CoMedia: Mobile Group Media for Active Spectatorship

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ABSTRACT
Previous attempts to support spectators at large-scale events have concentrated separately on real-time event information, awareness cues, or media-sharing applications. CoMedia combines a group media space with event information and integrates reusable awareness elements throughout. In two field trials, one at a rally and the other at a music festival, we found that CoMedia facilitated onsite reporting to offsite members, coordination of group action, keeping up to date with others, spectating remotely, and joking. In these activities, media, awareness cues, and event information were often used in concert, albeit assuming differing roles. We show that the integrated approach better supports continuous interweaving of use with the changing interests and occurrences in large-scale events.

Author Keywords
Mobile applications, groups, awareness systems, large-scale events, spectatorship, field evaluation.

Acm Classification Keywords
H5.3 [Information interfaces and presentation]: Group and Organization Interfaces—Collaborative computing.

INTRODUCTION

At present, large-scale events are prime social, economic, and media happenings. 'Large-scale' refers to the multitude of sub-events and their distribution in space, the temporal extension of the event (typically more than three days), and large numbers of visitors. Spectators organize themselves in groups investing resources such as time, energy and money into experiencing together something set apart from everyday life. The term *spectator* is derived from the Latin *spectare,* meaning 'to watch', which may convey the impression of spectators as passive witnesses enduring a predefined schedule of events. Generally speaking, HCI research and commercial services seem to follow this interpretation focusing on the provision of timely event information and content. Our previous work shows how spectators do much more than just 'watching' [5]. Spectators constantly coordinate and revise plans. They navigate and negotiate space, capturing various forms of media and other 'documentations'. Spectators discuss the event and take part in various types of collective performances (dancing, joking, supporting, etc.). These observations led us to consider three distinct application areas: 1) *Event information applications* provide information pertaining to places, objects, and events of interest and could provide schedule and coordination support. 2) *Awareness applications* could provide spectators with real-time information on the presence and actions of friends and fellow spectators. 3) *Media-sharing applications* could support recording multimedia collections and either archive them effectively or share them directly with interested parties. In this paper, we present 'CoMedia', an application that gathers selected features from these distinct areas and proposes a number of interaction design solutions for integration. This is a new development of a previous system, mGroup [12] that addressed merely the latter application area, demonstrating how spectators can create collectively media collections. We evaluate CoMedia, reporting the analysis of two field trials where users were engaged as spectators during two large-scale events. We aim at addressing two questions. First, we investigate how features from these distinct application areas can be combined in one application. Second, we aim at evaluating whether such integration better supports active spectatorship. The results of this undertaking are useful for developers of applications and services for spectators in large-scale events, for interaction designers of composite services and mash-up applications, and for researchers and practitioners investigating augmentation of media-sharing applications with awareness cues.

ACTIVE SPECTATORSHIP AND MEDIA

Active spectatorship is regarded as an alternative approach to the perspective that sees spectators as passive witnesses merely enduring a sequence of events. Active spectators are driven by motivations and prior experiences to act out situations where the event itself is merely a platform for expression. Active spectatorship has parallels with the notion of *active users* [1], which highlights the view that users cannot be represented as information-processing automata that merely generate responses to stimuli provided by an interface. The development of CoMedia has focused

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upon creating technologies that support and encourage active spectatorship; in particular, we have analyzed how mobile and ubiquitous media can support it. 'Media' refers to all digital content distributed to mobile devices created by spectators or event organizers. The following describes three research areas of spectator experience that we found can be supported by ubiquitous media.

Event Engagement

Large-scale events consist of multiple sub-events and take place over several days. Thus, a single spectator can only partially witness the whole event. For example, rally spectators will painstakingly choose a small selection of stages and positions along the side of the course they travel to [5]. Spectators are also active in areas such as planning, documenting and betting, and will employ a wide variety of resources, such as annotated pamphlets, radios and other spectator-produced materials, to do so. Previous work addressing rally spectators [9] noted that the primary interest of the spectator is to experience the event in action, socializing with other spectators. The design of *event information applications* focuses on the question of what type of timely information should be provided to the spectator [9]. Other work investigates new interfaces, mainly from the point of view of the performer on stage [11]. That is, spectators are traditionally seen as consumers of mobile media—only recently has their role as creators of media been considered [3, 12, 6].

Awareness and Coordination

Statistics show [5] that spectators organize themselves in groups when visiting an event. Typically, a group engages in preparation activities *before* the event, but the revision of plans and the coordination of actions will continue throughout the event. Groups will split into subgroups, requiring a way for the subgroups to be aware of what the others are doing [12,5]. There are many mobile awareness systems addressing presence and coordination providing both user-controlled and automatic (i.e. sensor-derived) *cues* of a user's situation. Through these cues, they attempt to facilitate coordination and provide new opportunities for social interaction [4]. Typically, cues are related to the location, the proximity, or the activity of friends, but each mobile awareness system provides a unique set of cues [14]. Holmquist et al. [4] have tested an awareness device at a rock festival and in a conference and noted its usefulness in fostering a feeling of connectedness between friends and in finding opportunities to meet new people. However, there are no known reports of the integration of awareness cues into media-sharing applications.

