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Published in:

International Journal of Human-Computer Studies

DOI (link to publication from Publisher):

[10.1016/j.ijhcs.2011.02.002](https://doi.org/10.1016/j.ijhcs.2011.02.002)

Publication date:

2011

Document Version

Early version, also known as pre-print

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Bidwell, N. J., Winschiers-Theophilus, H., Kapuire, G. K., & Rehm, M. (2011). Pushing Personhood into Place: Situating Media in the Transfer of Rural Knowledge in Africa. *International Journal of Human-Computer Studies*, 69(10), 618-631. <https://doi.org/10.1016/j.ijhcs.2011.02.002>

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Int. J. Human-Computer Studies ■ (■■■■) ■■■–■■■

International Journal of
Human-Computer
Studies

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Pushing personhood into place: Situating media in rural knowledge in Africa

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Received 3 March 2010; received in revised form 15 January 2011; accepted 6 February 2011

Communicated by S. Wiedenbeck

Abstract

Designing interactions with technologies that are compatible with rural wisdom and skills can help to digitally enfranchise rural people and, thus, contribute to community cohesion in the face of Africa's urbanization. Oral information has been integral to rural identity and livelihood in Africa for generations. However, the use of technology can inadvertently displace the knowledge of communities with practices that differ from the knowledge traditions in which technology is designed. We propose that devices that are sensitive to users' locations, combined with platforms for social networking and user-generated content, offer intriguing opportunities for rural communities to extend their knowledge practices digitally. In this paper we present insights on the way rural people of the Herero tribe manage information spatially and temporally during some of our design activities in Namibia. We generated these insights from ethnography and detailed analysis of interactions with media in our ongoing Ethnographic Action Research. Rural participants had not depicted their wisdom graphically by photography or video before, rarely use writing materials and some cannot read. Thus, we gathered 30 h of observer- and participant-recorded video and participants' interpretations and interactions with thumbnail photos from video, photography and paper. We describe insights into verbal and bodily interactions and relationships between bodies, movements, settings, knowledge and identity. These findings have made us more sensitive to local experiences of locations and more aware of assumptions about space and time embedded in locative media. As a result, we have started to adopt an approach that emphasizes connectors rather than points and social-relational and topokinetic rather than topographic spaces. In the final section of the paper we discuss applying this approach in design by responding to the ways that participants use social relationships to orient information and use voice, gesture and movement to incorporate locations into this "dialogic". In conclusion we outline why we hope our reflections will inspire others to examine the spatial, temporal and social affordances of technologies within the bonds of rural, and other, communities. © 2011 Elsevier Ltd. All rights reserved.

Keywords: Traditional Knowledge; Rural; Africa; Spatial; Temporal; Locative Media; Topokinetic; Topographic

1. Introduction

Designing locative interactions compatible with rural wisdom and skills may contribute to community cohesion in the face of Africa's urbanization and to bridging the digital divide for 200 million rural Africans. For

generations oral information transfer, contextualized in material settings, has sustained the identity and livelihood of Africa's rural communities. We propose that devices that are sensitive to people's interactions in their specific rural environments may offer new opportunities for communities to practice knowledge from animal husbandry to plant use. Here, we reflect the ways that people manage locational information in interacting with audio-visual media within our design endeavors in Namibia.

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We seek ways to combine locative devices, such as GPS, 802.11, Bluetooth and RFID, with platforms for social networking and user-generated content (UGC), which can enable rural communities to extend their knowledge practices digitally. Thus, this paper aims to motivate further research on technologies to support spatial, temporal and social aspects of knowledge practices in digitally sparse, ‘underdeveloped’ settings.

We start by proposing that technologies may foster community cohesion for the Herero, a tribe that constitutes 9% of Namibia’s population, by better matching rural knowledge practices. Then, we discuss political, social and cultural factors that can cause knowledge loss when communities use technologies designed within knowledge traditions that differ from their own. Next, we describe methods to gain insight into interactions between rural knowledge practices and audiovisual media. We summarize our use of ethnography and our analyses of observer- and participant-recorded video and participant interpretations. These methods revealed a rich set of relationships between speakers, listeners, artifacts, settings and movements in knowledge practices and verbal and bodily interactions with media. Such relationships and interactions conflict with common strategies for locative technology. Thus, we conclude by describing how we sensitize design to locative aspects of rural Herero’s knowledge practices.

1.1. Technology, rural wisdom and cohesion for the Herero

Namibia’s unbuilt, semi-arid landscape profoundly influences tribal and national identity and concerns for habitat, food production or nature tourism. Namibia has a very low population density but has rapidly urbanized with a doubling of the population around the capital in a decade. Rural-to-urban migration constitutes half of this increase but is characterized by continuities between migrants and their origins (see Kok and Collinson, 2006; De Bruijn et al., 2001). Most rural–urban migration aims to improve conditions for their origin households or save money for rural homes or livestock; so migrants live in low-budget settlements, like Katatura, often with relatives, and return home when affordable. Continuities with rural origins enable urban migrants’ survival; for instance, 60% of households in Katatura receive farmed and wild foods via rural contacts (Frayne, 2005).

Paradoxically, continuities between Namibia’s 0.8 million urban and 0.8 million rural residents also disrupt the knowledge traditions that underpin rural cohesion in at least two ways. First, rural and formal knowledge systems are geographically polarized (Van Harmelen, 2004). Formal education is compulsory until 13-years of age but is often unavailable in rural areas; indeed, nearly 60% of households in rural regions populated by Herero are more than 3 km from a secondary school. Rural habitats structure learning for the 12–25% of rural residents who never attend school, but less so for those in formal

education who must live away from home (Rumble and Koul, 2007). Second, ungrounded in the details of everyday rural life, an urban migrant’s identity and connection to rural habitat is shaped by globalization and urban–rural power-relations. When migrants return from the city they re-contextualize rural practices, such as by traveling in vehicles, not on horseback; listening to a radio, not a storyteller around the fire or by keeping more livestock than before.

Combinations of spatial technologies, platforms for social networking and UGC may offer opportunities for rural knowledge to connect communities by linking remote people and joining co-located with non-located networks. Examples of projects aiming to connect rural people have involved people in Mexico, who used a virtual room to collaborate and share expertise across a tribal network (Williams et al., 2003); indigenous women in Australia, who use a clan-based online social network to share stories geographically, (Bidwell and Hardy, 2009) and UK residents, who contribute geo-tagged photos to mash-up multiple photos at a rural event (Cheverst et al., 2008). However, there are few initiatives to locate technologies in rural knowledge practices. This is partly because the locale of technology production, sited in research labs and design studios in cities and industrialized regions, produces selective interpretations of rural life (Bidwell and Browning, 2009). Projects for rural areas prioritize making urban facilities available rurally, so that residents can shop in 3D worlds (Schmitz and Quraischy, 2009) and access information and services (Patel et al., 2006) or formal education (Moraveji et al., 2008). Further, rural places are often presented as landscapes to be viewed from a detached tourist gaze or as resources for harvest, rather than as a home or workplace. Consequently, rural inhabitants encounter many disjunctures between technology and their lived experience. For example, video conferencing and social network technologies match the social interactions of office workers or urban inhabitants, better than the social interactions of farmers and other rural inhabitants (see Bidwell and Browning, 2009). Such mismatches of interactions with technology, daily practice and local knowledge in Southern Africa have contributed to many failed initiatives, such as rural telecentres (Butcher, 2003) and perceptions that computers suit only the formally educated people (Thinnyane et al., 2007).

