



ERCIM "ALAIN BENSOUSSAN"  
FELLOWSHIP PROGRAMME



## Scientific Report

First name / Family name	Britta Meixner
Nationality	German
Name of the <i>Host Organisation</i>	CWI
First Name / family name of the <i>Scientific Coordinator</i>	Pablo Cesar
Period of the fellowship	01/10/2016 to 30/09/2017

### I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During my fellowship I mainly worked in three different areas, as described hereafter:

**Data formats and user interfaces in the 2-IMMERSE project:** I collaborated in the 2-IMMERSE project which deals with delivering single and multi-screen content services for immersive, customized and shared experiences in homes and social spaces. I worked on data formats needed for describing the user experience. This way, I applied my previous knowledge in new application areas. I collaborated with project members from BBC in the requirements analysis of the production tool, the interface concepts of the production tool, and in software and user tests of the production tool. This work allowed me to increase my skills in requirements gathering and analysis, UX-/UI-design and usability testing. Especially interviewing professionals in the area of broadcasting helped me to understand real world production workflows better.

**Streaming:** I contributed to a DASH streaming project. There I set up a raspberry Pi testbed to conduct tests with 600 DASH players in a network. This research on streaming has been successfully evaluated and presented in an award winning paper. I furthermore started implementing a visualisation of the testbed and implemented an Android app to collect live LTE data for further analysis and model building. The more practical work gave me deeper knowledge on technologies. It has significantly contributed to strengthen and broaden my areas of expertise and interest.

**Service to community:** I continued my tasks as a co-editor of the MTAP Special Issue “Interactive Media – Technology and Experience” and as a co-organizer of the WSICC Workshop at TVX. During my fellowship, we published the MTAP Special Issue and wrote and published a paper about the workshop series in the IEEE Multimedia magazine. I wrote a book chapter on “Theoretical Foundations: Formalized Temporal Models for

Hyperlinked Multimedia Documents“ for the book “MediaSync: Handbook on Multimedia Synchronization” to be published by Springer. I published my ACM CSUR paper about hypervideos and interactive multimedia documents. I have also been invited as Committee Member of a Master’s Thesis at the Universiteit van Amsterdam. I served as a local co-chair for ACM TVX 2017 in Hilversum, the Netherlands, got invited to be workshop co-chair for ACM TVX 2018 in Seoul, Korea and to be program co-chair for ACM TVX 2019 in Manchester, UK. I was co-chair of the multimedia storytelling and curation area of the Experience track at ACM Multimedia 2017. I will furthermore serve as a local co-chair at MMSYS 2018 in Amsterdam, the Netherlands.

**Teaching:** During my Fellowship, I gave a course on “Interactive Multimedia” at the Technische Universität (TU) Chemnitz for advanced Bachelor and Master students including the lecture, exercises and project supervision. The course included topics like authoring paradigms and tools, players, timing models, an introduction into XML, data formats, QoE and usability, as well as download and cache management and streaming technologies. This course got a very good evaluation from the students. I also gave an one-day tutorial “Interaktive Multimedia-Anwendungen” (in German) at the INFORMATIK Conference in Chemnitz, Germany.

Summarizing, the ERCIM fellowship has extended my research to new fields (adaptive streaming), gave me the opportunity to work with broadcasters in the UK (BBC and BT), and strengthen my network being involved in conference organization. Talks with my Scientific Coordinator Pablo Cesar helped me to find a vision for future research and to better frame my documents for future job applications in the scientific field.

## II – PUBLICATION(S) DURING YOUR FELLOWSHIP

### Journal papers:

[1] Rene Kaiser, Britta Meixner, Joscha Jäger: Reflecting on the Workshop on Interactive Content Consumption (WSICC) Series. In: *IEEE MultiMedia*, Volume 24, Number 3, IEEE Computer Society, pp. 83-88, ISSN 1070-986X, 2017

[The level of interactivity can vary when watching TV or online media. It can range from simple—where secondscreen applications extend passive consumption with unsynchronized information about a program—to complex—where highly synchronized methods provide haptic feedback to actors of a remote live performance. Although simpler versions of interactive content enhancements are publicly available, more advanced methods and prototypes are still in the testing phase and thus stand to benefit from discourse in the community involving both researchers and practitioners. Enabling interactive access to multimedia content and evaluating content-consumption behaviors and experiences involve several different research areas, which are covered at many different conferences. To enable a more focused discussion on interactive content consumption and its manifold factors and facets, during a project plenary meeting in Graz in 2012, the idea was born to conduct a related workshop at a scientific conference, which turned into the Workshop on Interactive Content Consumption (WSICC) series (<https://wsicc.net>). The first WSICC was held in conjunction with the last European Conference on Interactive TV (euroITV) in 2013. EuroITV then became the ACM International Conference on Interactive Experiences for TV and Online Video (TVX), which is where the next three WSICC sessions were held. Over the years,

we worked with different co-organizers, and the series concluded at the 2016 TVX conference. In this article, we reflect on the outcome of the series.]