Co-Experience in Spectator Groups

Spectatorship is intensively social. Spectators constantly look to each other to express and share experiences through a combination of verbal, performative, material, and technological means. Groups display their identities with costumes, for example, and create group-specific idioms such as recurrent jokes that build up the collective history of the group [5, 6, 12]. Spectators already engage in these activities using imaging technologies (mainly chemical and digital cameras). Previous studies addressed topics relating to the sharing of pictures in amateur photography (e.g. [7]), and the conversational use of pictures in multimedia messaging, [8]. There have been studies that analyzed how users mainly invite as viewers people that were present at the time of the shooting and the importance of commenting and knowing who viewed pictures [13]. With the exception of our own work developing and evaluating mGroup [12], there have been no attempts to systematically support media sharing at large-scale events. Implications derived from the field trials indicated the need for awareness cues about other member's context and system usage.

DESIGNING COMEDIA

Our attempt to combine previously distinct application areas gave raise to three design challenges: 1) *Selection.* A variety of features can be selected from the three areas above (e.g. from event content, awareness cues, and spectator-created content). Designers, for example, have to anticipate which awareness cues might be useful offered in a small-sized screen and cues need to be rapidly identifiable and learnable. 2) *Composition.* Designers need to balance between keeping important data and functions *together* vs. *distributing* them to different parts. Secondly, the interaction architecture has to support navigation in these parts. 3) *Integration.* An important challenge is to integrate cues appropriately *within and next to content* to support contextualized sense making. This requires keeping in mind possible contexts of interpretation during the design process. Our solution to the problem of composition is to group features in a way that relates to what we know of spectators' typical activities. Thus, *CoMedia* is built around three perspectives on content:

1) Media Stories, creating stories together,

2) Member List, awareness of other members,

3) Event Pamphlet, plans and information of the event.

For each, the application has a dedicated *view*. These three views are exemplified by their main screens, shown in Figures 1, 3, and 4. The central view is the list of *Media Stories*, which provides an overview of the stories with contextual information. To enable a quick change of view, the user can move between these sections by pressing left and right on the phone's joystick. Navigating left, the user finds a dynamic event *Pamphlet* that contains a schedule and next-to-real-time content. Navigating right, the user finds the *Member List* that is augmented with information as to people's current locations and activities. Importantly, these views are not isolated; integration is achieved by displaying information that ties into the other views. We describe these aspects in what follows.

Re-Usable Awareness Elements

A key part of integration is provided by *awareness cues* of other people, which are used throughout the interface. For

consistency, all occasions where a user's name is displayed, a *Member Icon* is also displayed representing that user's current status:

Blue man icon: a nearby online CoMedia user in bt range

Green man icon: a remote online CoMedia user

Gray man: an off-line CoMedia user

Violet man: the user him/herself

Phone icon: a user has used the phone recently

Thus, the system classifies users as local vs. remote. Local users are presented separately to indicate that some collocated group members are right now reading the story. The idea of cues for remote users is to help determine collocated remote users and their activeness in the system. In the following sections, we present how these were used throughout the screens in CoMedia.

Media Stories

CoMedia is based on the concept of *Media Stories*. Stories organize a group's messages into a dedicated discussion space on the phone. These spaces resemble on-line chat in that they contain messages that are displayed as a temporally ordered sequence. New Stories can be created on the fly by entering a title (text) and selecting the desired members that the user wants to invite to the Story. The Stories are persistently stored, meaning that the users can leave the system and come back without losing any content. *The Media Story List* in Figure 1 displays stories that the user can access. For each story, CoMedia shows the title, the time of the last post, who made the post–including the poster's status–the number of people viewing the story and the number of messages. If there are multiple users, a number appears next to the icon, giving information about current activity inside the story. The second row contains information about the last message posted to a story. If there are new messages, the number in parenthesis turns red. The name of the poster and the icon are intended to work as teasers: they tempt the user to read new messages, particularly since they personally know the person who wrote the message. They also serve as cues of on-line activity, showing who are actively using the system. *The Individual Story View* lists the messages in the Story, with the most recent on the top. In order to support a quick overview of activity in the Story, this view shows only

Figure 1. Media Stories list shows accessible Stories. Opening a Story shows the thumb-nailed message list.

Figure 2. Individual messages can contain video, text, images, and audio. Message View shows cues of who were present when it was created. A detailed screen shows various data about viewings.

minimized messages: for each message, the system shows a thumbnail of the first picture in the message (if any) and some text from the message. On the same line as the message text there are member icons representing the number of people viewing that message, analogous with similar icons in the previous view. The scrolling ticker at the top of the view shows the names of the people viewing this story. *The Message View* shows the contents of a single message. The media items are ordered vertically and the user can scroll up and down to scan the whole message. The media is automatically augmented with information about who were present when the message was taken using Bluetooth scanning. This hints of who might have contributed to the message. *The Message Creation View* provides the user with a screen to enter text, or to insert media like video, audio, or images through the options menu. Media can be acquired using CoMedia's built-in media capture functionality (photos, videos and audio) or taken from the phone's gallery. The built-in capture functionality is useful when a user is running CoMedia and then wants to capture some media. The use of media in the gallery is necessary when people have first captured media and later on realize that they could use it.