1.2. Lost in translation: dis-placing rural knowledge

A large body of literature refers to dilemmas in using technologies and media to serve marginalized knowledge traditions. One issue relates to access to the tools to produce media; for instance, an elaborate 3D geospatial representation built for traditional custodians to tell their stories of the land must be mediated by design teams (Truna and Bidwell, 2007). Beyond inequalities in the technical abilities of groups lie deeper tensions within the social, technical and literary strategies that different knowledge traditions apply in organizing and sharing information. That is, chronologies,

cartographies, taxonomies and systems of authorship do not merely translate knowledge but, more fundamentally, reproduce a community's priorities and assumptions about reality.

The core argument in this paper is that people apply assumptions about location and time when they design and use technologies. For instance, technologies encode concepts from science and certain languages by dividing time into nested units or into the past, present and future. Assumptions about geography and temporality have long mediated our experiences of place across distance: maps help us navigate to places far away and postcards enable us to share fond memories of places to which we have never been. Abstractions that disconnect time from geography, and places from events, offer intriguing re-combinations. For instance, they allow people to persist their story at a location after they have left (Weal et al., 2006), interact with another's experience of place asynchronously (Giles et al., 2009) and move through location-triggered storylines (Paay et al., 2008). However, these abstractions may be incompatible with the way some communities make sense of the world. For example, different perceptions of space and time affect indigenous farmers' decisions globally (Raedeke and Rikoon, 1997), placeless events are nonsensical to native Americans, who explain current situations by drawing upon collections of stories (see Brewer and Dourish, 2008), and timeless geographical locations in 3D visualizations inadequately depict Arawakan people's stories in Brazil (Green, 2007).

Certain types of politics privilege certain social, technical and literary methods. Use of these methods can 'give' voice to marginalized people but, simultaneously, suppress and distort their knowledge traditions (Green, 2007). Consider how people in 'underdeveloped' regions create digital stories using formats derived from English-language journalism (e.g. Taachi and Kirran, 2008) or try to protect their resources or contest their territory using geospatial technologies. Western traditions use particular types of temporal, spatial and authorship referencing in transferring information to make information traceable and useable. However, these methods may compromise important aspects of other knowledge systems and, thus, contribute to a loss of local logics and skills. For instance, an Indigenous Australian Elder was disappointed with a GPS-system, which was designed to assist persisting his clan's knowledge on fire but did not support the nuances of "walking country" (Bidwell et al., 2008). This may resonate with observations that Western schooling hinders the otherwise superior performance of certain groups of Australian Aboriginal children on visual spatial memory tasks (Kearins, 1978). Thus, dilemmas in designing technologies and media to serve marginalized knowledge traditions are not about whether local knowledge remains superficially the same, but what values, logics and literacies are lost in transformation.

Power relations produce particular accounts of human skills. For instance, attributing the cognitive abilities of detachment and objectivity to written literacy (Scribner and Cole, 1981) arises within value-laden perspectives on

modernity, 'progress' and writing systems (Kaschula, 2001). Such accounts focus emphasis in designing for oral users (e.g. Sherwani et al., 2009). However, they neglect how cognition and verbal practice are specifically affected by particular literacies, reading and writing activities and schooling (Hull and Schultz, 2001). They also disregard the acute linguistic awareness developed in multilingual contexts, frequent in Africa (Finnegan, 2007) and the way rural communities prefer face-to-face communications despite transport constraints (Seshagiri et al., 2007), perhaps because they relate to identity and sense of belonging (Bidwell and Browning, 2009). Thus, we can design for an 'illiteracy' at the expense of designing for literacies that we are illiterate in ourselves. For instance, no current design heuristic recommends that an interface demands users to remember its entirety or the exact position of an icon or distinguish between identical icons in a list. Yet, African trackers, skilled in recognizing and interpreting natural signs and unable to read written text, accomplished these very same spatial acts in using a system to gather conservation data (Blake et al., 2001).

1.3. Critical design in locating rural knowledge

To design locative technologies to extend the ways the Herero practice their rural knowledge we sought to explore possible conflicts between the knowledge systems of rural people and technologists. Here, we summarize various aspects of learning theories that help us to think about the ways that interactions articulate and embody knowledge.

Contemporary learning theories emphasize that 'knowing' is an action and recognize that knowledge is not a rootless commodity but is created within the process of constructing social groups. Lave and Wenger (1991) show how people, from midwives to quartermasters, gain the literacies of their profession tacitly by learning from others as part of everyday practices. Knowing is distributed across people, and between people and material systems, and includes both corporeal and cognitive interactions with settings. That is, learning involves both bodies and minds, as shown when children globally engage their whole bodies during learning (Gonzalez et al., 2009) or in the skills used by hunter-gatherer people to negotiate their environment (Ingold, 1993). Thus, much knowledge lies within extra-linguistic actions and is intelligible only through actions, movements and gestures. Actions, movements and gestures also contribute to community cohesion, a collective sense of 'home ground' and to an embodied experience of being (see Brewer and Dourish, 2008). The theory of 'embodiment', has helped HCI to avoid dichotomising the mind, body and environment and extends beyond Vygotskian emphases on psychological, ideological and bodily mechanics. Embodiment includes unconscious actions and can help us to notice the ways actions inscribe cultural assumptions into the world. Thus, we propose the theory of embodiment helps us appreciate

temporal and spatial enactments that cannot be codified or reflected upon.

In this paper we adopt a Critical Design position to acknowledge some of the political, social and cultural dimensions that influence the design and use of devices and production of media artifacts (Dunne and Raby, 2001). We propose that Critical Design involves sensitivity to local epistemology and the ways local people make sense of, and communicate about, artifacts and their settings. Understanding relationships between knowledge and locations in communities that emphasize orality means paying attention to verbal nuances. The Herero's language, Otjiherero, is rich with environmental concepts, that relate the land to economics, ethnicity and other social and natural dimensions; their oral practices have other locative properties. For instance, praise-names or verses that recall, describe and revere the places Herero society inhabited before the German conquest suggest a mapping of the land related to people or events (Bubbenzer et al., 2009). Such interactions may also manifest morality and metaphysics as they do in other African oral traditions; such as the divine calling on a traditional Xhosa praiser to speak (Kaschula, 2001). Further, much has been noted about the use of time to engender sensual experiences of place in the performance, structure and form of African oral literatures (Finnegan, 2007). Thus, local epistemology may relate to felt experiences, such as how a Xhosa praiser feels before an oral performance (Kaschula, 2001):

‘You feel it in your veins, they are tight, you feel like stretching, stretching ...’

