EXTENDED ABSTRACT
A Field Computer for Animal Trackers

Edwin H Blake

Collaborative Visual Computing Laboratory
Computer Science Department, University of Cape Town
Rondebosch 7701, South Africa

edwin@cs.uct.ac.za

ABSTRACT

The field computer system has been developed to gather complex data on animal behaviour that is observed by expert animal trackers. The system is location aware using the satellite Global Positioning System. The system has been designed to empower semi-literate trackers. User testing showed that trackers were easily able to master the interface. They benefit from greater recognition, while the wider community gains from access to the knowledge of the trackers on animal behaviour.

Keywords

User Interface, Empowerment, Location Aware, Context Aware, CyberTracker

INTRODUCTION

Expert animal trackers play an important role in providing information on the distribution and behaviour of animals, which is overlooked by current surveillance techniques. The best trackers, however, are found in hunter-gatherer communities with oral traditions and who cannot read or write.

Computers could be regarded as devices that disempower marginalized people. We describe the design of an interactive computer system that supports and empowers such a group: semi- and ill-literate animal trackers. We have developed a field computer with a graphical user interface that enables trackers to record their observations. A pen-based handheld computer system for observations, and satellite Global Positioning System (GPS) receiver to obtain position data, constitute the field data collection system, while a base station PC system serves for long-term data storage and visualisation.

Our novel computer system has enabled functionally illiterate trackers to communicate their expertise to the research community. The initial system ran on an Apple Newton and it now runs on Palm handhelds and compatibles.

Our system was initially developed from February 1996 and tested in the Karoo National Park in June and September/October 1996. It has been continually refined and updated since. The system has subsequently become a successful product [1] with a number of applications.

CONTRIBUTION

We developed a user interface for functionally illiterate users. The interface is adaptable for varying educational, cultural and language backgrounds.

Trackers are experts in their own right and have access to very sophisticated and complex information about the environment. This knowledge is not available to the wider community, mainly because of the barrier of illiteracy. Our first *hypothesis* was that trackers are very familiar with the way signs point to meaning and so should have no trouble in attaching meaning to the icons of a well designed graphical user interface. We *further hypothesized* that such an interface will give the wider community the benefit of the knowledge of the expert trackers. Finally *we believed* that such a system would empower the trackers and allow them greater recognition and rewards for their skills.

The system was developed as a *critical action research* project and it has gone through a number of cycles. The trackers participated in an iterative design process and themselves validated each aspect of the interface. The success of the intervention can be judged by the impact of the users being recognized as experts in their field [2,3].

Context Aware Computing

A similar independent project was initiated under the banner of "Context Aware" computing by Pascoe *et al.* [4] shortly after our first field trails. Our research constitutes a critical action research intervention. Though illiterate, our co-designers, the trackers, have skills that well equip them to design and use handheld computer interfaces. Our success depended on following a traditional approach of *empowering users*. We believe that the notion of context-aware computing is a distraction in our type of application. We needed to record complex observations

CHI 2002, April 20-25, 2002, Minneapolis, Minnesota, USA.
ACM 1-58113-454-1/02/0004.

and inferences about the world. The machines are best regarded as marginal annotators: merely providing the space-time coordinates of the observation.

THE FIELD COMPUTER SYSTEM

The field computer enables trackers to record all significant observations they make in the field. Visualisation on the base station makes it possible for scientists to have instant access to all the information gathered over a period of time.

Icons allow the tracker to select options by simply touching the screen a pen-based computer. The tracker goes through a sequence of screens until all the necessary information is recorded. When the tracker saves the information a date/time stamp is added and an integrated Global Positioning System (GPS) automatically records the location of observations.

When the tracker gets back to the base camp he follows a very simple procedure to transfer the data onto the base

Design of user interface

Trackers are expert interpreters of signs. This ability can be exploited in the design of a user interface. The tracker connects a sequence of artificial signs corresponding with a sequence of natural signs.

In our iterative design methodology (or action research method) the trackers were consulted at every stage of development on both the visual layout and the behaviour of the system. Their input was incorporated into subsequent designs, and they could witness their input being immediately acknowledged. The interface includes text where appropriate as requested by the user's themselves. The level of literacy varies from illiterate to limited secondary schooling.

CONCLUSION

Technology can be developed to enhance human skills in a way that have social and environmental benefits. Rather than consider how technology can become context aware we preferred to consider how computers can assist the awareness of humans.

Over tens of thousands years hunter-gatherers developed a highly refined perception of nature through the interpretation of signs. At a time when traditional hunting is dying out, the field computer system helps to revitalise the art of tracking and develop it into a new science with far-reaching implications for the conservation of biodiversity.

We have shown that trackers are well able to use icons and other elements of a graphical user interface. Trackers are reluctant to use hierarchies and easily adopted identity maps. They are well able to use icons and other elements of a graphical user interface. However this is only true if the icons are designed with careful consideration of the cultural background of the users. The criteria used for icon recognition are clearly different from those used by the researchers.

The system has proven to be enormously useful and has had considerable impact. It has been used in four African National Parks: Karoo National Park and Kruger National Park in South Africa, and the Odzala National Park, Congo. It has also been adapted to record observations on the Cape Floral Kingdom for Cape Nature Conservation (see [1] under "Projects"). The first evidence of wider appreciation of the expertise of trackers is apparent from the publications based on their work as well as the exposure on the World Wide Web of the CyberTracker product. We have clearly shown that our system empowers trackers and does not deprive them of their roles.

The original Newton Design and separate GPS system has become an integrated system on PalmOs machines. The initial interface design has stood the test of many years of use very well and remains essentially unchanged. The hardware has developed in the past years and is now smaller and much faster and GPS is now much more accurate. The software has been released as free software.

ACKNOWLEDGEMENTS

Thanks to Lindsay Steventon, Jacqlyn Edge and Andrea Foster for development and research. Louis Liebenberg for the problem and many solutions; Leighton Hare, Karoo National Park and the trackers, Karel Bernadie, Chocolate Bosch and James Minye, for their contribution to creating the system; to Dr Gary Marsden for his helpful comments.

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