

Live TV-Set with mobile Augmented Reality

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Abstract - To interact as audience to a live television production is today a common procedure. New is to use Augmented Reality support to reach the audience at home. Also new is the situation to have many Television Sets at private houses connected with the internet. Both are offering lots of possibilities for interactive live television productions. The author shows current productions, a by himself produced case study with Augmented Reality at the OpenCampus 2011 and is going into discussion.

Keywords: Audience Interaction, Broadcast, Streaming, WebTV, Augmented Reality, Virtual Reality

1 Introduction

Nowadays Live - Television Shows often include a way of audience interaction. The idea is to reach the viewer to make him watching the show as long as possible. One reason for that is often selling advertising time (commercial spots) to finance the station. Another is the concept of the show itself, social participation. Many technologies are in use to interact with the audience. A new way is to use Augmented Reality and SmartTV for interactive experiences, where the technology itself can also be used for different applications. Both are based on the latest technology. Augmented Reality, based on a mobile device App, needs a Wifi or UMTS internet connection to work. SmartTVs are also based on an internet connection. These two technologies are getting more and more common. Telecommunication Companies started to realize the "Last Mile" to the customer with LTE and fiber optics to support higher data rates. The feedback channel to the broadcast center and streaming server doesn't need these high bandwidths. Only video streaming needs nowadays such bandwidths.

2 Interactive television today

In the past there were many good and bad examples of interactive television shows. Planning and realizing a TV format is very extensive and expensive. A few projects showed that interactive television can be very profitable. The challenge is to find a creative idea and to use an easy way of technology for customers. Hollitzky describes, that nowadays there are several business plans to create a successful interactive television project [2]:

Indirect profit

Television stations can create interactive applications to increase customer loyalty. This is very important for PayTV stations. With new concepts of interactivity they acquire new customers and hold regular ones.

Selling content

Television broadcasters sell their videos or applications like PayPerView, PayPerTime or PayPer Download. Sky Austria for example provides additional channels, where viewer can pay for new movies.

Selling interactivity

This means that people can participate in contests by sending SMS or call in. Viewers get the feeling of interactivity and the TV station earns money by its premium-rate telephone service.

Selling products

Interactive television applications offer products while the show is running. For example merchandising or product placements. The viewer has a quick chance to get the product.

Advertising specials

Specialized interactive television systems can personalize the advertising, depending on what a viewer is watching. Advertising specials can also be interactive advertising shows.

Today there are a few interactive television concepts, which show the different ways to attract viewers. Nowadays a good example is icueTV. [...] Viewers can interact with programs by voting, requesting additional information or purchasing items related to their viewing experience. The ETS platform handles the back-office functionality required for the fulfillment of interactive events. This allows viewers to select and purchase products offered by the content provider or advertiser. With a few simple clicks on their existing remote control, the TV viewer can purchase a DVD of the show they are watching, buy their favorite actress dress or even

download a ringtone of the latest hit song [10]. This means, that icueTV provides the technical solution with an IPTV backchannel for a fluent process. Television broadcasters have to provide interactivity.

ActiveVideo is another interactive television concept of on-demand television in America. The main concept of ActiveVideo is CloudTV. This means, that viewers get their content served as they enter their preferences. Beside normal television shows viewers can also choose mobile services, web videos or social platforms. Content developers are able to store and process video content in the network cloud of ActiveVideo. While watching a television show people can chat with each other on the TV screen. Customers need a set-top box and a broadband internet connection or a cable connection. Founded in 2008, ActiveVideo acquired more than 5 million customers and proves how successful their concept is [8].

YouView, formerly known as Project Canvas, is a television platform with an internet-connection in the United Kingdom. Project Canvas was founded by the four broadcasters BBC, Channel 4, Channel 5 and ITV plc [11]. The basic idea of YouView is that viewers can watch whatever they want. YouView needs a set-top box, a broadband internet connection and a satellite connection. Viewer can choose from a big variety of television shows. YouView also offers plugins, similar to smartphone apps nowadays. The fact that customers just have to pay for the set-top box shows, that it could be a big success, even if it will be released in 2011 (cf. YouView Questions 2010, no page).