Member List

The Member List (Figure 3) shows where other users are and whom they are with. By pressing the joystick right on the main story view one enters the global member list that includes all users. Another view to a member list is through a Story. There, a Story-specific list is entered by using the

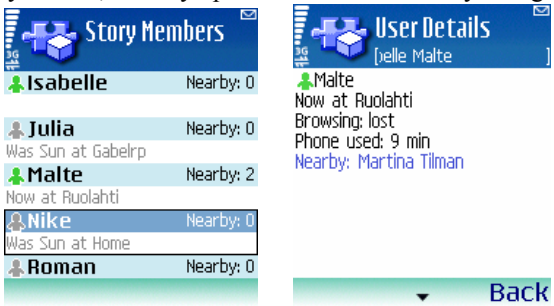

Figure 3. The Member List indicates the status of several users; from that screen, a user can be inspected in more detail, showing who is near by and what they are doing.

right key. In both cases, pressing the left key brings the application back to the original view. In this view, each member's general status is shown with the coloured icon next to the person's name. Beneath the name is information about the person's current location (if known) and how long (s)he has been in the place. In addition, the system shows how many other members are in the person's vicinity. Clicking on a member drills into the *Detailed Member View*, showing what the person is browsing currently, when she used her phone previously and who are in Bluetooth range. We decided to include a separate Member List into CoMedia for a number of reasons. First, Media Stories and the Member Lists are conceptually separate categories of information; the users may therefore be interested in finding out something in one aspect and not the other. For instance, a question like 'Where are my friends right now?' cannot be answered easily if cues were embedded in the Story views. Second, switching back and forth between these two different visualizations is fast with the joystick's left-right movements. The three-view solution supports exploration of the cues without extensive navigation through many parts of the user interface.

The Event Pamphlet

The *Event Pamphlet* was created as a dual-purpose application. Firstly, it is meant as an event-planning tool, giving users a simple tool to browse sub-events and information ahead of a large event, such as a rally or music festival. Browsing can be done socially within the group, and things can easily be added to a group timetable. Once marked, the sub-event will be shown in a shared group timetable. Secondly, it is used during an event as both calendar and a source of live and static information. The general layout of the Pamphlet is to have content at the top and the navigation menu always at the bottom of the views. Thus the navigation menu can be jumped to at any point using the # key. The menu was kept simple and inline with the task-based nature of the application. As shown in Figure 4, the menu simply displays 'Show me...' and a list of things that can be seen. Altogether, the Pamphlet has seven sub-sections with different contents and uses. *The Locations View* presents a list of physical locations active during the event. Each location has sub-events listed that take place there. For example, at 'Rally HQ' there might be an opening party that could be shown when this location is viewed in detail. *The Stages View* presents a list of stages ordered chronologically, each description including information on its start and end time, a function to add it to the Group Timetable, and a possibility of seeing more information about that Stage. *The Timetable View* contains only sub-events that are yet to be completed. Each can be added to the Group Timetable by ticking it. *The Race Standings View* displays live information about the status of Stages, including times and standings. *The Backstage View* contains news similar to tabloid newspapers. There are interviews of drivers as well as reports of curious incidents and anecdotes. *What's Happening Now View* lists current

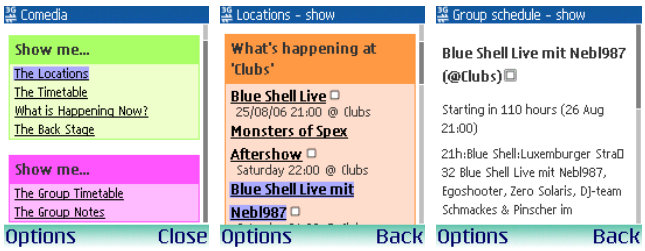

Figure 4. The Pamphlet menu can be jumped to at any time by pressing #. New Locations can be added by the users for the group to view in their Group Schedule.

and next on-going sub-events to provide an overview of alternatives at the moment. *Group Notes* is an area where users can add own information to the system. These textual notes are seen by everyone and can be edited by anyone.

Webstories

The Media Stories are archived in the web for viewing after an event. They take a form of a simple list of stories called Webstories. Each Webstory is ordered chronologically from oldest at the top to newest at the bottom. Webstories also display interleaved with the messages when events and stages started and ended, adding context to what was happening at the time when media was being created. The intention of the Webstories is to provide a means for users to browse and look at the media generated during an event in much the same way as someone might look through an old scrapbook. The goal behind the integration of event information into the narrative was to help trigger memories and contextualize the media. Seeing a picture of a rally car perhaps is not all that interesting, but to know a picture was taken when the rally started puts the image into a perspective that is not apparent just from the image itself.

