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Homestead Creator

a tool for indigenous designers

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Homestead Creator – a tool for indigenous designers

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ABSTRACT
The article presents in-situ findings of introducing a tablet prototype, with touch interaction and 3D graphical visualizations, to empower knowledgeable village elders in Namibia to locally re-create a 3D graphical context for previously recorded video clips of indigenous practices and narratives. Findings indicate that tablets enable those indigenous users to partake in design sessions more equally than with laptops and other input devices. Through a GUI design example we illuminate the unique opportunities and challenges in designing in the space where cultures meet.

AUTHOR KEYWORDS
HCI; 3D Visualization, participatory design; Indigenous Knowledge

ACM Classification Keywords
H.5.2. User Interfaces

INTRODUCTION
Valuable indigenous knowledge (IK) in Namibia has been transferred from wise village elders to youths through personal interaction in a collectivistic and oral culture. Rural indigenous communities in Namibia are facing culturally threatening conditions due to increased rural-urban migration, thereby interrupting long traditions of informal education on herb lore, husbandry, rituals etc. necessary for a sustainable life in the bush. However the youths, whom are heirs and future maintainers of the IK, are now living in large cities to learn from a modern curriculum of algebra, IT etc. In our research project, which aims at preserving IK, we have engaged with village elders (wise men who play key roles in their community), to create a system that can store local knowledge not only for preserving and managing it, but to later in the development allow a transfer of IK to youths from the area. The elders have recorded rich media, such as video recordings on where to find healing herbs or how to slaughter a goat according to customs. Now a system for the elders to organize these clips in is much needed. Our approach is based on participatory action research. Latest efforts in substituting textual systems such as search-by-term databases with 3D graphics have shown promising results in the sense of reaching a common ground of acceptance and criticism important for co-design. Yet our studies are concurrently highlighting the difficulties in designing shared interface concepts. Previous studies conducted with the elders have shown reluctance in interacting with laptop prototypes, thus making it difficult to discuss the core propositions the prototypes are designed for.

Challenging Differences and Unique Opportunities
Being users and designers originating from Western countries we utilize interact and create towards a wide array of differing technologies and devices. The user's utilization of these fluxing digital innovations is smooth and although methods of interaction change, the graphical interfaces constructed often rely on previously learned *Western ways of doing* and principles of design. When designing for Sub-Saharan indigenous groups, we realize a number of challenges due to significant cultural deviations as from standard western users. Complexities can range from choosing the type of device with respect to the physical environment, the user and the fundamental difference between the African IK systems and the Western knowledge system governing designers and technology [7]. Acknowledging the fundamental role of indigenous co-designers, as equal partners [6] and decision makers [1] we jointly agree on the tools we wish to build with as well as the methods of interactions. In previous evaluation sessions [8] we observed, the lack of users actively shaping artifacts and user reluctance towards prototypes running on laptops. A laptop traditionally consists of a screen, and the residual app. 50% physical volume is – to textually illiterate-'useless' buttons. Moreover with an additional external input device, the technological learning curve disrupts the core task of jointly shaping a new suitable artifact. A designer should consider hidden disempowerment embodied by technologies when considering devices in design probes and end systems. As Ertner et al. states: "Empowerment becomes a goal which is not unproblematic and depends upon the designer's ability to create the right framework for participation." [2]. Moreover designers' assumptions might have to be revised, as "ICT4D designers face challenges transporting both design conventions and processes of HCI across cultures. HCI's visual conventions have proven not to be universal – systems effective in the

US may fail utterly in Japan or South Africa" [4]. Designing systems for digitally and textually illiterate groups is only fruitful, if we through participatory design and based on polyvocal feedback continuously iterate and shape our prototypes striving towards intuitiveness for the user rather than attempt to convince our user segment of our principles – which we could term Design Colonization.

Concept

We decided to evaluate tablets as a new device to facilitate stronger user involvement, develop interaction methodologies better suited to the user/co-designer and attempt to give the rural co-designers a tool (Homestead Creator) based on negotiated premises, which they can utilize unhinged from designers' presence. The overarching aim is to create a repository of IK , which is based on 3D graphics visualizing the context from which the community collected IK video clips and pictures. The fraction of this study is to evaluate a prototype, tablets and touch interaction to enable indigenous rural elders to design arbitrary virtual 3D contexts to match real contexts not embodied in self-recorded IK rich media content. Already investigating the potential of 3D visualizations, game dynamics, IK and the interplay of these components, we embrace an opportunity to investigate this in the hands of knowledgeable Herero elders in Namibia and in the Third Space of HCI [6].