3 Augmented Reality in live performances and TV productions

The simplest form of AR is optically-based, where the system only draws in the AR detail with the rest of the display remaining black for the physical world to be viewed in the HMD [Head Mounted Display] [5]. In order to improve accuracy and achieve higher quality images, my implementations have switched from using optical overlay to video overlay [...]. All of the pictures [...] were captured using video AR. Performing video overlay is more complicated than in the optical case, and the computer needs to capture the video from a head mounted camera, render this to the display, and then overlay the 3D and 2D graphics on top to produce the final output for the HMD. The implementation still contains the ability to switch to optical overlay, but this is rarely used. Wearable systems are often vaguely described as electronics somehow integrated with clothing. We argue that

while this is the way many systems are implemented, the definition of a wearable system is much more broad [4]. Wearable systems are better defined through their functionality as systems that are usable always and everywhere. It is only from such functional definition that viable architectures and concepts for the integration of electronics with the users outfit can be developed. For consumer markets, today mainly smartphones with an AR Browser like the Layar Reality Browser or Metaio's Junaio App are used for AR.

Marking the first step for true interactive television, German TV show Galileo has partnered with Metaio to beta test out Junaio, the interactive broadcast for iPhone or Android phone users [13]. Viewers could participate in an interactive quiz, get feedback on the pooling results and compare the answer to other viewers. All a user will have to do is select the Galileo channel on his/her smartphone through Junaio application, point the phone camera at the TV screen at close enough distance, and Junaio application will capture the screen image using digital image recognition and start connecting the TV station's server via internet to kick start the two-way transmission. User could send their response by clicking the available answer on their smartphones touch screen, and could view the answer immediately to check for correct answer.

Zambo is a cross media platform for kids located in Switzerland. A part of this platform is broadcasted by the Swiss television (SF) as the interactive live show "Zambooster" [12]. The interactive approach by this Swiss television show is to interact in a real TV set with virtual Avatars of the kids. The children can answer questions at an interactive website and their avatars will be divided into winner and loser. In the end, there is only one winning kid who is immediately invited to the live show to talk with the host and plays a final game to win a price. While the host of the show talks via phone to the real child, the virtual avatar is mapped through augmented reality markers in the studio and overlays the camera image of the live show [3] and [7].

Woolard et. al. [14] build up a study on the use of an augmented reality application in a BBC news TV studio. In their solution they use a 3D landscape, tanks and missiles, tracked with the help of pattern markers, to present current war scenes interactively. For implementation they use the "ARToolKit" [15] software library with several adaptations to handle Chroma keying, zooming cam lenses and interlaced images.

The Cyber-Illusionist Marco Tempest uses augmented reality for his stage performance “Augmented Reality Magic 1.0”. “I’m using a camera eye, which shows what happens on the table in front of me. Then the computer overlays the image with virtual objects. The cards will start to move or grow things out of them. The state of the development of Augmented Reality is currently known from the advertising. On a real object, such as a magazine, a specific pattern is printed. You can hold this pattern in front of a webcam and the real object and virtual images or enriched animations appear on the screen. With this card trick, I’ve tried to make it a story, to tell a story. The cards serve as pattern, the computer will recognize these and overlays with digital information” [1]. Tempest encourages the industries to use augmented reality especially for games. He sees the technology only as good enough for games, because the optical see-through glasses, which are relevant for the most augmented reality solutions, are not yet available for the mass [6].

4 Live-TV Productions at the Open Campus 2011

The annual OpenCampus event on 18th + 19th March 2011 at the St. Poelten University of Applied Sciences was used to produce two live TV-Productions with Augmented Reality support. Both Productions were based on a Virtual Studio Production. The Studio Set was a Sports studio and the guests of the two talk shows were on the first day the Soccer Player Andreas Gradinger and a day later the Basketball Coach Hubert Schreiner and one of his Players.



figure 1. Live – TV-Production OpenCampus 2011 – Virtual Studio 19/3/2011



figure 2. Live – TV-Production OpenCampus 2011 – Greenscreen 19/3/2011

5 Results

The interaction by the audience was realized with the Augmented Reality App “Junaio” for Android and iOS smartphones. The Universities logo was used as marker which had to be scanned with the smartphones camera. The feedback after the image recognition was an augmented start screen. This start screen was the basis for all further selections. It was possible to start the live video stream in the Media player on iOS for http-streaming and for Android Handhelds; a website started with rtmp-streaming (Adobe Flash Player).