2. Designing an interface for sharing rural wisdom and skills

Our goal is to design a digital system that extends the ways that the Herero practice their rural knowledge traditions. We used Ethnographic Action Research (EAR) to link participatory techniques in which participants appropriate media, with ethnographic strategies to guide reflection and research (Taachi and Kirran, 2008). Rural participants had not depicted their wisdom using photography or video before; rarely use writing materials and some can not read. They also use few technologies in their everyday life and do not have access to grid electricity. For instance, although some listen to the radio, no one has TV and, although some own a cell-phone, cell-phone coverage is limited. In response, we took an adaptive approach to developing activities around media within EAR.

For most of the analysis we discuss here we chose video as the medium to anchor activities because it can record body movements, settings and oral and visual communication and contributes in different ways to interpretation. Both the content of, and participants' interactions while making and viewing, 30 h of video were a rich resource of verbal and embodied interactions. We used video with rural participants to explore meaning by linking previously

recorded video to other media in sense-making activities. These activities included tangible and oral interactions with printed or electronic thumbnail photos from video, photography, paper and pens. We also explored meaning in translations and interpretations of the video by rural-to-urban migrants who are closely linked to the rural communities. As rural participants gained familiarity with making and viewing video they expressed various goals for generating and sharing their own content digitally. These included preserving and teaching specific knowledge for their own health/survival; unifying clan relations and preparing returning migrants for rural life. Participants also expressed design ideas ranging from specific media, such as books for disseminating herb lore, to unique functions for kin-based social networking applications. To develop a design approach towards these ideas, first, we critically reflect on our interpretations in ethnography and on participants' interactions and commentaries while recording and viewing video (Fig. 1).

2.1. Participants and sites

Eight academic researchers in our team have varied cultural identities, native languages, religions and expertise (see Bidwell et al., 2011). The authors of this paper include a Namibian Herero man (Author-3), an Australian woman (Author-1), and a German woman (Author-2) and man (Author-4). Authors 3 and 4 reside in Windhoek, Author-1 has moved between countries in southern Africa for 4 years and Author-4 lives in Denmark.

Most Herero participants are pastoralist dwellers in two villages, which are 50 km apart in Omaheke, near Namibia's border with Botswana. The villages are accessed by gravel and sand tracks so it can take up to 5 h to reach them from Windhoek, Namibia's capital. To situate design in relations between local knowledge systems and kinship (Wallace, 2003) we linked to the rural villages via participants in Windhoek. Thus, our EAR focuses on two rural villages (Village-1 and Village-2) but also includes people in the urban capital. Altogether eleven men and eight women participated in the main activities. They consist of two professional healers who use herbs, prayers, magic and guidance from spirits (Healer-1 and Healer-2); seven men and women aged over 45 years ('Elders'); three men aged under 25 years ('Youths') and six men and women between the ages of 25 and 45 years. We recompensed all primary participants with modest food hampers or payment for healing.

Many participants in Village-1 are related to Author-3, who lived in the village until he was 12-years old when he moved to Windhoek with his family. Like many Herero rural-to-urban migrants Author-3 and his mother (Elder-9) return regularly to Village-1 to maintain their homestead and livestock. The family and Author-2 have links to Healer-2, a Windhoek-based healer, who introduced us to Healer-1, a 45-year old man from Village-2. Healer-1 and his wife are slightly separate from their village and

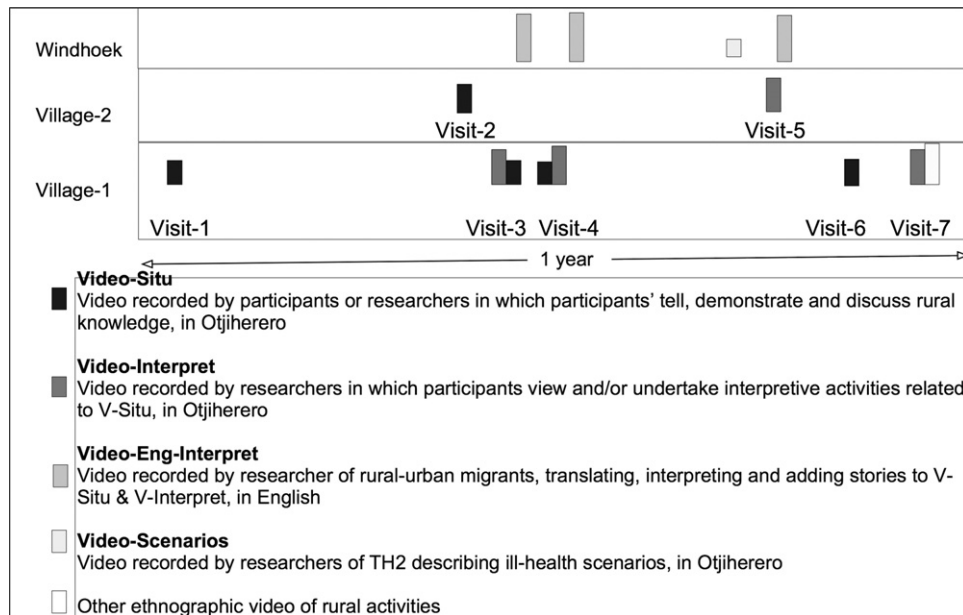


Fig. 1. Video includes in situ knowledge (Video-Situ) and health scenarios (Video-Scenarios); viewing and discussion of Video-Situ and Video-Scenarios (Video-View); and, translating and interpreting Video-Situ and Video-Interpret (Video-Eng-Interpret).

were the only participants from Village-2 although we observed patients and villagers from Village-1 visiting their homestead.

2.2. Ethnography and immersion

In addition to field-trips Author-1 lived with Elder-9 for a month in Windhoek and in Village-1, undertook basic Otjiherero language lessons and attended Healer-2's Apostolic Church, which merges Christian and traditional Herero religions. The sensitivity of topics and practices in healing limits full ethnography. However, we gained insights during the participants' serious health episodes and three of us have participated in healing with Healer-1 in Village-2 and Healer-2 in Windhoek.