Implementation

The core CoMedia application is built with Java 2 Micro Edition as a MIDlet. The MIDlet runs on a smart phone and exchanges data with a server. The server keeps all data in a relational database and acts as an information distribution channel between the phones. Besides CoMedia, each phone runs ContextPhone – a native Symbian application for collecting context information [10]. ContextPhone runs in the background and transmits data to CoMedia via an XML stream. Examples of the information that ContextPhone gathers for us are a list of nearby Bluetooth devices, location of the phone, and information about phone usage. During one trial, the location tracking was accomplished using a mobile operator's SMS-location service. In the trial in Germany, such a service was unavailable, so the positioning relied on GSM cell ids. The system prompted the users to name a location whenever they entered a new cell and stayed for more than 15 minutes.

FIELD TRIALS AT A RALLY AND A MUSIC FESTIVAL

A critical evaluation of CoMedia centres on trying to understand how it provides novel possibilities with regard to meaning making, action, and experience in various goal-pursuits that are typical to spectating. To address this, we

introduced the prototype to spectator groups participating at two different events: a rally and a music festival. In doing so, we aimed for generality and ecological validity in the evaluation. Understanding such abstract phenomena as 'experiences' and 'activities' called for a multi-method approach that triangulated the phenomena by considering various indices and sources of data ranging from accounts of subjective experience and observations of action *in situ* to the contents of the digital artifacts acted upon, as well as records of how they were interacted with at the interface.

The Rally

The Neste Rally Finland is part of the World Rally Championships and attracts approximately three hundred thousands spectators during the four days of activities. The competition consists of 21 special stages spread over 100 km of central Finland. As the competition migrates from one stage to another, spectators do likewise. They park cars close to a stage, walking the rest of the way, searching for a place to settle down and observe the action. Good planning and drawing upon previous experience is important during these activities. A user group of eight people was recruited through an advertisement in the rally organizer's email newsletter. The group consisted of six enthusiasts, who had a small rally team that participated in rallies at competition level, and two other people. The social makeup of the group included a family of 4: a mother (44), a father (46), and their two sons (23 and 16). One son (a rally driver) brought along his fiancé (22 and not a rally enthusiast), his female co-driver (24) and a friend who was also a rally driver (24). The last group member was a woman (23) who was also not a rally enthusiast. The average age of the younger members was 22. Typically, they had a vocational or college-level training. In their everyday life, they stayed in touch with each other daily via mobile phone calls and text messages. Email was used daily by six members of the group, with the exception of the two 23-year-old male users who used it almost never. Other electronic communication media like instant messenger (IM) and web forums were used rarely, i.e. 1-2 times a month at most. The only exception was the 16-year son and two younger female group members, who used IM weekly or daily. Six of the group members lived in a small town of 8,000 inhabitants and two lived in Lahti, a nearby town with 100,000 inhabitants. During the day, the group was particularly mobile; each day they would split into two groups of four and would typically visit 2-3 stages. The rest of the time was spent at a summer cabin they had rented, which was located roughly 6 km away from the city centre of Jyväskylä–the central hub for the rally. Five of the eight (Nokia N70) phones were distributed to the group one week in advance of the trial so as to let them familiarize themselves with both the phones and CoMedia. We provided a tutorial and an instructions manual in which the functionalities of the program were explained. In these meetings, we very deliberately did not suggest specific uses for the system. We explained neutrally that users will be able to communicate with each other by using the software, see real-time information regarding each other's situation, and access some rally-related news and timetables.

The Festival

'c/o pop' is an electronic music festival held annually in Cologne, Germany. Performances and exhibitions are distributed all around the city: in the city centre, a building hosts the festival centre with ticket office and the main electronic music performances. In the park, there is an open-air stage with live alternative pop and rock, DJ (disc jockey) and VJ (video DJ) performances in an additional 18 different locations. The music festival is different from the rally as it is entirely within the city limits and attracts more local visitors. Many visitors during weekdays will go to work or perform other daily activities before going to the festival, whereas most rally spectators will take a vacation in order to attend. The result is that rally spectators view the event as more of a holiday than an evening activity. In addition, the main performances are scheduled in the evening, whereas the main rally activities happen during the day. The group was recruited through the event organizers. The group was made up of 50% males and 50% females, half of the participants were between 20 and 30 the other half between 30 and 35. The group included three couples; six members of the group knew each other well, whereas one couple was visiting and known only by three members. Only the couple visiting had never been to the event before. The entire group reported that they use SMS, email, web forums, and digital cameras. Only three members reported using Instant Messenger. All reported almost never using MMS (one exception), WAP and mobile services.