1. Start the junaio App

2. Load the Channel „opencampus”

3. Focus on the Logo



4. Interaction screen appears



figure 3. AR Browser Junaio

A website displayed some general information about the project. Finally, the audience interaction feedback to the live set was accessible and switched the screen. In the next step, a selection screen appeared and the audience could select the interaction. For each one of the three studio guests, one question could be chosen by the user. In addition, the background color of the virtual studio set could be chosen (white, blue or yellow). All buttons on these screens were animated 3D-Objects with custom textures (e.g. soccer ball, basketball). The results of the selections by the audience about the questions to the studio guests have been shown on a Flatscreen in the virtual environment of the Ventuz real-time 3D-Graphics which was in use for the Virtual Set. Finally, the interviewer asked the guests the selected questions.



figure 4-5. Interaction Screens

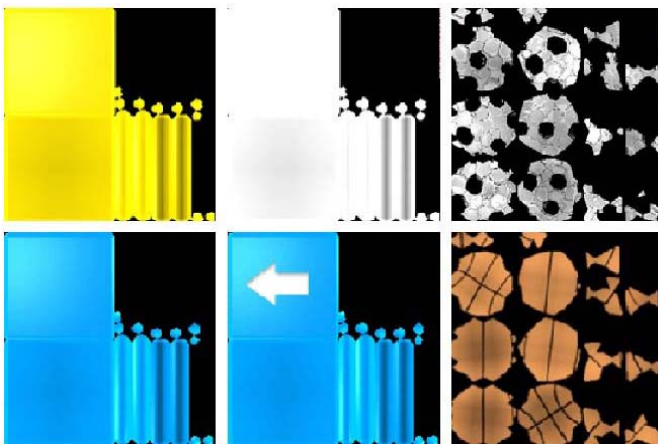


figure 6. Animated Button Textures

5.1 Website statistic

762 Hits on Friday and 624 hits on Saturday were recorded from our apache webserver during the OpenCampus 2011 event. The website visitors' source operating system count for Windows: 303; iPhone: 141; IPAD: 1; MAC OS: 76; UNKOWN: 241 hits on Friday and on Saturday for Windows: 224; iPhone: 78; IPAD: 1; MAC: 50; UNKOWN: 271 hits.

23 visitors' decided to join our lottery. They have had the possibility to use IPHones provided by our faculty or their own. Because of this reuse the unique IP address which reached our webserver count only 18. 26 only played with the OpenCampus junaio App and decided not to join our lottery.

The live video stream was played/stopped 75 times on Friday and 130 times on Saturday by the users. To connect to our Wowza Media Server, 21 unique IP sources use a windows operating system; 12 a Mac OS; 9 an iPhone; 5 an Ipad and one an Android like shown in figure 4. In figure 5 the client locations are shown, departed in Austrian districts and other countries.

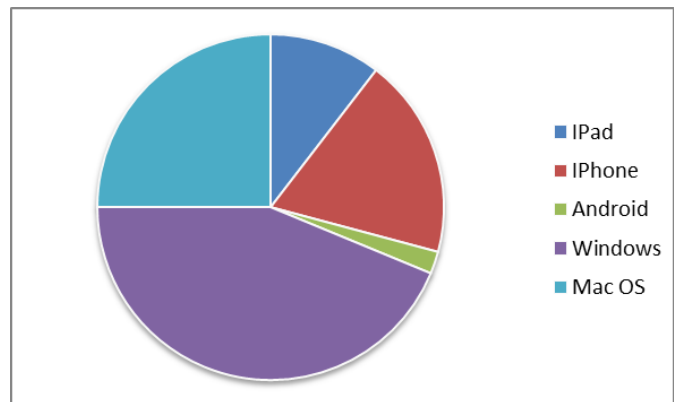


figure 7. Live Stream Visitors Operating Systems

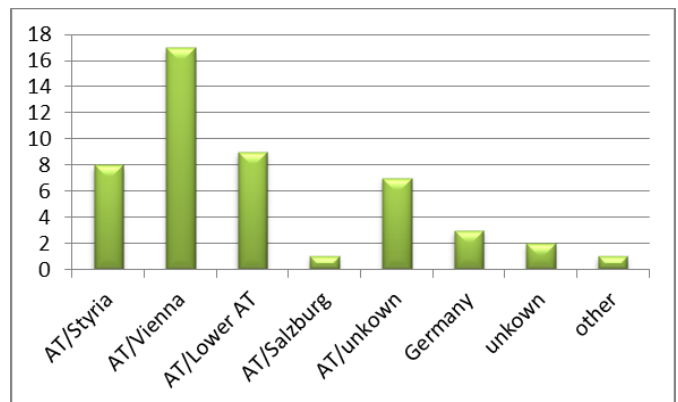


figure 8. Live Stream Visitors Location

5.2 Video On Demand

The two Video productions are available on YouTube:
<http://www.youtube.com/playlist?list=PL14E2A6799BA1970D>

