016). Our data illustrates that the additional digital interpretation at these stops appeared alongside more talk episodes about Romans. However, relatively high Roman-relevant talk at stop one was not linked to any 'revelation', but instead may be due to the presence of an interpretation panel at the carpark, or may reflect heightened interest on setting off.

That mundane conversations occur alongside heritage-relevant ones is unsurprising; we might expect similar findings when visitors use traditional media. Significantly though, digital screen-based media does not stifle sociable conversations as previously assumed (Gallagher 2015; Poole 2017), even at its most engaging. Greater interest in the interpretive media does not come at the expense of other conversations. Instead, talk begets talk, even in the presence of eye-catching digital media, such as the CGI-reconstructions at stop eight. These data show that sociability is not just visitors talking and interacting with each other (Wakkary et al. 2012),

there are different foci to sociable interactions that come and go during the visit, as might be expected. Yet, significantly these ebbs and flows are spatially mediated. Figure 2 illustrates precisely where such talk types occur. For interpreters, this may be significant in identifying how the spatial features of outdoor heritage sites mediate the flow of talk.

Relatedly, talk relevant to navigation of the site was significant. Although we discuss navigating the site elsewhere (Smith et al. 2020), in figure 2, navigation becomes prevalent around stop six. At stop five, visitors must leave a track, heading out onto the open moorland with limited paths, using the app map as a guide. In group GPS-traces (figure 3), all but one group heads in the wrong direction before correcting their course. It is perhaps not surprising then that there is an increase in navigational talk at stop six and after. However, with most groups 'off course', this does not preclude other talk-types occurring. Significant for debates about digital tools for interpretation outdoors, whilst the app enabled our groups to find otherwise well-hidden archaeology, it did not completely resolve the problems of rural navigation; 'attunement' to the spatial environment (Pink and Fors 2017) required work between participants, evidenced by their increasing navigational talk. Equally, our findings question the 'basic needs' argument of heritage interpretation (Brochu and Merriman 2003); even when we see high levels of navigational talk, Roman-relevant and unrelated talk do not stop. Visitors can still be receptive to, and discuss interpretation even when off-course.

Figure 3: GPS traces of all participant groups, with stops 4-6 on the app tour highlighted.

We now explore three episodes from our participant's journeys, to demonstrate how the trends we identified played out during the visit. We begin with an example of talk occurring whilst the audio content is playing (codes Ra, L and Ru). Second, we examine Roman-relevant talk after viewing the video content at stop eight, at the Clavicula (codes Rc and T). Finally, we turn to how participants remembered and talked about stops earlier in the tour (Rp).

5.1 Talking during an audio clip

Few studies of heritage interpretation have examined how group interaction, embodied experience, and engagement with heritage is accomplished simultaneously. In our first example, we join Ralph and Phoebe as they play audio clip four, titled 'Why build a marching

camp'. Figure 4 features conversational extracts as they listen to the audio, although note these are not sequential extracts and provide a 'simplified' transcript.

Figure 4: Ralph and Phoebe listen to clip 4

Figure 4 contains interactions between Ralph and Phoebe whilst listening to the audio. In box one, both laugh at a joke in the audio commentary, which we code 'L'. Although a relatively mundane exchange, it demonstrates a joint orientation towards listening and responding to the audio content: through shared laughter Ralph and Phoebe demonstrate to each other that they are listening. We see across our data that this 'joint laughter' is common in response to the interpretive audio, and is significant for maintaining 'listening together'.

Shortly after, in box two, Phoebe, looking down at her calf, utters a moderately disgusted 'urgh', to which Ralph replies promptly with 'you alright?' Phoebe's reply, 'I've got sheep poo

on my leg', accompanied by a 'smile-tone' to her voice (Stokoe 2018), clarifies that her original 'urgh' was not serious; Richard laughs in response. We code this 'Ru': talk unrelated to the interpretive content during playback. Although we do not know if they are still attending to the commentary, box two does tell us something about what listening to audio content can do. Ralph and Phoebe are stationary: they choose to stop and listen before moving on. We found our groups split between those who stopped and those who continued to walk and listen. Stopping whilst listening provides time for Phoebe to 'notice' the poo and for Ralph to demonstrate a 'caring' response. Ralph and Phoebe are a couple, and small exchanges like this, occurring whilst stationary and listening, afford various opportunities to show care and companionship. If Ralph was intent on listening to the commentary, we might expect him to treat Phoebe's 'urgh' as an unwelcome interruption (Tolmie et al. 2014). Instead, the interruption is treated as an opportunity to display a caring disposition. Here, participants prioritise maintaining their group (and relationship) coherence, over listening carefully to the commentary.

