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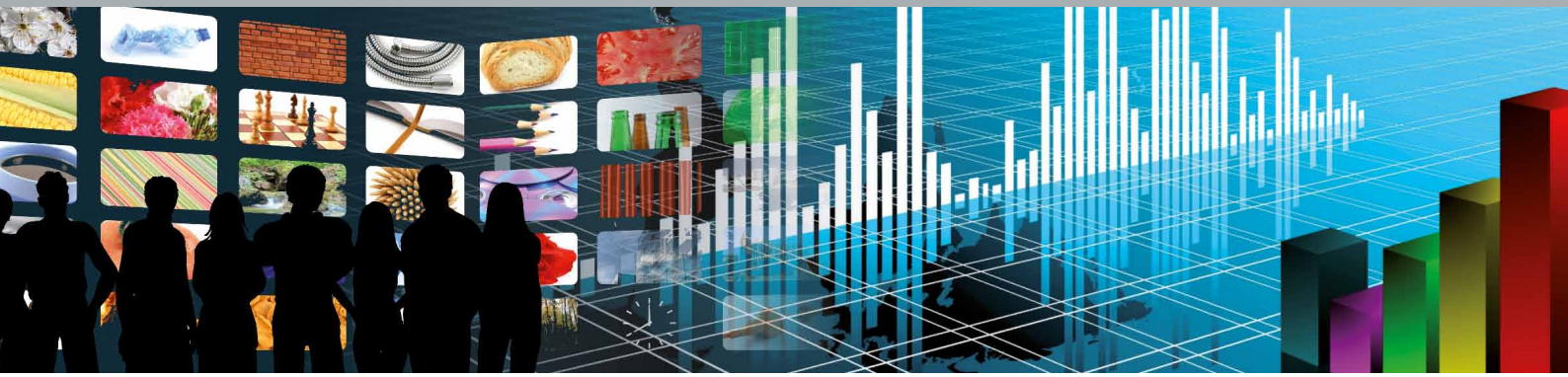

ChameleoAD: REAL-TIME ADAPTIVE DIGITAL SIGNAGE AND CUSTOMER ANALYSIS

Throughout the past years public advertisement and information systems have undergone major technological changes. The introduction of the "5th screen" provides a new infrastructure for delivering advertisement (Digital Out Of Home) and public information (Digital Signage) to customers, mostly in form of video and multimedia content. Systems are based on installations of public and situated displays, running media player software either being network connected or based on local data storage. Digital Signage systems are typically designed as Point-of-Wait (PoW), Point-of-Sales (PoS) or Point-of-Transit (PoT) networks, depending on the expected customer context. Nowadays most digital signage systems present content in a static manner, defined by playlists which reflect common heuristics and knowledge about expected customer presence and behaviour. Besides means of interaction (like mobile phones, touch screens or freehand gestures), systems are usually not capable of recognizing any properties of customers in real-time. Systems mostly do not collect any feedback during interaction with content. Therefore it is still impossible for the operators to accurately estimate the effectiveness of their signage networks and individual terminals, nor to improve content perception by automatic adaptation.

Real-time Audience Sensing, Content Adaptation and Data Analysis

Fraunhofer IGD's ChameleoAD system is designed to build on top of existing Digital Signage Solutions. It is capable to recognize anonymous properties of the audience around digital signage displays using visual sensors like standard digital cameras and time-of-flight (ToF) range imaging sensors. Moreover, it can automatically select appropriate content for the detected audience and play it considering the current state of

Fraunhofer Institute for Computer Graphics Research IGD

Fraunhoferstrasse 5
64283 Darmstadt

Contact

Competence Center "Cognitive Computing & Medical Imaging"
Volker Hahn
Tel.: +49 6151 155-612
Fax +49 6151 155-480
E-mail: volker.hahn@igd.fraunhofer.de

www.igd.fraunhofer.de/igd-a7

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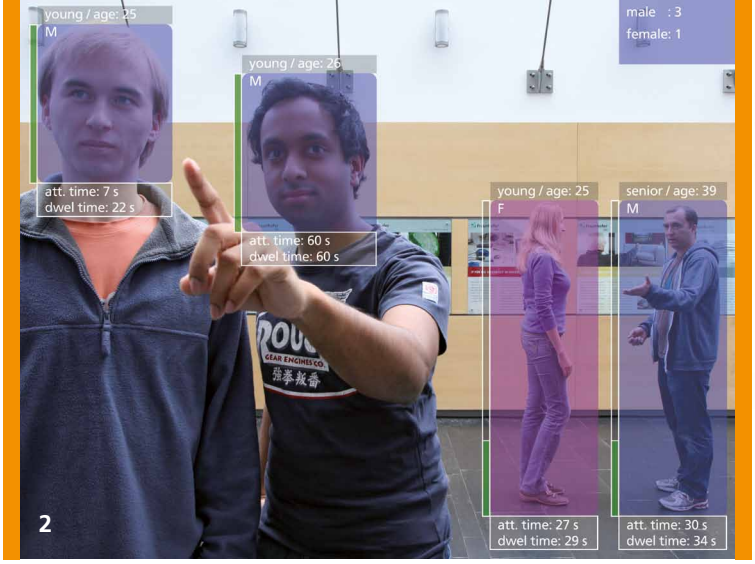