Data Collection

Background questionnaires pertaining to 1) using related communication technologies, and 2) the social relationships between users: how they knew each other and how often and in what circumstances they usually met. *Content analysis*. This includes the Media Stories created and messages sent through CoMedia. *Interaction logs* for each phone. For instance, each viewing of a message was logged, as well as detailed data on how each feature was used. *Participant observation*. Two observers in both trials shadowed the sub-groups, observing their natural behaviour using video cameras. We took great pains to avoid instructing users on possible uses for CoMedia, suitable moments of use, places in which it could be used, and avoided making suggestions as to how users might spend their time at the rally. To make shadowing and videotaping more efficient in the Rally trial, we had a third researcher following the group's discussions in CoMedia through the Internet, and informing the observers by (silent) SMS whenever messages were sent. For the observers, this facilitated their decision making as to where to point the video camera. *Concluding interviews* were held individually with each user within one week of the trial. The interviews focused on three areas: 1) inference and use of cues, 2) use of media stories, 3) use of event information,

Occurrence	Rally Trial (2.5 days, N=8)	Festival Trial (3 days, N=8)
CoMedia running per day per user	7.8 h	7.3 h
Stories created altogether	35 (14 empty)	47 (9 empty)
Average lifespan	68.2 min	115.3 min
Text elements in a Story	4.2 (SD 4.3)	2.7 (SD 3.3)
Images in a Story	1.0 (SD 1.5)	4.6 (SD 6.2)
Video clips in a Story	4.4 (SD 5.8)	1.1 (SD 1.7)
Audio clips in a Story	0	0.3 (SD 0.6)
Messages per Story (non empty)	4.7	5.5
Messages created per day per user	4.7	8.6
Messages viewed per day per user	13.6 (SD 7.9)	38.0 (SD 13.7)
Average number of users present when creating a message (Bluetooth)	3.3	2.4
Event Pamphlet access per day per user	4.5	2.9
Member List access per day per user	5.3	5.5

Table 1. Frequencies of various user actions with CoMedia based on interaction logs gathered in both trials.

and 4) feeling of presence and moods using the application. The interviews were primarily cued by content and the interface feature in question. We asked the interviewee to recount narratives of actual episodes that happened (as opposed to opinions and generalizations). Opinions and simple ratings were collected on the usability and usefulness of the system once the recounting of narratives was over. Finally, the users filled in a social presence questionnaire and explained their ratings. The typical length of an interview was one hour.

Overview of Interaction and Media Use

As an introduction to more qualitative insights into how CoMedia was used, we present statistics extracted from the logs describing the use of CoMedia's features and the generated media. Please consult Table 1 below for the statistics. There are five conclusions we can draw from Table 1. *1) Active use.* CoMedia was used actively, covering about all the time a user spent at the event, averaging 7-8 h per day. 2) *Use of stories reflects the nature of the event.* The average lifespan of Stories (1-2 h) reflects the duration of the various sub-events in the event. (Also, the titles given for Stories were often the names of the sub-events.) 3) *Visual media important.* Visual media was actively used in both trials, visual elements being as frequently used as textual elements. The Rally group preferred video and the Festival group images. 4) *Media used collectively.* Messages were viewed and created when some 2-3 other users were present (on average). The video data indicates that a large part of these were collaborative uses where the phone was shown to a co-present other. 5) *Stories the main functionality.* While all users used the Stories actively, usage frequencies for the two other main functionalities were lower and less uniform. One to two users in the trials did not use either the Event Pamphlet or the Member list.

APPROPRIATIONS OF COMEDIA

We present the findings of our evaluation through a description of the ways in which users appropriated CoMedia. *Appropriations* refers to recurrent uses originating from user activities, as can be inferred from the interviews, videotaped observations, and content and log analyses. The term *appropriation* was chosen because, although we designed the system with general use scenarios in mind, we had no clear idea as to how the use of the system would actually be embedded to the activities of users. We analyzed the data, first extracting individual instances where CoMedia was used and then iteratively categorizing the appropriations. In this analysis, it was important to understand the intentions and roles of the participating agents, what was being done and, particularly, how CoMedia's features were utilized.

Onsite Reporting

Members of the groups we studied were often separated for various reasons, such as simultaneously following sub-events of interest or the need to stay home. In these situations, it was commonplace for onsite members to create *reports for the others* through text, videos, pictures and sound. These reports attempted to convey some details of the event and what it was like to be there.

In the festival trial, several of the onsite reports were about *conveying the experience of a particular performance or venue*. For example, one user (Roman) sent a message with a sound clip and the text 'The sound kicks ass but there is no place for dancing… '. When some members were not able to attend, which occurred during all three evenings of the festival, there were cases of *onsite reporting*.

Onsite reporting in the rally trial included explicit requests to others to evaluate different viewing spots, or to share opinions regarding how various drivers were able to drive through a certain curve or a jump in the road. For this, messages were supplemented with videos and verbal remarks. In a Story called 'Laukaa' (a Special Stage), Linda sent a message with two video clips and a small teaser: '[A driver in the video] avoids that rock really skilfully! If only our guys could do something like that as well…that would be quite cool…' In interviews, Esa explained:

'We were interested in getting video and sound. In rally sports you can figure out if you have a car approaching, you know where it starts breaking if you hear the sound changing […] when you see the road and hear the sound, that's it. You hear the bounces in the road, what the place is like. We sent these messages to others, and they sent back similar stuff to tell what their place is like.'