6 Discussion

In this work the author described how Augmented Reality could be used for audience interaction. In the case of the usage with smartphones, a live TV-Production was realized. It was possible to develop audience interactions with iOS and Android smartphones of the latest generation, with the Junaio App and a colored marker. The image recognition, based on Metaio's Junaio App, worked well under stable light conditions, printed markers and also computer screen based markers. Reflections on the markers and too pixelated images haven't been useful. The user had to be aware of these issues to get a stable augmentation of the interaction screens. The usability of the interaction Screens must be very well thought. The Internet connection is another important issue. There must be always a 3G or free accessible Wifi network available to use this kind of interaction. In our case, some of the Phones we were using had a slow internet connection, while we were using them inside of the Videostudio. So it is better to use a Wifi network at home, if there is also limited 3G access. The visitors responded good experiences with this way of interacting with the production crew and looking forward to further broadcast productions.

Finally, the cases study shows that interactive television will get more important by using new technologies like smartphones instead of traditional remote controls of TV Sets. In combination with internet connected TVs, lots of opportunities for interactivity are possible.

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Figure 9. Live – TV-Production OpenCampus 2011 – direction
19/3/2011

8 References

- [1] Gross, S. (2010). Marco Tempest: Virtuelle Magie als YouTube-Hit, Vienna: Die Presse: 2010-12-10
- [2] Hollitzky, R. (2010). Interactive Television for TV Productions. Bachelor Thesis, University of Applied Sciences St. Poelten
- [3] La Tendresse, C. (2011). Realtime 3D - Avatare im Kinderstudio. Speech. Media Future Day <Virtual & Beyond>, Zurich/CH: tcp – technology and production center Switzerland ag – Studio 1: 2011-01-27
- [4] Lukowicz, P. (2007). Bodynet architectures: the meaning of wearability. Proceedings of the ICST 2nd international conference on Body area networks -BodyNets '07
- [5] Piekarski, W. (2004). Interactive 3d modelling in outdoor augmented reality worlds. PhD Research Thesis. University of South Australia
- [6] Tempest, M. (2011). Cyber Illusion - Is Seeing Believing? Speech. World Economic Forum. Davos: 2011-01-28
- [7] WEAVE Magazine (2010), Article: AR-Kinder-TV für den Schweizer Rundfunk, Ulm: Ebner. Volume 05.2010
- [8] ActiveVideo Networks (2010)
[<http://www.activevideo.com/>] (2010-09-16)
- [9] BBC.co.uk (2010) TV Interactive – Using the red button.
[http://www.bbc.co.uk/digital/tv/tv_interactive.shtml]
(2010-09-14)

- [10] icueTV (2010)
[\[http://www.icuetv.com/home\]](http://www.icuetv.com/home) (2010-08-18)
- [11] Projectcanvas.info (2010)
[\[http://www.projectcanvas.info/\]](http://www.projectcanvas.info/) (2010-09-09)
- [12] SF (2011). Schweizer Fernsehen – Zambooster Kids TV.
[\[http://www.zambo.ch/Sendungen/Zambooster\]](http://www.zambo.ch/Sendungen/Zambooster) (2011-02-08)
- [13] Xu, E. (2011). Junaio: Two Way Interactive TV Transmission – For iPhone And Android Smartphone Users.
[\[http://thecoolgadgets.com/junaio-two-way-interactive-tv-transmission-for-iphone-and-android-smartphone-users/#ixzz1DxQ3wUQn\]](http://thecoolgadgets.com/junaio-two-way-interactive-tv-transmission-for-iphone-and-android-smartphone-users/#ixzz1DxQ3wUQn) (2011-01-28)
- [14] Woolard, A. / Vali Lalioti, V. / Hedley, N. / Carrigan, N. / Hammond, M. / Julien, J. (2003). Case Studies in Application of Augmented Reality in Future Media Production. Proceedings of the Second IEEE and ACM International Symposium on Mixed and Augmented Reality (ISMAR '03)
- [15] ARToolKit (2011)
[\[http://www.hitl.washington.edu/artoolkit/\]](http://www.hitl.washington.edu/artoolkit/) (2011-07-15)



Figure 10. AR OpenCampus Channel in Use