- [2] Britta Meixner: Hypervideos and Interactive Multimedia Presentations. In: *ACM Computing Surveys (CSUR)*, Volume 50, Number 1, Article 9 (March 2017), ACM, New York, NY, USA, 34 pages. DOI: <https://doi.org/10.1145/3038925>

[Hypervideos and interactive multimedia presentations allow the creation of fully interactive and enriched video. It is possible to organize video scenes in a non-linear way. Additional information can be added to the video ranging from short descriptions to images and more videos. Hypervideos are video-based but also provide navigation between video scenes and additional multimedia elements. Interactive multimedia presentations consist of different media with a temporal and spatial synchronization which can be navigated via hyperlinks. Their creation and description requires description formats, multimedia models, and standards -- as well as players. Specialized authoring tools with advanced editing functions allow authors to manage all media files, link and arrange them to an overall presentation, and keep an overview during the whole process. They considerably simplify the creation process compared to writing and editing description documents in simple text editors. Data formats need features that describe interactivity and non-linear navigation while maintaining temporal and spatial synchronization. Players should be easy to use with extended feature sets keeping elements synchronized. In this article, we analyzed more than 400 papers for relevant work in this field. From the findings we discovered a set of trends and unsolved problems, and propose directions for future research.]

- [3] Britta Meixner, Rene Kaiser, Joscha Jäger, Wei Tsang Ooi: Guest Editorial: Interactive Media: Technology and Experience. In: *Multimedia Tools and Applications*, Springer US, pp. 1-5, ISSN 1573-7721

[The shifting balance between lean-back passive TV/Web-based media experience and leanforward interactivity has led to new forms of collaborative content creation. This allows controlling media with a companion screen and more advanced forms of audiovisual content interaction. Based on such developments, new media formats and consumption paradigms that allow for new types of interactivity have emerged. This special issue focuses on interactive media experiences and presents articles on recent advances regarding interaction with audiovisual content, both recorded and live. The issue brings together articles from the area of interactive media around topics of interest like enabling technologies, experiences, user interaction, and content. It shows best practices in all these areas as well as future challenges. The special issue received 31 submissions showing its widely-gained attention. After two rounds of revision, a total of 9 manuscripts were accepted.]

### **Book chapters:**

- [4] Britta Meixner: Theoretical Foundations: Formalized Temporal Models for Hyperlinked Multimedia Documents. In: *MediaSync: Handbook on Multimedia Synchronization*, Mario Montagud et al. eds., Springer, to appear

[Consistent linking and accurate synchronization of multimedia elements in hypervideos or multimedia documents are essential to provide a good quality of experience to viewers. Temporal models are needed to define relationships and constraints between multimedia elements and create an appealing presentation. However, no commonly used description language for temporal models exists. This makes existing temporal models harder to understand, compare, and transform from

one to another temporal model. Using a formal description is more accurate than commonly used textual descriptions or figures of temporal models. This abstract representation makes it easier to precisely define algorithms and constraints for delivery and buffering, as well as behavior of user and/or multimedia document. The use of a common formalism for all temporal models makes it possible to define synchronization constraints and media management. The same variables and terminology can then be used for describing algorithms that are applied to the documents, for example to implement pre-fetching or download and cache management in order to increase the quality of experience for users. In this chapter, we give an overview of different existing temporal models for linked and temporally synchronized multimedia documents, like point-based, event-based, or interval-based temporal models. We analyze their common features and formally define their elementary components. We then give formal definitions for each temporal model covering essential features. These can then be used to computationally solve existing problems. We show this by defining basic functions that can be used in algorithms. We also show how user interaction and resulting video behavior can be precisely defined.]

### **Full papers:**

- [5] Jan Willem Kleinrouweler, Britta Meixner & Pablo Cesar: Improving Video Quality in Crowded Networks Using a DANE. In: *Proceedings of the 27th Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV '17)*. ACM, New York, NY, USA, pp. 73-78 (**The DASH Industry Forum Excellence in DASH Award 2017 (second place)**)

[Dynamic Adaptive Streaming over HTTP (DASH) is a technology for delivering video content over the Internet. It provides an effective mechanism, which has been adopted by major content providers. Nevertheless, available DASH player implementations have a number of drawbacks such as performance problems on shared network connections, which lead to video freezes and frequent video quality changes. In this paper, we propose a method to reduce the performance problems that exist in networks with a large number of DASH players. These networks can be found in hotels, apartment complexes, and airports. In experiments with up to 600 simultaneously active players, we are able to reduce the number of DASH players with freezes by 95% (from 345 to 15) compared to throughput-based adaptation and by 75% (from 62 to 15) compared to BOLA using our DASH Assisting Network Element (DANE). In addition, we reduced the number of quality switches by 94% compared to throughput-based adaptation, and by 85% compared to BOLA.]

