Panoramic Art in Real Time

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ABSTRACT
In the past few years and near future, technology moved and will move continuously towards computers which will be more and more integrated. Not only in purely technical but also in artistic environments we can make use of this and contribute new applications and artworks. We want to give the opportunity to experience art at first hand and directly influence the art as an observer. With a completely wearable equipment we can achieve this.

Keywords
Panorama, AOS, Active Oberon, QBIC

1. INTRODUCTION
Wearable devices open fields for new applications. One such application is the Virtual Panorama project[2]. A wearable system is used to look at and navigate within panorama pictures. The user's direction of sight is approximated with an electronic compass. Using this information as input, a wearable computer displays the section of a panorama picture the user is virtually looking at.
The *QBIC Belt Integrated Computer*[1], developed at the Wearable Computing Lab of ETH Zürich[1], serves as hardware platform. The operating system *Active Oberon System*[2][3] is well suited for this platform. Both the operating system and the Virtual Panorama application are written in *Active Oberon*, a strong-typed object-oriented programming language with built-in concurrency support. The programming language and the operating system were developed by the Programming Languages and Runtime Systems Research Group at ETH Zürich[3].

2. MOVING FROM VIRTUAL PANORAMA TO PANORAMIC ART IN REAL TIME
In this section we briefly explain the Virtual Panorama project and then describe the enhancements which let it become an artwork.

2.1 Virtual Panorama
The Virtual Panorama project provides an intuitive, natural user interface for navigation within panorama pictures. By moving his head the user can look around within the panorama pictures. It is based on a wearable hardware system, which consists of three major parts: A 3D electronic compass, the *QBIC belt integrated computer* and a head-mounted display. We show in brief what function these parts actually have.

2.1.1 User Input
The 3D electronic compass is the only input device in the system. It measures the spatial orientation of itself (heading, pitch and roll). Since the device is mounted on the user's head, we can use its measurements as approximation of the user's line of sight. It is also possible to recognise gestures. The measurement values are sent to the *QBIC* using a proprietary wireless link.

Figure 1: 3D Compass on Top of the Helmet

2.1.2 Data Processing
The compass transmits the angles of its rotation along the three axes of coordinates. These are transformed by the computer to coordinates of the section of the picture the user is virtually looking at (see red box in Figure 2). Several panorama pictures are stored in the flash memory of the *QBIC* for more variety. A simple gesture recognition algorithm allows to switch between them.

Figure 2: Panorama Picture

2.1.3 Output
The *QBIC* renders the section of the panorama picture and finally shows it on the head-mounted display. This display makes the wearable system fully self-contained so the user can move freely around without disturbing cables to stationary systems. Furthermore, the user has the display always right in front of his eyes even while turning his head.

[1]http://www.wearable.ethz.ch
[2]http://www.bluebottle.ethz.ch
[3]http://www.jg.inf.ethz.ch

2.2 Enhancements

Some enhancements to the Virtual Panorama project are introduced to add an artistic aspect to the project. Since the graphics performance on the *QBIC* is very limited, we use modifications of the colour palette that are easy to implement and impose very little costs in terms of computational power. Each pixel is represented by an 8-bit value, that is used as index into a colour look-up table, whose entries are 16-bit colour values. Therefore, a maximum of 256 out of 65536 colours can be displayed per frame. By changing the colour palette locally, psychedelic effects are introduced to the pictures.

Figure 3: Philipp Bönhof wearing the QBIC

Within a grey scale palette which is used for the images, we select a range of grey values and assign a single randomly chosen colour to all colours in this range. The width of the range is proportional to the number of turn-arounds of the compass device and can therefore be influenced by the observer directly. Its centre position is selected randomly at certain time intervals.
This minimal changes have the potential to achieve interesting effects. Because the observer can control the width of the range, an almost infinite number of variations of the image are possible.

3. CONCLUSIONS

New technologies enable not only the implementation of innovative products but also build an inspiring basis for new kinds of artworks. Based on the Virtual Panorama project that enabled users to naturally look at panorama pictures by providing a novel user interface, we built an artwork that can be influenced by the observer in real time. Since we are not artists ourselves, the focus of the project is mainly on technical aspects. In particular, we show that the use a fully self-containing wearable system is feasible as one-man project and can be an attractive basis for artistic experiments. Due to the simplicity of the underlying software technology, in particular the programming language Active Oberon and its lean runtime system AOS, an artist should be able to implement software-based artworks on this platform without having to focus too much on technical details.

4. ACKNOWLEDGEMENTS

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5. REFERENCES

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