Evaluations of this kind with regard to viewing spots were typical when the group walked along the track and decided where to stop to watch the cars. Use of a common media space allowed remote group members to also participate in the evaluation. In some cases, reports were created to *share an important moment or place*. At the music festival, Julia dedicated a Media Story to share her last day at a

workplace. 'My workplace. Adieu the last day…' She explained in the subsequent interviews:

'I found it nice to show my workplace to the CoMedia group; it was my last day at work, I could share it with everybody.'

At the rally, some group members had been able to find tickets to a special VIP area to which other visitors were required to pay a lot of money (150€). Through the evening, they reported with messages about, for example, the free drinks that were served (Figure 5 left). Jenni (who was not there) explained that:

'When Linda and Ellu were there in the VIP party, we could also participate a bit though we weren't there. You could get into the atmosphere. I looked at that many times during the evening as new messages appeared.'

To sum up, active spectatorship with CoMedia is evident in the way members create reports by selecting and framing particular aspects of the environment through pictures, videos and sounds combined with textual descriptions and reflections of experiences. These were done to share and document important moments and aspects of the event.

Keeping up to Date with Each Other's Undertakings

The spectators we studied were often apart for longer periods, which caused a natural interest in following what others are doing. They used a *combination* of the Media Story and Member List features to keep up to date with each other. In the festival trial, for example, Tilman recalls an episode from Saturday night when he did not see any new messages from Julia and Malte, and therefore employed the Member List to gain an understanding of what they were doing. Tilman explained this later on:

'It's always good when you can see when they last used the phone and to see who is with them… You know what the others are doing then maybe you go and join them. […] It was informative and interesting to see where and with whom the people were because it is an event that was organized simultaneously in different locations. Sometimes it was also important for the theme that was handled in the story to notice who took part in the experience.'

An important feature for the festival group was the possibility of *naming a location* with an own description that would then appear automatically when the user was in that location. For example, the festival group entered descriptions for a location 72 different times with an average of nine descriptions per user. Tilman told us:

'I found it good that because you enter a name the locations acquire other names. I find it good that within a group new descriptions for places emerge; this makes our group feeling stronger.'

Figure 5. Messages from the rally trial. Left, onsite reporting from in the VIP free-drinks area. Right, a message from remote spectators.

In the rally group, keeping up to date included episodes where members were concerned about each other. Following Linda's and Ellu's VIP evening, because the girls did not show up in the morning at the cottage, everyone worried a little worry about their well-being. This worry was eventually relieved upon seeing messages from a new Story called 'VIP pier' (Figure 5 right). In addition to seeing the messages, the locations of the girls delivered through the Member List showed that they had found their way back to the group's base. Toni explained:

'At least this message I will never forget, when Ellu posted this, what was it, yeah, the 'VIP pier'. There were Linda's hoorays in there. It was really interesting, they were not even spectating the rally but still they were really on! Staying at the cottage but still with 100% spirit.'

The two groups differed in terms of this appropriation. The festival group reported the importance of being constantly up to date with each other's activity. For the rally group, this was important only in certain topical moments. Both groups used the Media Story and Member List features in concert in this appropriation. This appropriation, with regard to active spectatorship is different, because the checking of others' undertakings was more of a background activity; however this activity often sparked and inspired other actions.

Remote Spectating

It often happens that some members *cannot* participate in a sub-event they find of interest. CoMedia was used in such situations in two ways: 1) by offsite members to be *part* of that happening; 2) by onsite members wanting to know how the competition or the event is advancing in remote places. In the festival, Martina had to stay home with her baby while the rest of the group went to follow performances. She explains how CoMedia supported her:

'I was not much with the others, and when the others were away I felt a bit as if I would be there with them although I was not there physically… I was interested to know what the others were doing, how the venues looked like, how the music was. The sounds were very important in the festival because I could hear if I liked the music or not.'

This appropriation was often achieved by prompting others through a message in a Story to explain what it is like to 'be there onsite'. Replies to these messages were also used to portray the offsite member's own situation, for example, when Martina sent a picture with a sad face and the text 'I have to stay home. Have fun!' Every night, even very late, the offsite members sent in messages to the rest of the group. Very similar episodes were encountered in the rally

trial also. To follow unfolding sub-events of interest, the onsite members used the Event Pamphlet. Two sub-sections of the Event Pamphlet were utilized: 'Standings' and 'Backstage'. Standings were particularly useful to monitor the success of specific drivers and to follow-up on specific events they had witnessed. One participant told:

'When Latvala [a competitor] had a fire burn, I was watching how much he's behind, if he's made it to the end of the stage. […] I was also following if Marcus [a Finnish driver] was still leading and how much.'

The Backstage section was reporting drivers' comments from parc fermé and news that was more general about rally. Some users were using it mainly to find out why a driver had underperformed. When something interesting was spotted, it was often shared to collocated members:

'I was reading this to Toni in the car, about Välimäki's [a driver] neck being swollen. We don't like Välimäki so this was the funniest Story when he was complaining about his neck and back hurting. I read [it aloud] and we all laughed.'