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the audience, like distance to the display or level of attention. All collected Audience and content playback data is stored in a database. A corresponding analysis tool allows the operator to perform a more in-depth evaluation of the collected data, either from a single or multiple display locations, in order to determine most favorite content or temporal / spatial audience characteristics.

OmniSense: Multi-Sensor Imaging and Analysis Technology

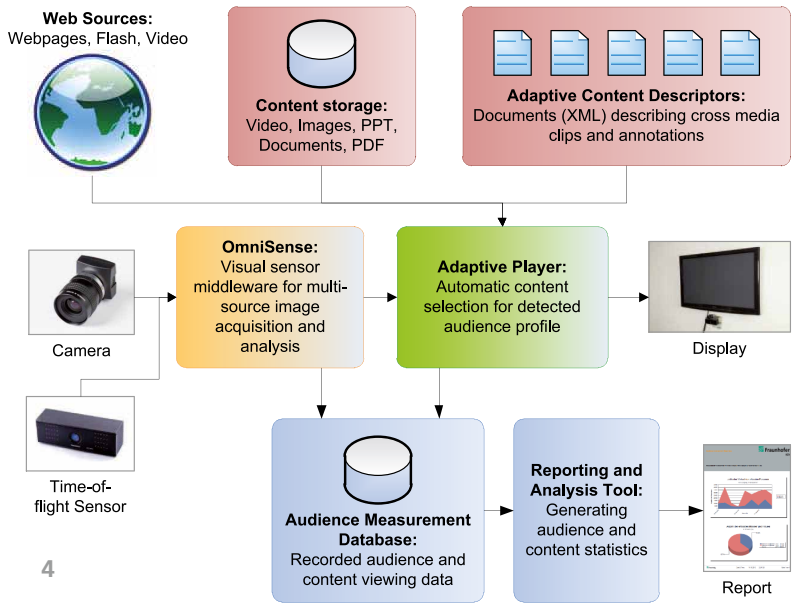
The sensing components of ChameleoAD rely on Fraunhofer IGD's OmniSense software framework. OmniSense comprises various components for visual sensor processing and extraction of high level data from raw camera pixel information, which can be used with standard camera vision (e.g. color, HDR, stereo, etc) or time-of-flight range imaging sensors, and for combined multi-sensor processing. OmniSense provides advanced technology for detecting and tracking humans in camera images, analyzing their anonymous visual properties (gender, age, motion patterns, etc) over time and detecting their level of attention. Besides audience analysis capabilities, OmniSense offers touchless interaction for hands-free point&click and gesture recognition. This interaction technology can also be seamlessly combined with audience analysis.

Adaptive Media Player

ChameleoAD's adaptive media player is able to adapt the presented content with respect to the audience in front of the display. The player uses specific media container formats (based on XML), which comprise references to digital media items (like HD video files, images, MS PowerPoint files, HTML webpages) and annotations from the content provider, reflecting audience related meta data (e.g. suitability of a piece of media to a certain age group or gender). The player receives real-time audience data from the OmniSense analysis component, and queries targeted content from the media containers, content storage and web resources. In this selection process different aspects like audience composition, distance to display, dwell time, age, gender and attention are considered. The player can also be combined with existing playout systems, to control playback and maintain dynamic playlists.

Data Analysis & Reporting Tool

Besides exploitation for real-time adaptation, collected audience data is also stored in a central audience measurement database. A database analysis tool allows the operator to visualize results from sensing and adaptation in real-time generated reports. The reports give detailed insight into daily, weekly, monthly statistics on temporal development of customer profiles or statistics of presented content.



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1 *Fraunhofer's OmniSense Technology can use standard digital cameras or Time-of-Flight (ToF) range sensors for audience analysis.*

2 *Detection, tracking and classification (blue:male, red:female) of persons based on facial regions and full-body image regions.*

3 *Camera and time-of-flight sensor for audience analysis, mounted below a digital signage display.*

4 *The ChameleoAD approach to automatic content adaptation and analysis of customer / content statistics.*