PROTOTYPE: HOMESTEAD CREATOR

The Homestead Creator is developed in Unity3D and was executed as Android 2.3 on a Motorola Xoom tablet. The Homestead Creator (see figure 1) consists of a large open virtual terrain seen from a top-down camera angle, and as investigated in [5] a selectable 35 degree tilted view. The right side of the screen contains 4 pictures as categories for 'trees', 'houses', 'animals', and 'homestead objects', which upon touch input expand and display an array of virtual models (see figure 2). When the user touches a virtual model it is instantiated in the green circle, which is designed to reserve an easily recognizable area for new objects in a potential large virtual context. By a 'single touch and drag'- gesture the objects are placed as desired by the user, while a white trail delivers a visual feedback cue to the user about which object is being active. The user can pan the terrain by dragging with two fingers, and zoom by traditional 'two-finger pinch zoom' - gesture. The input for rotation of camera/objects has not been implemented as a methodological approach to invite for end-users' help as devised in [6] regarding evolutionary prototyping. The blue square button on figure 1 and 2 triggers changing camera perspectives and has also been left open for further design discussions. An end product would require more elaborate and nuanced user controls for an IK management system that would potentially house a plethora of videos and audio clips. The authors describe in [9], that their users with low computer literacy did not find technical design standards intuitive, such as a 'triangle that makes a list drop down and

expand' or boxes with text in to be a button etc. Thus we first attempt to map traditional desktop icons or functions to a set of culturally derived metaphors. Heukelman's research on designing cultural interfaces [3] inspired us to look for an important user action; e.g. the deletion of virtual objects in the 3D world. Another member of the research team, originating from the village has close to his house in the village a hole in the ground to dispose garbage in. It is partly covered with worn metal plates to support the sides of the hole, and immediately attracted our attention as the metaphor we are seeking. If a user drags an object into the garbage hole, the object is removed from the terrain (see figure 1).

Figure 1 - a screenshot from the Homestead Creator interface captured from a top-down camera in the scene. The graphical metaphor for deletion of objects is located to the left.
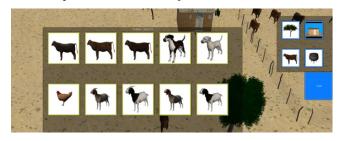

Figure 2 – a screenshot from the Homestead Creator depicting an expanded animal category seen from a tilted camera in the scene.

INVESTIGATING THE PROTOTYPE IN-SITU

Where?

We drove from the capital Windhoek in Namibia app. 400km into the Kalahari Desert to meet our co-designers in their space – a village consisting of about 20 homesteads with smaller houses. The majority of the houses are made of metal sheets and cow dung, some are artistically painted and they all provide a well-tempered space for up to 10 family members. Surrounded by bush and thick acacias the people in the village are living in and from the nature and when we enter their space we rely on the village elders to grant us time and participation.

How?

Being a smaller group of designers, we each have roles for taking notes, photos and video recording the sessions, while a member from our research group; who originate from the

village, conduct semi-structured interviews with the village elders while concurrently translating and sharing the dialogue with us. As mentioned in [7], there are unique issues with conducting studies in a developing world. One of those is the cultural barrier, where we must rely on our trained local research member to facilitate the sessions in accordance with local customs and power relations.

The elders were presented with The Homestead Creator for the first time and were being asked to design their own homesteads with the 3D models available. Being an exploratory study on a vertical prototype the dialogues with the elders were anchored with the following topics:

  a. How the change in prototype devices, from laptop to tablet is perceived, by the elders based on personal experiences?
  b. How is the touch interaction in The Homestead Creator perceived, and how could the gesture for rotation of objects/camera be implemented?
  c. Do the object-categorizations make sense and do the 3D models represent the actual objects?
  d. How can the 'blue button' be re-designed to represent a change in camera perspective?
  e. Does the culturally derived metaphor for deleting objects fit local concepts?

RESULTS AND DISCUSSION
Four elders, who all have been part of the research since 2009 and active participants in all phases of the project, participated in the evaluation and design discussion. They have been anchoring studies involving members of the village and have deciding power over the collaboration within their community. The individual sessions lasted approximately 45 min. and followed the same facilitation setup; the local researcher introduced the Homestead Creator and described how to operate it. While the participant was designing his homestead, they discussed in Otjiherero (local language of the tribe) the anchored topics and anything that might trigger further elaboration. At the end of the design session a European member of the research team was shortly updated in English and allowed follow-up questions. The sessions were recorded and afterwards translated by an external translator into English for further processing by the researcher team.

