Digital Information Architecture
Visualization of Demographic Statistics in Augmented Reality

Michael Zoellner

Extended Abstract

Introduction

When Otto Neurath transformed one-dimensional knowledge from books into two-dimensional picture statistics for his visualization system Isotype (International System of Typographic Picture Education), he experimented with all media available at that time. He could, admittedly, only dream of today's numerous media possibilities available on the market: Film, Interactive Media, Internet, mobile Information Systems, Virtual and Augmented Reality. The work titled »Digital Information Architecture« examines the possibilities for visualizing information generated by the new medium of Augmented Reality(AR). Augmented Reality is a new man-machine interface which displays information in the user's field of vision (on a pair of data goggles). Virtual objects are thus placed in the user's virtual surroundings. The result is Augmented Reality - an amalgamation of virtuality and reality.
»Digital Information Architecture« is a study about localized and object related visualization of statistics in AR in urban environments. It is an experiment that tries to project a city's or a neighborhood's demographic data in real time onto the city's inhabitants. These people are representing the demographic data and thus are transformed into living information graphics.

Application Scenario

Over the last years the mobile phone has become a familiar tool for the mass audience. 3G devices are offering color displays, high resolution digital cameras, Bluetooth and broadband internet access. It is self evident to use these as interaction devices for applications in urban environments. Thus a mobile telephone serves as an interaction device for the user who, by means of display, can choose a range of data possibilities for the respective surroundings, and can then have the result displayed on the goggles. The user is required to define the persons or objects, which are used to display the information. To achieve this, the user photographs people in the immediate vicinity of his mobile phone, using the built-in camera. According to the user's subjective impression these people represent a particular demographic group, for example a child, a youth, an adult or an older person. The segmented data are then used to generate graphs in real time and are projected into the field of vision of the user. Real people become living information graphs by projecting data on them in real time. These information graphs are walking through the neighborhood and are representing its demographic structure. The representation is no longer an abstract two dimensional chart users have to read and to imagine. It is mapped on real people living in this area. Thus these people are representing demographic data they are part of.

Visualization

How do we need to design content for Augmented Reality? Do rules of classic information design still apply to AR? In the first years after new media appeared a lot of people just tried to transfer their brochures to the web. It took a long time to recognize where the problems and advantages of screen presentations were. The development of a clear visual language for new media is still going on. With AR one does not only have a new medium just to present digital information, but is also able to project digital information onto the real world. Hence one has to keep the technical limitations of displays and trackers in mind. The low resolution of the current head-mounted-displays has a major impact on the visual quality of AR applications. Markerless tracking is essential for urban environments, but is still in its early research stages and not usable for end user applications yet. Although the technology side of Augmented Reality is quite sophisticated, the visual design issues of AR content in contrast, are nearly unexplored. It is a challenge for researchers and designers to explore the potentials and problems of creating a world full of digital information together. This project examines the impact and effect of visual perception, screen resolution, color and time on the visual quality of AR visualizations. It analyzes the different recognition of quantitative and relative visualization of data in AR, the problems of typography and the choice of color. The aim of the project is to focus on the design of AR visualizations at the starting process of the creation of a visual language for Augmented Reality.

Technology

The Work is based on Java and the Processing API. Processing is a programming language and environment, built for electronic arts and visual design communities. It can be used as a standalone programming environment or as an API in Java.
The core functionality of the project's software is to separate the person in front of the camera from its background and create an image statistic from its silhouette. In order to create a cropped image with alpha channel the video images are compared with a reference image of the background. The resulting cropped silhouette will be manipulated in order to represent the statistical values and remixed with the live video image.
Most parts of the software like the video tracking were published as open source software and were used the processing community in a lot of other projects.

About the Authors

Michael Zoellner is researcher at Fraunhofer IGD in the department „Virtual and Augmented Reality". The focus of his work is Information Design in Augmented Reality and User Interface Design. He developed for example the dentistry interaction device "Cercon move". The current project he is working on is the Augmented Reality Telescope called xc-01.
He studied „Communication Design" at the University of Applied Science in Wuerzburg, Germany. Focus of the studies was Information Design in Augmented Reality. Before and during the studies he was working as a freelancer at Design Agencies like Pixelpark AG (Berlin), Haeberlein & Maurer (Berlin) and a.f.i.m. GmbH (Munich) for customers like Adidas, Bertelsmann, Smart and Vitra. During the graduate studies he was working as assistant researcher at the Fraunhofer Institute for Computer Graphics (IGD) in Darmstadt, Germany. After the graduation (Dipl. Designer) in Wuerzburg he went to Providence, Rhode Island, USA in order to study at imedia Academy with a scholarship of the INI-GraphicsNet Foundation. imedia is a cooperation between the TU Darmstadt, the Fraunhofer INI-GraphicsNet Foundation and the Rhode Island School of Design.

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