This appropriation was relevant in both trials and spanned all features. It is related to active spectatorship in two ways: 1) remote spectators portray themselves to be part of the group, 2) offsite members construct socially an awareness of the remote event by commenting and discussing with collocated members.

Coordinating and Making Plans

When group members were distributed, they often had to revise plans in response to unfolding events; this required careful coordination of joint activities. All three views of CoMedia were employed in this activity. The Pamphlet was used to revise plans with up-to-date information on the following events or to enter items in the group schedule. The Member List was useful for keeping awareness on the location and activities of others. Media stories were used explicitly to post coordinating messages such as invitations, questions, and negotiations. For example, Julia (on Friday at 21:14) asks who was interested in going to a certain performance. After 4 minutes, Frank replies that he will be going there. In another message sequence, Julia starts with 'good morning' and then complains about a headache. Tilman, after less then three minutes, invites the group to lunch with the message 'at 14 :00 spaghetti at our place'. Malte then asks if everybody is invited and notifies that he is coming. After the lunch, Roman notifies the group about the plans with his girlfriend: 'After the big Bolognese party we are going to the Chocolate Museum and we buy Vodka on the way home'. After 10 minutes, Frank notifies the others with a message that he has entered two items in the group schedule. These had been discussed in the group the day before. In the rally trial, having the rally schedule on the mobile phone proved to be useful for planning daily schedules in the rally. The group was divided in two or three sub-groups most of the time (except at night), and had to adapt to the traffic jams and difficulties in finding the way because they preferred viewing spots where few other spectators were present. The usefulness of the schedule was expressed by Esa:

'When results started to appear in the system, then at some point we used that to decide where to go next. We did not use it only during Friday but also on Saturday. We did not have a map, it would have been in the backpack, but it was easier to do that by using the phone'.

In both trials, there are also cases in which Media Stories were employed for *storing and sharing detailed group-relevant information*. In the rally, two users, Toni and Jukka, were betting about the winning driver in some rally stages. Their betting information was printed on a little paper ticket, but they put the relevant parts into a separate rally betting Story, to make it accessible to everyone. This appropriation was relevant in both trials in the same way. Both used all views of CoMedia, the only difference being that, in the rally, the Event Pamphlet was used more to be aware of upcoming events.

Reliving and Knowing What Others Have Done

Not only current and near-future events were important; also, spectators often spent times remembering, joking, and discussing past happenings. This included reviewing Media Stories from several hours to days later, on the phone or from Webstories. This was done either by the creators of messages and members who reminisced and relived previous events, or by other members that could not be there to know what others had done. The log data show that users quite often read the messages they created themselves (18 and 16% of all viewings in the Rally and Festival trials). Of these viewings by the poster, a vast majority (78 and 56%) took place almost immediately (within one hour) after posting it – most probably for the reasons of checking how the message looks and if there are new activities. However, a small but significant part of these viewings took place a long time after the activity in the story had died. Particularly, in the Rally and Festival trials, 11 and 20% of viewings of a message by the author occurred six hours after the message was created. Our interpretation is that these were mainly done for the purpose of remembrance and reliving the situations. The festival group reported on the importance of reviewing messages the 'next day'. Tilman explained that he read messages the next day to relive and remember the previous evening. Nike reported viewing messages to see what others had done once she left to go home and to know when they made it home. In the rally, for example, certain pictures in a particular story had been viewed multiple times. Tiina told us:

'Then there was this pier story, with Jani, we looked at that many times! We thought that oh no, should we start to drive there, are they okay… That was really good!'

This appropriation also applied to the Webstories. To give an example, following the end of the trial, the festival group accessed the Webstories site a total of 293 times over 10 days with one user accounting for 144 accesses. Five other users viewed on average a total of 33.75 stories each. The

Activity	Media Stories	Member List	Event Pamphlet
Onsite reporting	Creating media of on-going situations		
Keeping up to date	Reading about latest activities	Knowing where others are	
Remote spectating	Spectating through others' messages	Knowing the spectating spot	Doing follow-ups
Reliving	Reviewing past Stories		
Coordinating	Negotiating plans, reporting progress	Following others' progress	Scheduling and suggesting visits
Joking	Staging funny situations for media		

Table 2. Utilization of CoMedia's features in spectator activities. Aggregated over the two field trials.

uneven distribution of viewings is due to the fact that four users live next to each other and reported carrying out most of the viewings together. This is an important aspect of spectator appropriation, especially for events that last several days [12]; it was relevant in both trials. Spectators are active in reflecting and joking about past happenings using the Media Stories as a resource. Media Stories provide documentation of situations enriched with dialogues and contextual information that spark discussions and jokes and contribute to prolong the event experience.