Changing device and interaction
It was evident that the tablet enabled the elders to immediately begin designing, and that the discussions were now based on the actual system in active use. One of the elders explained: "He (the elder) said that on the other prototypes (laptops) they had to use a mouse, which was difficult, this is easy cause he just has to use his hand" (in situ translation). This was supported by the other co-designers. The users experienced a couple of times that the screen suddenly changed to the home screen of the tablet. This was due to the physical design of the tablet with a virtual 'home button'. This factor was not considered in the

development, and illuminates how we can get used to operate a device and forget first time users. The elders were confused about this, and thought they did something wrong when it was indeed our fault. Figure 3 depicts 2 elders designing their homesteads.

Figure 3 - village elders design their homesteads on the Homestead Creator.

The elders selected and translated the objects with ease, but having developed the prototype as being limited to two-finger input we occasionally experienced that the user could not complete the actions. In all the cases the user held the device with fingers overlapping the screen – thus this is advocating for multi-touch and classifications of input gestures. Two of our users tried to rotate the objects with a gesture of two fingertips moving in a circular motion, which is known from Apple products etc. This finding underlines the touch approach as being more intuitive, less user-device friction, but also the need to implement missing gestures in future prototypes. Despite issues with the physical features of the tablet, it is evident that the elders appreciate the shift in device and interaction design, and they all expressed how easy it was to use.

Investigating the GUI
In general the elders agreed with the concept of categorizing 3D models under expandable icons, but shared several pointers on how the objects should be grouped. E.g. all objects belonging to the homestead should be grouped together, since they are primarily cooking objects or belonging to the homestead. One of the elders did not agree with the separation of domesticated animals and the fences and said that they are at the same place, which they should also be in the system. This statement underlines the importance of the overall concept about re-creating the context surrounding IK videos with the fact that objects and their interplay represent and embody cultural values, which might not be represented by multi media. They recognized the concept of the models, but the trees (except one) were discarded as being not from the area. The trees were designed/modeled/textured according to reference photos and the species were validated by a local researcher from the Agriculture Department. However, they did not match expectations from the elders. The logical next step would be to create the virtual trees together, thereby learning from which point our abstractions of the specific trees diverge. All the elders suggested that the blue button responsible for

changing camera perspective does not tell anything by its color, but that an icon portraying a view from the other camera would be optimal.

Investigating the metaphor for deletion of virtual objects
The 'garbage hole' proved to be contextually and culturally inaccurate although the concept of its operational function was transferred to the elders, the premise on which it lies was misinterpreted by the developers. We asked for the elders' attitudes towards dragging a wrongfully spawned virtual house into the garbage hole to make sure that it was gone from the terrain. One of the elders explained to us that they don't throw away a house. He elaborated by explaining that 'if a house turns ugly' (in situ translation), they leave it until they need the parts for something else. The dialogue continued on how to solve this specific issue. We asked if a burning fire could represent the concept, but the elder responded that the object would then irretrievably be gone. He suggested that the object should move back into the categories or be deconstructed making it reusable in another activity. This finding has a great value on at least two levels. Firstly, it illuminates a discrepancy between developers' and co-designers' perception of virtual objects' semantic connection to the real world. Secondly, without having co-designers being honest and constructive this misstep might have carried on into further steps of the development, which not only keeps an inaccurate concept alive, it might also be transferred to the youths. Our most important role is to facilitate knowledge transfer, not manipulate or question the knowledge. After the formal part of the last session we saw one of the elders and a youth sitting with the tablet under the tree. The elder was showing how to use it and they continued for some time to design the youth's homestead. It indicates that although limited by its size (10 inch.) the tablet can be a device of social interaction and facilitator of co-design and knowledge transfer between parties without interfering in local hierarchies (see figure 4).

Figure 4 - two generations design with the prototype.

CONCLUSION
This paper presents findings on how mobile devices aid in facilitating the transfer and discussion on core values of a prototype rather than creating a technological imbalance dividing users and concepts. The study presents and evaluates a system for indigenous elders to design 3D graphical contexts which support IK video recordings and provides findings on the intricate matters of designing together across cultures and generations.

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