Moments later, their attention returns to the interpretive audio. In box three, the commentary '*there's evidence of two distinct marching camps at Y Pigwn alone'* is followed by Ralphs' question 'where's Y Pigwn?'. Phoebe responds: 'er', looking over her shoulder in the direction they will eventually be going. In box 4, seconds later, the commentary provides an answer: on the app map, the '*two coloured-in shapes…show the areas covered by the two camps'*. Ralph's 'oh' is a 'change of state token' (Heritage 1984), about the map. Ralph follows this with 'the pink and the (.) white', pointing to the screen, whilst Phoebe produces a confirmatory 'Uh-hmm'.

Ralph's 'pink and the white' are the outlines of the Roman camps as depicted on the app (figure 1[C]). The audio commentary is also a guide to the app's functionality, playing a dual role: interpreting the heritage landscape, and interpreting the digital media, producing 'reveals' (Merson et al. 2016) about the interface. Ralph's response also demonstrates two problems: (1) they reached stop four without knowing where the first camp is, and (2) they do not yet fully understand the features as represented on the map.

There are a range of 'motivations' for visiting heritage sites beyond learning about heritage (Galani et al. 2011): we have illustrated how sociability and togetherness are achieved whilst listening to interpretive content. At the macro scale, across the journey (figure 2), non-relevant talk and interpretation-relevant talk occur together. Ralph and Phoebe show how interactions with interpretive material are sequenced with social interaction. Listening presents opportunities to demonstrate togetherness and caring, to notice problems, discover problems ('where's Y Pigwn?'), and develop understandings of digital material. In the next section, we explore how participants engaged with archaeological features.

5.2 Jointly-accomplishing interpretation of subtle archaeology

Participants most frequently discussed commentary or CGI-video reconstructions immediately following listening or watching. Sixty-one talk episodes were associated with the last clip ('Rc'), compared to 49 Roman-relevant conversations not linked to any clip ('Re'), and three episodes linked to a clip further back in the tour ('Rp'). Although there has been much discussion about the diversity of interactive digital heritage experiences (Poole, 2017), as we saw in section 5.2, exactly when visitors respond to interpretation can affect their developing understandings over a visit. In the following example, Aiden and Brad watch the CGI-video

reconstruction of the camp entrance at stop 8 (figure 5), associated with considerable Roman-relevant talk (figure 2), where the curved clavicula earthwork is one of the striking tour features.

Figure 5: Aiden and Brad watch the animation at stop 8 (NB: this transcript is abridged)

In boxes one and two, Aiden does what we code 'T': he confirms the stop number and reads the title to Brad. This occurred 40 times across our groups. Aiden holds the device, assuming primary responsibility for its operation, and reading the title communicates the progress of the route. Aiden 'tips' the screen towards Brad (box two), at the moment where viewing the screen together is important for the 'next thing'. This role-taking is important for groups undertaking heritage tours, as Laurier et al. (2016) also demonstrate using map-apps in urban settings, where the member holding the device produces accounts of route progress for others. For

heritage interpreters, this suggests that titles are a critical way of communicating to others group members where they are, and what will come next.

Having watched the video, from boxes three to five Brad attempts to explain the feature, seemingly drawing from prior knowledge of Roman warfare. He gestures to demonstrate how Roman soldiers shot arrows through the gateway (box three), then acts as a defending soldier, telling Aiden, 'You'd have soldiers here blocking the gateway'. Brad walks to the earthworks (box five), and Aiden joins him. Aiden gestures to the clavicula, stating, 'yea, like the features very obvious'. Here, we see something common across all groups, a joint, embodied action to 'do' interpretation, or make sense of together, the relevant features. We code this 'Rc': discussions linked directly to prior content. Whilst some discussed the feature at a distance, others, like Aiden and Brad, walked around the feature whilst discussing its purpose, making sense of the feature for each other.