2.3. Recordings, viewing and interpretative interactions

The video was recorded during seven field-trips, which lasted from 2–14 days spanning across a year (Fig. 1), and is divided into three main types. One type of video records participants' wisdom and know-how, in situ rurally (Video-Situ), and in ill-health Scenarios (V-Scenarios). In another type of video we recorded participants' interactions as they viewed and/or undertook sense-making activities (Video-Interpret). In a third type of video participants translated and interpreted Video-Situ and added stories clips (Video-Eng-Interpret). We analyzed the video, translations and transcripts using grounded theory within our EAR cycles. These analyses coded oral and multi-modal interactions, including gesture, body and camera movement and text-based transcripts of the video.

2.3.1. Video-Situ: telling and demonstrating rural knowledge in situ

In 6 h of video participants demonstrate and discuss their knowledge, in Otjiherero, in the yard or bush around their rural homesteads (Video-Situ). We describe this video according to who controlled the camera and spoke different Points-of-View (POV). 1st POV describes the video in which participants narrated, co-narrated or participated in the action recorded; 2nd POV describes the video in which a researcher or participant interviewed people while recording; 3rd POV describes the video recorded by a researcher who did not participate in the activities recorded.

• Researcher-Recorded Interviews and Observations (Visit-1, Visit-5 and Visit-7).

In four visits we recorded a total of 3 h of video in which participants had no control over the camera (3rd POV). In Visit-1 we filmed 35 min. This started with an interview between Author-3 and Elders 1 and 2, who explained that a sick person may go to a clinic but economic, transport and geographical constraints usually meant using local plants. Then we asked specific questions and the Elders told a story or scenario and illustrated herbs in situ. In Visit-5 we recorded two demonstrations: Elder-1 slaughtering a goat and a middle-aged woman demonstrating cooking; then, in Visit-7 we recorded the activities of a group coordinating tasks with cattle.

• Participant-Recorded Narratives (Visit-3 and Visit-4).

In two visits men selected by residents of Village-1, recorded 40 min video independently of us. We explained how to operate a battery-powered 'Flip' video camera; then, Elder-3 used the camera independently for 2 h

to collect clips of everyday rural activities (e.g. Fig. 2a). A month later three Youths recorded clips. This collection of thirty-seven clips varies in length: Elder-3's clips were 60–180 s and the Youths' clips were 2–180 s. Short clips provided adhoc insight. The content of those clips that were sufficiently long and in focus to analyze included herb lore (e.g. Fig. 2b); livestock activities (e.g. milking cows, herding goats); people in yards undertaking domestic activities (e.g. Elder-5 making tea for Elder-6 over a fire) or work (e.g. packing tobacco, cutting recently slaughtered meat – Fig. 2d). In eleven clips the cameraman narrated, co-narrated or participated in the action (1st POV) and in sixteen clips a cameraman interviewed subjects in the clips (2nd POV).

- Researcher Recording Participants Recording Narratives (Visit-2, Visit-5).

We recorded 1 h of video while, concurrently, Healer-1 self-recorded his knowledge. He spent 1.5 h moving

around the bush close to his home in Village-2 using a 'Flip' camera to record thirteen clips of different herbs (e.g. Fig. 2c). His clips lasted 30–120 seconds and after each clip his wife translated and we discussed his practice. All of Healer-1's recordings were narrations about herbs from a 1st POV, while our observational video is a 2nd or 3rd POV. Five months later we recorded health scenarios by Healer-2 in Windhoek (Video-Scenario) and then traveled with Healer-2 to Village-2, gave him a camera and recorded him as he accompanied Healer-1 in a walk into the bush (Visit-5).

2.3.2. Video-interpret: viewing activities in situ

We recorded 9 h when participants viewing and/or interpreting the previously recorded video, Video-Situ and Video-Scenarios. All recordings were made at the rural sites, involved two or three researchers and sometimes rural-to-urban migrants. We recorded various discussions in

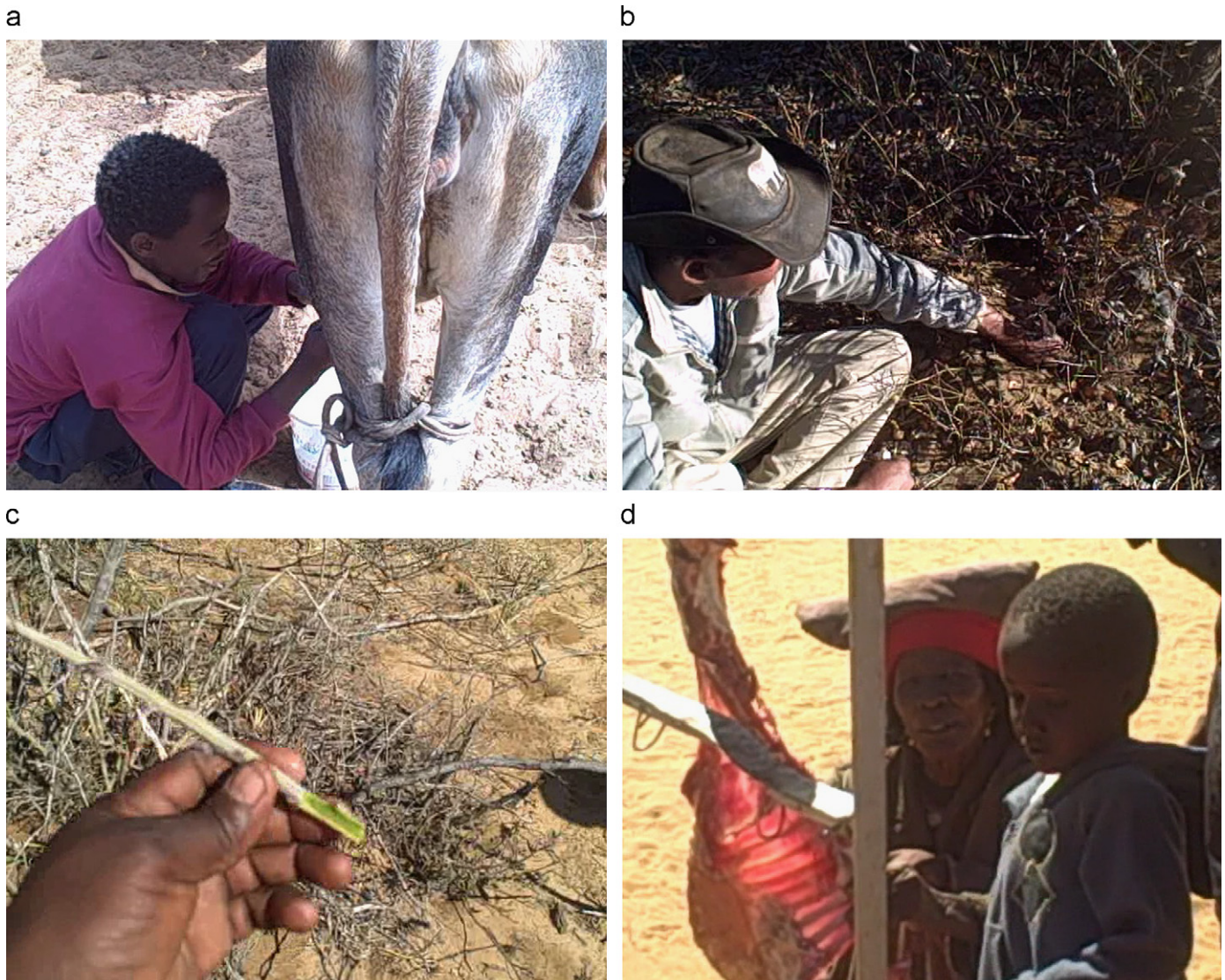


Fig. 2. Still images taken from participant recorded clips: Youth-1 milking a cow (a); Elder-2 demonstrating herb lore (b); Healer-1 demonstrating herb lore (c); Elder-5 preparing meat (d).