Joking

A spectator's day is characterized by different periodic activities with different rhythms. In what can be called downtime use (e.g. when waiting for a stage to begin), we observed the spectators actively looking for ways to avoid boredom. Spectators were active inventing ways to have fun. Media stories provided a good tool for staging and communicating jokes in a distributed group. In the festival group, Tilman sent a video of a baby crying. After a while, Isabelle took a video of Roman pretending to be a baby and using Tilman's video's soundtrack (Figure 6 left). One story was created as an open game to the group. The Story was called 'guess the movie'. Roman posted a sound clip of a Movie and Malte guessed what the movie was. At the rally, the users at the VIP area (Ellu and Linda) sent a video about the toilet facilities. It was supplemented with a name of a portable toilet that is common at events. This text oriented the viewers to expect something completely different than a clean, spacious toilet that actually was seen in the video. In Ellu's words:

'[…] now you could directly send something as you got the idea and you were there at the toilet. I could share it with many people. Usually Bajamaja is just a one-person cabin. Now it said 'Bajamaja' with big letters, six normal toilets, with mirrors and washbowls and all. Now there was the idea! A Bajamaja in VIP style versus a normal Bajamaja.'

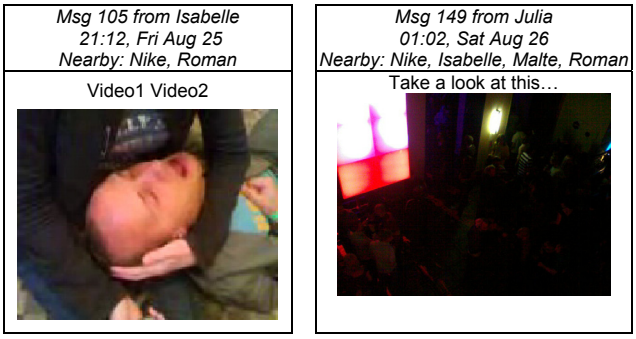

Figure 6. From the music festival. Left, a video using the sound from another message. Right, a message sent from Julia during a performance.

Joking is an important social aspect of spectating that creates group memories referred to in the group's interactions. CoMedia provided in both trials an additional tool to create jokes and, more importantly, to share and document them with multimedia.

CONCLUSIONS

CoMedia is a novel application integrating three previously unrelated types of information and functions for spectators: event information, media sharing, and awareness. It was inspired by the idea that spectators are not only passively watching events, but go there for 'extradaily', heightened moments. These, we argued on the basis of research into spectatorship, can be supported with multiple features tapping into their engagement and co-experience of an event, as well as awareness and coordination with others. Across the two field trials, we witnessed that CoMedia can support *active spectatorship* more widely than we have previously been able to achieve [12]. Despite the differences in the two trials, we found the appropriations to be surprisingly similar. The main differences were that the rally users made more use of the Event Pamphlet and the festival users used more the Media Stories. We learned that the appropriations common to both trials contributed to the collective character of activities, as well as development of group belonging and togetherness. CoMedia enabled media of onsite members to be used as a proxy for spectating remotely. Activities inside vs. outside the system were not easily separable in, for example, coordinating, joking, and following the event 'in the flesh'.

Mobile Group Media

Our paper has investigated the integration of previously distinct mobile applications. It has presented consequent design challenges and solutions in the setting of large-scale events. In this setting, the integration was useful in supporting continuity of action as users are quickly changing their interests as a response to, and in preparation for, unfolding occurrences. Previous work has addressed only some of the features that are present in CoMedia. For example, they address only awareness at events and for visitors with no previous relation [4], they have implement mobile instant picture sharing for buddy lists [2], or provided a mobile client to share collections of pictures *after* events [13]. CoMedia brings together functionality across these application areas. Cues about other's context and system usage, collective threads of audiovisual and textual items, shared schedules, effectively supported

distributed members in creating and owning media *together* and coordinating common action. Our work investigates Mobile Group Media problematising current conceptualizations of communication format, through, for example, new concepts like Cues and Media Stories. As Table 2 summarizes, each component of CoMedia was used in both trials. Media Stories were central in each activity and can therefore be considered the main function of the application. The Member List can be considered as a supporting feature and users reported using it more as a supplement and augmentation of Media Stories than as a standalone feature. The Event Pamphlet can be also be considered a secondary feature, but was used more in isolation, almost as a separate application. However, we found that, despite the isolation, it increased the users' interest toward the system and the possibility of using the other features as well. The integration of awareness elements (the Member Icons) in both the Media Story and Member List was successful; these two features were also heavily used in combination with each other. Nevertheless, there are more opportunities for integration that can improve the usage of CoMedia: 1) the Event Pamphlet had a limited integration with the rest (only with Webstories is event information inserted into the narrative of a story), and several users lamented the poor integration of these contents. 2) The current integration considers only re-using common elements in different features (Member Icon), or reporting information about another feature (in Member List, details of the current story being browsed by that member are reported). There are opportunities to create more active *links* among features, to provide, for example, a link to Media Stories, either from the event item in the pamphlet or from the Member List. CoMedia and its evaluation investigated novel features and formats that are needed to take advantage of the currently underexploited functionality of smartphones. We have shown the usefulness of conceptual and experimental work in Mobile Group Media to devise, select, and integrate features. What CoMedia demonstrates is also relevant beyond large-scale events and spectatorship, showing how multiple integrated communication formats can provide continuous support for the multithreaded nature of group communication.

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