The WWR app deploys 'traditional' interpretive techniques: audio guides and video reconstructions (Elwood and Mitchell 2015), if spatially linked through the digital map. However, visitors must interpret the site themselves because there is no human guide. The individual aptitudes of visitors, therefore, have a crucial role. Brad appears to grasp how the video reconstruction is linked to the archaeological feature and Roman warfare before Aiden. In terms of sharing responsibilities for interpretation, we see a flip between Aiden reading the title (box two) to Brad taking the lead doing embodied interpretation for Aiden (boxes three to four).

Although Aiden indicated a new understanding of the feature in box five, he expresses uncertainty again in box six and decides to re-watch the video. As he watches again, he walks

onto the clavicula. In box seven he stands on the clavicula with Brad behind him. Aiden 'tips' the device towards Brad, and as the video plays, he makes two incomplete attempts to describe the earthwork. Eventually, he completes his turn to identify that 'we're literally standing where the video is now', gesturing along the rampart, pausing on their position. In box eight, he makes a second alignment between the video and their position: 'where the spikes are an' stuff', referring to the 'spiked' defences on the clavicula depicted in the animation. Finally, in box nine, Aiden turns to face the camp entrance (where Brad stands in box four) and produces a 'change of state' token, 'o::h kay' before describing that in his new facing direction, he would be looking 'inside the camp'. As Aiden replays the video in this sequence, he repositions himself, then orientates to the archaeological features, a series of moves that enables him to better grasp the archaeology. It also suggests that, despite Brad's earlier efforts, Aiden did not understand the alignment between feature and interpretive content the first time and needed to do his own alignment work.

Others have noted that visitors are not 'passive' (Waterton and Watson 2013) and may value the 'ambiguity' of limited signage to develop their own narratives (Galani et al. 2011). Aiden and Brad negotiate the site's ambiguity through embodied, mobile interpretation, accomplished together. Although some digital heritage design has avoided screen-based displays over concerns that they detract from the landscape (Poole 2017), here, mobile, screen-based video enhances the visitors' ability to 'see' and interpret a challenging site. There are also concerns that digital interpretation 'upstages' the attraction (Merson et al. 2016). In this example, a more nuanced picture emerges, where viewing digital media is carefully sequenced alongside embodied site exploration and enhances understanding through positioning the media relative to visible features. Unlike static signage, visitors can position and repeat the media to enhance their spatial understanding. Aiden and Brad use the video to 'orientate' to the feature, not

dissimilar to how mobile digital maps are used to orientate to city environments (Laurier et al. 2016). This example gives a sense of why digital heritage interpretation, alongside the feature, leads to higher 'Roman-relevant' talk than observed at other stops.

5.3 Remembering an audio clip from earlier in the tour

Writing on digital geohumanities draws attention to the spatial experience of technologies in landscape (Crang 2015; Pink and Fors 2017). Thus far, we have discussed how digital interpretive media are woven into social experiences and the untangling of an archaeological feature. Next, we see how landscape experience can promote remembering interpretive material from earlier in the visit. We observed three such 'rememberings' in our data. Despite their rarity, they may have significance for interpreters. We re-join Ralph and Phoebe later in their visit, walking up a hill to stop 11. In this figure, we transcribe the whole sequence.

Figure 6: Remembering Roman clothing

Prior to box one, Ralph takes laboured steps through tussocky grass. He states his walking difficulties to Phoebe, who completes her turn-part in agreement. Ralph begins a second turn, making a joke about the Romans keeping the grass 'mowed down'. Phoebe does not return with laughter, instead asking a question about Roman footwear. The question is generally posed before being quickly repaired and re-framed as 'did they wear those wee leather slippers?' Ralph's reply seems grammatically formal ('were you not listening') but is delivered with a 'smile-voice' that continues the good-humoured tone from box two. Ralph references an earlier clip where the Roman character wore leather sandals, producing a confirmatory answer to Phoebe's question. Ralph uses Phoebe's lack of 'listening' to poke fun at her. Phoebe's drawn out 'Ye:a' has a tone that accepts this accusation with a 'smile-voice'. Both then remark on the likely consequences of Romans wearing leather sandals, 'up to their ankles in mud', and 'y' toes would fall off' in winter, a completing-remark on the harshness of the landscape.