Village-1 (Visit-2). We spoke with nine men and one woman (aged 16–75 years) for 1.5 h about intellectual property, participation and dissemination in relation to recordings. We discussed these topics first without video and, then, while and after the group watched the researcher-recorded interview of Visit-1 on a laptop (Fig. 3a). We also interviewed, independently, four women (aged 20–50 years) as they cooked, collected wood and cared for children and discussed technology access, potential value of recording and current and past systems to disseminate knowledge via family networks. We recorded various activities as groups viewed and discussed participant-recorded clips. In Visit-2 four men and two women, who had not yet used the camera themselves, discussed Elder-3's clips and, in Visit-4, two Elders and Youth-1 discussed both Elder-3's and the youths' clips (Fig. 3b). In Village-2 we recorded Healer-1 and his Windhoek-based apprentice, Healer-2, as they discussed Healer-1's clips (Visit-5).

We sought to explore ways that participants, who had recorded and/or had been recorded, might associate their own or others' clips with each other. So we recorded interactions in several focused activities. In Visit-4 and



Fig. 3. (a) Groups of participants in Village-1 view and discuss video clips on a laptop and (b) groups of participants in Village-1 reflect on the process of knowledge recording.

Visit-5 we recorded participants' interactions with clips displayed in iTunes on a laptop. We also asked participants' from both villages to group clips along various dimensions, such as explaining the ill-health a particular herb might treat. In another activity, in Visit-5, we recorded both healers when we asked Healer-1 to summarize what his clips were about and suggest which of his clips might treat five ill-health scenarios described by Healer-2 and recorded in Windhoek (V-Scenarios). In Village-1 (Visit-7) we asked Elder-1 and Youth-1 to group, and then sequence, fifty printed images, derived from all the video clips, according to their content and the order in which clips should be viewed. In a final activity Elder-1 took us to four places in the village and picked a herb at that location while Youth-1 photographed him and we registered a GPS coordinate. On returning to the homestead participants created a spatial map on butchers paper by placing the picked herbs at representative points and, then, arranging images from clips relative to these points, according to where they thought those clips were filmed.

2.3.3. Video-ENG-interpret: interpreting in Windhoek

Interleaved between rural visits we recorded 12 h of video spoken in English. Two rural-to-urban migrants translated, interpreted and added their stories to V-Situ and V-Interpret. Additionally, Author-3 translated V-Situ and V-Interpret.

3. Knowledge practices and locations

To motivate approaches to designing locative media for knowledge practices we discuss themes about relationships between people, their bodies, artifacts and settings distilled from ethnography and participants' narratives and camera-use.

3.1. Producing wisdom by determining connections between people

In Herero teaching Elders are obliged to offer wisdom. An amiable exchange between Elders-3 and 5, as they watched a clip, typifies a 'push' rather than a 'pull' approach to information sharing:

Elder-3: "Grandma you know a lot of things why don't you tell us?"

Elder-5: "How come you don't know <plant name>? It's weird. At your age you are supposed to know that"

Elder-3: "How will I know it if I wasn't told it?"

Participants' emphasized the responsibility of knowers for inter-generational sharing, as Elder-1 often commented, "My father told me that there is a plant." Participants indicated that candor was essential to information transfer and listened intently to Elders during face-to-face (e.g. Fig. 3b) interactions and while recording and watching clips.

Almost exclusively, villagers described wisdom in terms of relationships between people. For instance, in their herb stories participants explained that the symptoms of ill-health caused and/or resulted from problems in social relationships. Participants verbally described their knowledge using real or metaphoric or prototypical examples. Their examples always included relationships between people or between people and artifacts or settings. Participants conveyed these relationships using first, second and third person Points-of-View, but frequently personalized information for the listener. For instance one villager said:

“When you are telling a story with the intention of teaching you would want specific people to listen”.

Speakers contextualized information in their relationships and shared experiences with listeners, rather than abstracting. Consider Elder-9’s description a herb to treat distrust. Knowing about Author-1’s recent trip to another country she draws a location, and our relationship, into an imagined situation:

“Say for instance Author-1, you told me that you were in Botswana, and this side don’t believe that you were there and say ‘ah! she is lying to me man, she wasn’t there ... I was not with you’ ... after you have been using that [the herb], I will say ‘oh, is that so. ...’”

Speakers judge the relevancy of information according to a listener’s social roles. For instance, participants said a herb that cleans the womb after child birth was irrelevant and difficult to explain to a man (Bidwell et al., 2011). By personalizing, and controlling access to, information speakers contribute to constructing the listener’s identity and future accountability for knowledge. Further, constructing identity, in knowledge practices, also links with concepts about time that influence face-to-face interactions. For instance, participants arranged their activities with us without any strict schedule but by saying ‘in the morning’ or ‘later on’ and activities occurred when everybody was ready.

Participants indicated that they trusted the integrity of information in relation to recognizing the speaker’s pedigree. For instance, Elder-3 said it was obvious Elder-1 would know more about herbs as he grew up close to ancestors who used herbal practices regularly. Recognizing a knower’s pedigree, links to an intricate web of trans-generational, kin relations. The Herero permit polygamy; a husband and wife are frequently cousins; a wife remains part of her own female line, but is the responsibility of her eldest brother-in-law if her husband dies and child-care is shared amongst extended family and across generations. When discussing the potential for recording information about kinship Elder-7 insisted that villagers would recognize a speaker by their voice and without visual cues, even years later. Potentially, a speaker’s expressive manner also reveals their background; for instance, participants in Village-1 trusted Healer-1’s knowledge even though they do not know him. This is consistent with observations that Herero custom accentuates the oral, rather than the visual,

in describing people’s characters, personhood, societal position and genealogical bonds (Bubbenzer et al., 2009).