### **Short/workshop papers:**

- [6] Britta Meixner, Matthew Lee & Scott Carter: Chat2Doc: From Chats to How-to Instructions, FAQ, and Reports In: *Proceedings of MultiEdTech17: Multimedia-based Educational and Knowledge Technologies for Personalized and Social Online Training*. ACM, New York, NY, USA, to appear 2017

[Sharing multimedia via messaging apps is widely used. However, the timeline structure makes it difficult to retrieve content shared over time. It is not possible to organize accumulated knowledge so that it is concise for future use and easy access. So far, no system exists that combines the easy-to-use interface of a messaging app with a knowledge extraction system that can create multimedia documents and allows users to store and edit content for future use. In this paper, we propose a system that

will enable individuals to collect, store, and automatically extract procedural knowledge from their messaging interactions. The system uses the well-known chat interface to communicate and adds the capability for users to tag text and media to organize content. It also adds a new thread-like structure to the previously only linear timeline of a chat. Knowledge from the chat can then be extracted into a high-quality multimedia document.]

- [7] Britta Meixner, Matthew Lee & Scott Carter: Managing Family Healthcare with Multimedia Chat Apps: A Survey on What is Missing In: *Proceedings of MMHealth17: The 2nd International Workshop on Multimedia for Personal Health and Health Care*. ACM, New York, NY, USA, to appear 2017

[Chatting and messaging apps allow people to share information (text, images, etc.) using a simple, well-understood interaction metaphor of a conversational time-line. These apps can help small task-oriented user groups, like caregivers of a family member, to coordinate with each other in group chats to get things done. However, whereas existing chat apps are well-suited for communicating and sharing content on-the-go, it is difficult to retrieve content generated and shared over time or related contents that showed up over time. Currently, it is also necessary to install multiple apps that may require separate user accounts for sharing for example task lists or calendars. In this work, we provide results from a survey that investigates what additional features are considered useful in a multimedia enriched chat application used to coordinate caregivers of a family member. We also look into what an extended multimedia enriched chat interface should look like and which features it should provide.]

- [8] Jan Willem Kleinrouweler, Fabijan Bajo, Britta Meixner, Sergio Cabrero & Pablo Cesar: Mobile Instant Video Sharing: Does More Information Help? In: *Proceedings of ACM Multimedia Thematic Workshops '17*. ACM, New York, NY, USA, to appear

[Videos are an important part of social platforms. With growing data speeds and high resolution cameras on mobile devices and smartphones, mobile instant and live video clip sharing become increasingly popular. However, video uploads are resource consuming which leads to long upload times, especially in environments with poor data connections. In current mobile applications, the user has little to no influence on optimizing the upload of her/his video according to the current (network) context. In this work, we propose a mobile application that shows an accurate upload time estimation and a current network speed indication. The user can select a video quality for uploading and by that possibly reach faster uploads in low bandwidth connection areas. In a user study with 21 users, we show that users perceive the upload speed as higher with given upload estimation and network speed indication when they have less bandwidth available. With this information, participants perceive the application as more reliable and have an increased feeling of control over the upload process. All users liked the proposed video quality customization feature. Compared to a graphical representation of the network speed, the upload time was the more helpful information to customize the upload.]

- [9] Britta Meixner: Interaktive Multimedia-Anwendungen (TUT02). In: *Informatik 2017, Lecture Notes in Informatics, GI*, to appear

[Mit modernen Web-Technologien können interaktive und mit zusätzlichen Medien angereicherte Videos umgesetzt werden. Diese können in einer nichtlinearen Weise organisiert werden und erlauben eine Anpassung der Inhalte an den Nutzer. Darüber hinaus können dem Video zusätzliche Informationen wie kurze Beschreibungen,

animierte Bilder und weitere Videos hinzugefügt werden. Dies ist vor allem im Bereich der Wissensvermittlung hilfreich und sinnvoll wenn Lernende unterschiedliche Wissensstände aufweisen oder unterschiedliche Medien vorteilhaft eingesetzt werden sollen. Dieses Ganztagestutorial bietet eine Einführung in die Gestaltung von interaktiven Multimedia-Anwendungen. Behandelte Schwerpunkte sind zeitliche und räumliche Modelle sowie Interaktions- und Synchronisierungsmodelle. Weiterhin werden Software-Frameworks und Standards vorgestellt. Ein weiteres Augenmerk liegt auf der Quality of Experience in multimedialen Anwendungen und Präsentationen. Zielgruppe des Tutorials sind Dozenten und Dozentinnen, Wissenschaftler und Wissenschaftlerinnen, Studenten und Studentinnen, sowie Fachpublikum aller Disziplinen die daran interessiert sind, Lerninhalte ansprechend und individuell anpassbar zu vermitteln.]