Prior listening can be returned to later if the content becomes relevant. Studies of guided museum tours show how participants draw on prior learning to make sense of new objects (Fukuda and Burdelski 2019). In our example, the embodied experience of landscape, Ralph's difficulties walking through tussocky grass, prompts a conversation where remembering earlier content about Roman footwear is relevant. The relationship between terrain and interpretive rememberings is reciprocal, not dissimilar to how Lorimer and Lund (2008) find that environmental features demand a halt for walkers, such as hill summits. The affective experience (Gallagher 2015; Poole 2017) of moving through the vegetation underfoot, prompts a remembering of Roman footwear. Equally, the app prompts Ralph and Phoebe to walk this

way and earlier informed them about Roman clothing, putting into relief their experience of the landscape. This suggests that digital heritage, situated in the mobile landscape experience, plays an informative role in perceiving that landscape and the experience of walking through it. Ralph and Phoebe also demonstrate how this 'sense' of the physical environment ('hard going', muddy, cold) is produced socially (Elwood and Mitchell 2015). Through joint-production of affective experiences of landscape, they also produce a space in which interpretive content is remembered and a joint-understanding of the difficulties Romans faced traversing this landscape.

6. Conclusions

We have viewed digital heritage as embedded within the everyday, mundane and seemingly 'incidental' sociable interactions. Heritage interpreters and digital content designers may benefit from a nuanced understanding of how digital heritage encounters are woven into sociability. We find talk-types linked to interpretive content, and talk-types that are not, do not 'displace' each other. Mundane sociable interactions are sequenced between and alongside engaging with interpretive media. Visitor motivations extend beyond 'learning' to various sociable reasons (Galani et al. 2011), and we have demonstrated that these 'mundane' interactions are significant for achieving visits together. Non-relevant interactions are not necessarily treated as interruptions, as others suggest (Tolmie et al. 2014). Instead, they can be opportunities to show care or 'togetherness', relevant for successfully doing the visit and sustaining relationships beyond the visit. Therefore, the sociable work of visiting together must be woven into heritage encounters. That our participant's discussions concerning the app narrative were not diminished by navigational discussions, or other irrelevant conversations meant that users could still be receptive to interpretive media.

Embodied and multimodal encounters with digital heritage and landscape have also been highlighted as significant. Digital interpretive material can promote embodied interaction as-done-by visitors. Aiden and Brad's response to the clavicula and video material comprises various multimodal resources: gestures, movement around the feature, and sharing the screen. These responses point to how mobile digital media 'attunes' visitors to the environment (Pink and Fors 2017), but this 'attunement' is a shared accomplishment in response to each other's embodied conduct as much as to landscape and digital media. Embodied device use should not be overlooked. Screen-sharing, tilting the screen and aligning bodies, and screen positioning in alignment with landscape features, are critical. Embodied conduct integrating the device does the work of interpreting the archaeology and does social work, displaying 'togetherness' when screen-sharing, and demonstrating the accountability of different roles, such as leading the group through holding the device. Heritage app developers might be more conscious that mobile apps are likely to be shared amongst a group, unlike audio tours in museum settings. One individual is likely to direct and curate the interpretation for the group. This could be welcomed: it provides opportunities for groups to share knowledge of events being interpreted. Non-digitally mediated visits may equally promote sharing, yet we have demonstrated that digital media does not stifle these possibilities for sharing and sociability as previously assumed and may, through the diversity of spatially-linked media they display, significantly enhance landscape interpretation.

The WWR app successfully enables visitors to interpret subtle archaeology and access a remote site. Using mobile video footage enables detailed study of the challenges visitors face in interpreting a complex site, situating these challenges in the context they are encountered. Far from 'upstaging' the archaeology (Merson et al. 2016) or proving a distraction (Gallagher

2015), the coupling of audio and video with a mobile device enabled participants to decipher subtle features through re-positioning the device, 'watching again', and listening to audio which explained the app's functionality alongside interpretation. Although the app provides a somewhat linear narrative, our participant's readings of the landscape were not always linear. A pair recalled earlier content about Roman footwear as they stumble on rugged terrain. As Ingold (2004) argues, we are in touch with our surroundings through our feet, and what is underfoot may be just as crucial for prompting engagement with heritage as what can be registered through other senses. Just as shared journeys can act to re-tell stories, the walking terrain can prompt re-telling. These re-tellings of remembered interpretation bring new perspectives on landscape, just as the experience of that landscape seems to usher in the remembering.

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