Local practices of co-constructing knowledge and a person’s identity, in rural Herero communities, have important implications for concepts embedded in information storage and retrieval, in particular those influenced by Western Constructivism. In the villages, Elders determine relevancy in an oral narrative via their deep acquaintance with a listener’s social relations, including their ancestry. This limits multiple meanings in a way that challenges the design of a system, which enables the community to add and disseminate material. Participants insisted that their knowledge accumulates and could be contentious and, also, that much of it had not yet been recorded. However, the mechanics of adding material must not interrupt the way that patterns of dialog or narrative include information about social relationships that localize meaning and restrict multiple interpretations.

3.2. Camera-use extends the bodily absorption of social relations

Participants’ camera-use embodied social relations between speakers and listeners. For most participant-recorded clips other people were present, either within or out of view, and a cameraman’s vocal interactions with others prevailed over his interactions with the camera. We found that participants’ recordings of interviews lasted longer than their 1st POV narratives because cameramen waited for subjects to speak. Prevailing social interactions were many when Healer-1 recorded. First, over half of his 1st POV clips include subtle interactions with his wife during brief translations or questions. Second, our video of Healer-1 shows that, to begin with, he held the camera in front of his face but, increasingly, he lowered the camera to chest height while he looked at a plant, his wife or ourselves or into the distance. Thus, he became unconscious of the camera; so, in the first two clips he looked at the screen constantly but from the seventh clip looked at the screen only occasionally once he had set up his shot.

We observed how an ‘Elder effect’ influenced interactions between cameramen and the camera. When Elder-3 recorded interviews he tended to shift focus between subjects as he asked questions, approached subjects or panned the setting. In contrast, Youths did not move when recording interviews and their clips present a static view of people undertaking activities. Indeed, Healer-2 was so absorbed in talking and walking with the more senior Healer-1, in the bush, that he failed to record. Interestingly, the one rural-to-urban migrant who recorded, a youth studying at university, did not record Elders and panned settings more than resident youths. This shows his disjunction with local practice and may resemble the tendency for transient people to depict places more egocentrically than people with stable residential histories (see Bidwell and Browning, 2009).

As elsewhere in Africa, communication protocol is based on Elder authority (Bidwell, 2010) but this may be disrupted

when participants are unfamiliar with technology. In our first interviews, in Village-1, the Elders talked to the camera in response to Author-3's questions, but were uneasy and did not make eye contact with each other or Author-3. Shyness affected initial recordings even when we were absent since those recorded averted their eyes from the camera, looking up briefly from activities to smile, but did not initiate discussion with each other or the cameramen. Indeed, after his recordings Elder-3 reflected that he should have interviewed more actively so that his video's subjects would "*explain to the video*" what they were doing. Over time all participants became comfortable; indeed, Elder-1 remarked while watching a later clip: "*Ah! that's what I want, you are open now.*"

We propose that bodies orientate spatially in social relations. As discussed earlier, camera-use embodies social relations and protocols, such as Elder authority. Additionally, participants used spatial metaphors in speech in referring to real and imagined relationships; such as describing people on "*this side*" or, "*looking in opposite directions*". These representations connect spatiality, qualities of social bonds (e.g. harmony, distrust), others and self. For instance, Elder-9 expressed:

"the person will now start to smile and look at you and you will decide on one thing. Even (after) that he turned away, ...".

The way in which villagers's embody social relations may reflect their need to engage collectively with their habitat and their animals in order to survive. For example, we observed how fifteen men coordinated to brand, neuter and clip the horns of fifty cattle in a 100 m² kraal. Any one time, during this 5-h activity, groups of young men firmly, but kindly, grounded and held cows with their bodies. Simultaneously, men alternated to jump the fence to retrieve one of three irons from a fire, brand cattle and collect wet sponges from buckets and then cool singed hide. Moving between the men, an Elder neutered and clipped and cauterized the horns of cattle, sedated by men who carefully positioned their necks. Throughout, cattle galloped powerfully around the corral as the men smoothly coordinated. The men laughed and talked, appearing to enjoy the physicality and proximity to each other and the cattle and, we propose, their bodily interactions contribute to a sense of belonging. Elder authority may create the foundation for such collaborative actions; for instance, in one recording Elder-7 lamented the naughty behavior of children in her care who, all the while, moved back and forth bringing her items she demanded for her preparations over the fire (Fig. 4a).

3.3. Movements connect social relations to places and are felt through the body

In preceding sections we showed that participants relate wisdom to relationships between people and proposed that interpersonal bonds are embodied and oriented in a social-relational space. Next, we discuss how bodily movements connect social relations, artifacts and settings to values



Fig. 4. (a) Elder-7 discusses the importance of kin relations to knowledge recording in a contextual interview at her home and (b) the front of a home with a goat corral behind.

and knowledge and how these connections can be difficult to record.

It appears that participants, like those with stable residential histories, identify with social elements of place (see Bidwell and Browning, 2009). Kin relations are built into the village's physical infrastructure; since villagers did not move into a pre-built neighborhood but construct their homesteads themselves. Further, communication with, and about, those beyond the village can also link to the physical infrastructure; for instance, villagers routinely congregate at the worker's hut in which Elder-9 has installed a landline telephone. We found that participants referred to locations when describing knowledge almost exclusively in terms of social relationships and significance. They insisted that all clips should bear the village and participants' names and, if describing an experience beyond the village, linked places to social relationships when recalling knowledge. For instance, "*... I was watching TV at my cousin's house*".

The Herero undertake daily activities on foot or, occasionally, on horseback, which provides opportunities

for social encounters and for meanings to emerge in the movements that produce or accompany these encounters. Homesteads are approximately 2 km apart, separated by communally used pasture, and consist of huts within a fenced yard accessed by several gates and corrals. Villagers' paths inscribe knowledge and values into settings as they move in, between and beyond homesteads. For instance, movements reflect the role of, and a reverence for, cattle. Cattle have economic and spiritual value and produce the food staple, milk. They also symbolize kin relations as they are tendered to a bride's parents to legalize marriage and are inherited matrilineally. In the homestead people can walk between their huts, the fire, on which women cook farmed animals, and the cattle corral but must pass behind the hut to slaughter goats and cook game (Fig. 4b). Villagers also maintain camps to distribute cattle over large tracts of pasturage and thus their movement between camps invests the environment with meanings. Our analyses suggest that villagers' movements and use of artifacts reproduce social relations and roles. Rural activities, relating to social roles, give meaning to materials found in the setting. For instance, Elders recounted a popular childhood game in which girls and boys chase each other with plants matched to their respective genders. Social roles and protocols govern villagers' behavior and, in turn, shape their experience of their local environment. Various women noted that their traditional garments restrict moving quickly and Healer-1's wife remarked she knew little of the land beyond the village. We also noticed relationships between places and gender in video clips. In yards women butchered meat, prepared food on the fire and supervised children but men talked and relaxed; whereas, men worked in the corrals and bush around yards (e.g. Figs. 2d and 4a).