- [10] Britta Meixner, Maxine Glancy, Matt Rogers, Caroline Ward, Thomas Röggl & Pablo Cesar: Multi-Screen Director: a New Role in the TV Production Workflow? In: *Adjunct Publication of the 2017 ACM International Conference on Interactive Experiences for TV and Online Video (TVX'17 Adjunct)*, ACM, New York, NY, USA, pp. 57-62

[Multi-screen applications have been a research topic for the last 10 years. Recent technical advances make authoring and broadcasting of interactive multi-platform experiences possible. However, most of the efforts have been dedicated to the delivery and transmission technology (e.g., HbbTV2.0), but not to the production process. The hypothesis of this paper is that studio and outside broadcast production requires radical changes in the production workflow, in order to allow for an efficient management of interactive multi-platform experiences. This paper explores such changes, investigating workflows and roles, and identifying key requirements for supporting these. The final objective is to create a new set of tools, which are extending current processes, that allow broadcasters to curate new types of experiences. We conducted a set of interviews with broadcast producers and directors that allowed us to identify two major (sub-)workflows, one for pre-recorded and one for live experiences. We could then assign roles to the different stages of the workflows and derive a number of requirements for the next generation of production tools.]

- [11] Britta Meixner & Jennifer Marlow: "Like" it or not: How do users understand the relationship between "likes" and edited social media content? In: *CHI'17 Extended Abstracts*. ACM, New York, NY, USA, pp. 1893-1900, 2017

[The "like" button on many social media platforms allows individuals to express endorsement of content. However, sites with a "liking" feature, such as Facebook, also permit users to edit or change the content of the original post after it has been published and "liked" by other users. This can be problematic if a transparent edit history is not (easily) available. In this paper, we report an online survey that assessed how individuals interpret what has changed in such a case. We tested four interface designs to see whether making the evolution of "likes" and edited comments more explicit improved users' understanding of what had happened. We found, that in contrast to what is displayed in current interface implementations, alternate interface designs make clearer how "likes" are associated with posts that changed over time. These have the potential to help users understand what has been changed in the post more easily.]

## III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

### Seminars at CWI:

- **One-day Masterclass on Supervision of PhD Students**  
Date: 11 May 2017, Time: 10:00-16:00 hours
- **Time Management course**  
Date: 12 September 2017, Time: 09:00-12:30 hours + 1h workplace visit

### Conferences/Workshops:

- **ACM Multimedia 2016**, October 15 – 19, Amsterdam, The Netherlands
  - Co-author and presenter of the demo paper “*Hypervideo Production Using Crowdsourced Youtube Videos*” by Stefan John, Christian Handschigl, Britta Meixner & Michael Granitzer.
- **2016 ACM Workshop on Multimedia for Personal Health and Health Care, MMHealth '16**, collocated with ACM Multimedia 2016
  - Co-author and presenter of the paper “*A Dual Screen Concept for User-Controlled Hypervideo-Based Physiotherapy Training*” by Britta Meixner, Christian Handschigl, Stefan John & Michael Granitzer.
  - Co-author and presenter of the demo paper “*Second Screen Hypervideo-Based Physiotherapy Training: Invited Demo Paper*” by Christian Handschigl, Britta Meixner, Stefan John & Michael Granitzer.
- **ACM TVX 2017**, June 14-16, Netherlands Institute for Sound and Vision, Hilversum, The Netherlands
  - Co-author and presenter of a work-in-progress paper [10]
  - local co-chair in charge of registration, dinner arrangements, other local arrangements
- **INFORMATIK 2017**, 47. Jahrestagung der Gesellschaft für Informatik e.V. (GI), September 25 – 29, Chemnitz, Germany
  - Gave a tutorial on „Interactive Multimedia Applications“ [9]  
<https://informatik2017.de/tut02-interactive-multimedia/>

## IV – RESEARCH EXCHANGE PROGRAMME (REP)

**REP institute:** Fraunhofer FOKUS – Fraunhofer-Institut für Offene Kommunikationssysteme, FAME group, Berlin, Germany

**Local scientific coordinator:** Dr.-Ing. Stefan Arbanowski

**Description:** During my stay from June 03 to June 07, 2017, I realized a DASH player testbed with raspberry Pies to test the SAND server implementation provided by Fraunhofer. To accomplish this, I installed, updated, and configured the raspberry Pies, set default values, configured remote access to the raspberry Pies. I presented my previous research projects and gave an overview of the results. Possibilities of establishing future collaborations were explored and I set up a Slack channel to stay in contact, exchange about funding opportunities, and initiate future projects.