We propose that the Herero's unmediated interaction with their rural setting promotes experiencing knowledge and a "sense of place" through their bodies. In moving on foot across unpaved, sand, around bushes and plants and animals, people have an ongoing multi-sensory and kinetic interaction with the land. Indeed, in many activities during our visits we observed how participants moved dexterously around plants in the bush, which suggests they forge knowledge in their movements as well as in oral interactions.

Our analysis suggests that the Herero participants express connections between places and knowledge in gesture. For instance, between watching clips Elder-9 went to various cupboards around her Windhoek home and returned with herbs, often sent by Elder-1, which she described by gesturing and interrelating her body to her rural home. Such observations, together with those that suggest participants orientate spatially in social relations, bear a similarity with the way Haillom bushpeople use gestures to accumulate spatial knowledge and participate in a type of topographical gossip involving directional referencing (Widlok, 1997). Participants' camera-use also appeared to distinguish meanings. For instance, generally, participants gestured and/or moved the camera more when

recording knowledge about herbs than other rural knowledge. In our own researcher-recorded interviews about plants participants often made hand gestures and half of participants' recordings of herb lore show gestures. Further, participants' 1st POV clips show that cameramen, themselves, touched, gestured to or pointed with a stick to herbs and snapped and crunched herbs with their hands (e.g. Fig. 2c).

We found that recording relationships between bodies, artifacts and settings is often difficult and suggest that this constrains the knowledge video can represent. Participants' discussions often indicated that the content of clips incompletely depicted knowledge. For instance, in watching a clip which shows, visually, the side on which a cow is milked, (Fig. 2a), Elder-1 says it lacked information to explain "From what side, left or right?". Thus, while video records verbal descriptions, bodily actions and camera-use it excludes much information by projecting the lived world onto a 2D-plane. Sometimes the speed of activities, such as collaborative tasks with cattle, made recording interactions difficult. However, many other qualities of interactions that occur at slower paces cannot be recorded, such as connections between the bodily experience of healers and patients. For instance, Healer-1 said he always tests herbs on himself then, guided by spirits, diagnoses patients' ill-health by "catching their hand" (Bidwell et al., 2011). Further, video may not show all links between bodily memory and communicating. Our researcher-recorded video shows Healer-1 made explicit gestures to plants and held or touched plants as he recorded. His gestures to plants were encompassed or flowed into gestures to the surroundings and/or his body: sweeping, quivering, cupping his abdomen, limbs or head in a loose tempo. However, Healer-1's own clips show only some gestures and often all that is visible of these interactions is that the camera jolted or a branch twitched as a result.

3.4. Wisdom and identity in spatio-temporal continua

The previous section suggested that people communicate and connect knowledge to places through bodily interactions but that video cannot record all these phenomena. In this section we propose that the Herero's movements structure their knowledge and we explore how sequences, created by movement and represented in oral interactions, link to particular ways of thinking about location and time.

Villagers accumulate knowledge within sets of everyday activities not by assembling separate observations at discrete times and locations. All people act and move, in everyday life, by improvising in response to immanent factors; but, describe these actions and movements in ways that order events and objects coherently. Our analysis shows that participants often recounted knowledge using spatio-temporal references and sequencing. They described herb lore with respect to the seasons and recalled learning about new herbs within sequences of movements: "I went

to a second place in the village and was looking after the goats that got lost”.

Villagers' patterns of activities give meaning to environmental features and settings and help to shape paths in the land. For instance, a familiarity with life-stock and daily and seasonal rhythms enables wayfinding. Locations around villages and pasturage are neither named nor signposted, although a vehicle registration plate marks some homesteads. When uncertain of direction villagers follow passages created by cows' paths, read the movement of cattle between rivers, villages and corrals and recognize individual cows' footprints. It may be that sequencing events through movement enables the Herero to remember and recollect personal and collective history. Participants often structured relationships between specific features in locations, people, livestock, and events within journeys. For instance, participants explained that a village name recalls that, in settling the land, people came to a river so broad and deep that horses would not cross. The significance of movement and sequence in knowledge practices is unsurprising given that, until 50 years ago, the Hereros continuously relocated as nomadic cattle-herders and due to colonial and apartheid strategies. However, their movements in their contemporary life, as sited pastoralists, also contribute to shaping their identity and to structuring knowledge. We propose these structures relate to concepts of location and time that differ from those embedded in technologies that support Western or urban mobility.

The Herero perceive both location and time as continua. Consider practices related to the 'holy fire', a feature in some homesteads that ritualizes Herero values about their society's coherence and the role of ancestors in giving life to and overseeing descendents. The Herero use this fire in ceremonial slaughtering, in healing and in appealing to ancestors to address social tensions; and it has a vital, invariable, temporal dimension because men must burn it continuously to maintain favor with patrilineal ancestors. Further, the fire shapes everyday movement in keeping it burning as it lies between the main house and cattle corral but is separated by a stones or a hedge. Thus, movements and interactions structure, and make readable, connections between the past and present and contribute to identity in relation to ancestry, collaboration and gender roles.

Conceptualizing location and time as continual or discrete dimensions influences understanding relationships between knowledge and place. We noticed that we tended to abstract locations discretely when we interpreted interactions with video. For instance, we focused on relationships between specific locations, features and activities in Elder-1's comments about discussing a particular herb “*only when we are outside*” and when he explained about cleaning, cutting and using the roots of a fruiting plant which grows behind the homestead. That is we attended to situating knowledge topographically rather than topo-kinetically, or in relation to bodily movement (Green, 2007). We noticed that when viewing clips participants recognized herbs in clips visually more easily if they

could recognize the places where clips were filmed. However, settings were not always legible and participants often found it easier to identify features from spoken sequences instead. As described in previous sections, video clips embodied social relations and focused on people but did not always record gestures completely and did not convey the visceral qualities of knowledge that participants may feel in their bodies when moving. We argue that in order to align a migrant's to a rural Herero's perspective it is not appropriate to describe places as locations or spatial or temporal points in a network of connectors. Rather, we need to provide a system in which knowledge can be represented and organized in continua and which respects the role of movement.

Our analyses suggest that face-to-face oral interactions tend to communicate spatial and temporal continua better than video. Participants' spatial references, in video and everyday life, often relate locations to movements (e.g. behind the house) and their stories depict sequences of places. Yet, participants' clips were usually confined to locations and participants rarely moved through settings while recording. For instance, Healer-1's discreet clips at each plant do not show their spatial or temporal settings. This contrasts with the way his gestures integrated the surroundings and the way our video of him shows his passage between plants. It suggests that video may encourage the villagers to take a particular spatio-temporal perspective on locations. This perspective obscures relationships between the body and the surroundings and interrupts the way meanings are ordered by movement. We noticed that in various activities participants had difficulty recognizing clips by static thumbnail images even when they were distinctive to us. This may reflect that video does not adequately support aspects of oral practices that occur in face-to-face, co-present communication. In particular, real-time video does not show interactions between bodies, movements, settings and artifacts nor can it manipulate space, time and sequences in the ways that oral storytelling can (Bidwell et al., 2011).

Villagers manage spatial and temporal continua according to interactions between people which may relate to the way that social encounters occur as people move around the village and to cattle camps. Otjherero often expresses the land as a continuum in which vegetation increases with distance from the speaker and co-present listener. On various occasion we noticed that participants had difficulty in calculating dates and, rather than scheduling daily activities according to impersonal, quantifiable elements (e.g. minutes, hours, weeks), constructed time polychronically, or relative to others. Participants were also uneasy in describing locations using frames of reference which are external, to the world. This was particularly clear when we asked participants to arrange thumbnail images spatially. In one activity they walked through dense bush directly to different locations but less confidently created a geospatially accurate, aerial view these locations, despite their proximity (Fig. 5). In this task participants scaled their



Fig. 5. Part of the spatial map that participants created by arranging herbs, collected at different locations, to represent these locations and then placing thumbnails of clips at points relative to the herbs.

map to the immediate area of the homestead, where they sat, and were reluctant to it extend or re-scale to include more of the village. They sorted thumbnails to choose those they wanted to arrange on their map, and also sequenced thumbnails chronologically in another activity, effortlessly. But, in the mapping tasks participants spent more time gesticulating around the homestead and talking about people and activities in clips than focusing on the map. Western abstractions that conceptualize space and time extrinsic to the world enable rendezvousing and accessing community spaces from diverse, independent paths. Our analysis shows that such abstractions do not make sense to rural Herero. This issue has broader implications for technology in Namibia, since we have also found that prioritizing relationships between people in managing time is critical to the success of systems design (Winschiers and Fendler, 2007).

3.5. Designing for Herero rural knowledge: pushing social relations into locations

We have discussed various issues affecting community cohesion and knowledge practices of rural Herero. Our account tests some of the assumptions about locations that are embedded in current technology. The design of mobile guides and online navigation tools and social networks are usually based on cartographies that identify and characterise nodes rather than the paths that flow between them. They identify way-points and destinations which enable people with particular mobilities (Sheller and Urry, 2006) and knowledge practices to access remote community spaces by transport or media (Bruckman, 2006). This may suit peripatetic people who travel, often alone, between places (e.g. home, work and shops) and along predetermined roads, flight-paths, concrete pavements and hypertext links. Such neo-nomads coordinate meeting at fixed sites and discrete times using absolutes and

abstractions that are extrinsic to the world, such as latitudes and longitudes, dates, hours and URLs. Of course, people do not experience and know places in terms of these abstractions but use them to manage diverse meanings about places and their relationships with those places. However, our aim is to enable people, such as rural-to-urban migrants, to participate in the particular knowledge practices of rural Herero communities. These practices do not promote the individual agency and multiple meanings that are supported by the types of locative media representations described above. Instead, rural knowledge practices involve repeated topo-kinetic and face-to-face interactions and merging paths, which flow through rural life, and unite meanings. Thus, characterizing discrete temporal and spatial nodes, does not support qualities of the social relations and intertwining trajectories involved in rural Herero knowledge practices. That is, we propose that assumptions within point-driven systems, date identifiers for video files, uninhabited 3D environments or RFID tags devoid of social relations and or spatial and temporal connectors, will compromise aspects of Herero knowledge practices.

We have already started applying some of the insights described in this paper to prototyping and evaluating locative media. Our approach aims to avoid isolating nodes, defining fixed routes between nodes or using measurable dimensions of location and time. Rather, we start with characteristics of the paths which, for the Herero, include social and topo-kinetic qualities. This recognizes some of the ways that rural Herero experience interdependence in their social relations, those that occur before or after their own lives, with ancestors or descendants. Thus, any locative media system must store information about intended listeners as well as knowers, gathered within real situations to enable either automatic or user-defined connections. Our design must respond to the way participants orient information, linguistically and extra-linguistically, according to a listener and push locations into this “dialogic” (see McCarthy, 2000).

Orientation towards information, be that to a corpus of user-generated videos, or a 3D representation or features tagged with RFID, must respond to the ways that people’s movements situate and make knowledge intelligible as sequences within a social-relational space. Any such system must enable rural people to describe the paths and connectors in their social-relational space according to their own representations. For instance, villagers experience and understand kinship by collaborating and engaging in rituals with their ancestors. These experiences and meanings are not represented in geneologies, such as in a family-tree application on Facebook used by some of Author-3’s urban cousins. Family-trees represents individuals as nodes in a static network of kin relations from an extrinsic view and is quite unlike the way rural participants’ communicate about people beyond the village. Thus, to explore how a system can represent social-relational spaces in ways that suit rural people we must

collect information about knowers and potential listeners when they attend events and participate in activities, within and beyond the village. This approach to gathering data and representing villagers' social space may also inform designing an architecture to enable people to upload new information as it accumulates.

When Herero villagers meet and move together, to collaborate or by chance, they experience links between their bodies and the activities and settings in which these meetings and movements occur. Maps and ways of representing people and places that typify locative media do not depict these connectors. In this paper we highlighted relationships between participants' gestures, voices and locations, activities and sequences. In responding to such relationships we have started by designing conversational agents, which personify social-relational and topokinetic characteristics, to orient listeners to information. Early results of prototyping show that participants attend to the gestures of agents, which were modeled on data about whole-body behaviors (Gonzalez et al., 2009), including the relative positions of people. This area has much room for development and we continue to explore the potential for representing topo-kinetic knowledge practices that are missed by video recording.

4. Conclusion

Discovering that knowledge is situated in social interactions related to places is far from novel to locative media design. However, our analyses of spatial, temporal and social relations within rural Herero's narrations and activities revealed that bodily movement and the bodily absorption of social relations play important roles in knowledge. The Critical Design position, we adopted here, emphasized aspects of Herero life that a purely technological account can hide. It questioned the assumptions about geography and location that are embedded in point-based, locative media. It also explained how such media can eviscerate a rural Herero's experiential literacies and neglect interconnections in the ways they interact with and make sense of the places they inhabit.

We offer our reflections in the context of concerns about how globalization and homogenization can displace local knowledge and make rural African livelihoods less sustainable. We do not want to romanticize rural life; indeed, we observed different social tensions. But, we do want to improve the opportunities for technology to extend knowledge practices that differ from those that influence technology design, and response to interlinking social, spatial and temporal factors produces new patterns for design more generally. For instance, the knowledge practices of the rural Herero, described here, offer valuable insights for approaches to locative media that integrate bodily orientations. Such approaches may better facilitate sharing between knowledge communities or a sense of belonging to place in technology-dense milieu.

Acknowledgements

With warm and grateful thanks to all participants and to the anonymous reviewers whose astute remarks have improved our account Kari nawa.

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