

# Supporting the Shared Experience of Spectators through Mobile Group Media

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## ABSTRACT

Interesting characteristics of large-scale events are their spatial distribution, their extended duration over days, and the fact that they are set apart from daily life. The increasing pervasiveness of computational media encourages us to investigate such unexplored domains, especially when thinking of applications for spectator groups. Here we report of a field study on two groups of rally spectators who were equipped with multimedia phones, and we present a novel mobile group media application called mGroup that supports groups in creating and sharing experiences. Particularly, we look at the possibilities of and boundary conditions for computer applications posed by our findings on group identity and formation, group awareness and coordination, the meaningful construction of an event experience and its grounding in the event context, the shared context and discourses, protagonism and active spectatorship. Moreover, we aim at providing a new perspective on spectatorship at large scale events, which can make research and development more aware of the socio-cultural dimension.

## Categories and Subject Descriptors

H.1.2 [Models and Principles]: User/Machine Systems - *Human factors*.

## General Terms

Design, Experimentation, Human Factors.

## Keywords

Spectator experience, spectator groups, shared experience, mobile group media, mobile phone applications.

## 1. INTRODUCTION

Through history, large gatherings of people have been a constant aspect of social life. A socio-anthropology of these events reveals the changes in their role in society and their organization, which has been evidenced through the centuries by varying characteristics: the religious, the theatrical, the carnivalesque, the

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*GROUP'05*, November 6–9, 2005, Sanibel Island, Florida, USA.  
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competitive, and the conflictual [30]. Nowadays, large-scale events are prime social, economic, and media-based phenomena ranging from sport events (e.g., the Olympics) and festivals (rock, cultural, folklore) to celebrations and carnivals. Interesting characteristics of large-scale events are their spatial distribution, their extended duration over days, and the fact that such events are set apart from daily life. Spectators and visitors gather in groups and invest resources (time, energy, money) to co-experience something “extraordinary.”

Large crowds of spectators are generally thought of as participants passively enduring the event and as consumers of an increasing amount of accessories and gadgets. Moreover, while current services and research target individual spectators exclusively, statistics show that spectators visit events in groups. Our research points to how the experience of the event is socially constructed, and any application or service development should take this into consideration. Novel applications can be specifically used to support different aspects of the experience of spectatorship, such as maintaining relations with a social network (the group’s co-experiencing of the event) or maintaining awareness of and engagement in the event (enhancing event presence).

From our fieldwork in ongoing projects, we have an initial understanding of the spectator’s experience at sporting events that are physically distributed in space [14]. Spectators are actively engaged in staging their experiences: navigating and selecting places, settling, creating multimedia records, expressing a group image (some wear “uniforms”), and interacting within their groups and with strangers. Spectators are organized in groups that display a characteristic image and exchange jokes, tips, and information among themselves and also with strangers. At some events, competitions and organized activities involve the spectators (best spectator photograph competition, fan clubs, etc.) All of these aspects are part of the spectator experience, and in this paper we chart a design space for applications that render the experience more active and engaging, although in a socially and culturally relevant way. We construct the design space, deriving its requirements from a field study of camera phones at a sporting event, and we concretize it by presenting a novel application for mobile group media. The application, mGroup, moves beyond person-to-person multimedia messaging and beyond the passive consumption of multimedia content. It turns mobile terminals into both powerful means of expression and learning, supportive group experiences.

## 2. RESEARCH APPROACH

Our research is pragmatically oriented at exploring spectatorship at large-scale events as a novel domain for group applications. With this paper we contribute a formulation of what this novel

domain might be. The approach that guided us is “setting-oriented design”, which combines in situ interviewing, observations and video analysis with design interventions [29]. Design in this research is conceived “as being part of a larger and inevitable cycle of observing use, developing requirements (formal or informal), designing, building and again observing” [3].

This translated into investigating the salient aspects of the spectator experience through ethnographic studies and technology probes [13] of two groups of spectators equipped with multimedia phones (Section 3). From the analysis of the ethnographic material and the technology probe, we derived a variety of design implications that define some boundary conditions for the novel domain (Section 4.1). We concretize some of the implications by describing a novel application that we developed, which supports the creating and sharing of “multimedia experiences” by groups at large-scale events. We conclude by showing how additional areas of the design space remain unaddressed (Section 4.3).

Through an anthropologically informed analysis, we aim at providing a new perspective of spectatorship at large-scale events, which can make research and development more aware of the socio-cultural dimension. Our aim is to define this new domain for group applications by proposing design implications from field studies and by charting a design space, and in this way, to provide basic knowledge for orienting the research in this new domain.

In the next section, Related Work, we review commercial systems for mobile media sharing, research prototypes and studies of multimedia messaging, and studies of spectators. It is a novel domain for HCI and CSCW as previous work has poorly investigated the implications of and opportunities for mobile multimedia media, especially in relation to groups of spectators and the co-experience of an event.

## 2.1 Related Work

In commercial systems for mobile group communication using multimedia, there are three main approaches: mobile instant messaging (MIM), multimedia messaging (MMS), and photo blogging. Practically, mobile instant messaging applications are interfaces to instant messaging services on the Internet. MIM applications are often downloadable applications that enable the user to access a real-time communication service via the mobile phone or other handheld device. Although some of the more advanced applications support sending of images to the recipients or push-to-talk features (see, e.g., Agile Messenger [1]), the primary communication media in MIM is typing. Also, like in PC-based instant messaging, there is very little support for structured or organized archiving of the communication, for example, as memorabilia.

Multimedia messaging is a standard based on text messaging (SMS) where people can send a message to one or several recipients. MMS messages can include text, sound, video and pictures, and the process is very similar to sending an email message from the phone. MMS messages can be sent to other MMS compatible phones or directly to email addresses. However, unlike email messages, the recipients of the message cannot see who the other recipients were, if any. This is an important aspect in maintaining the togetherness of a group in communicating. By not having visible information about other recipients, it is not possible to communicate interactively as a group. Moreover,

MMS has been significantly hindered by technical issues, such as unreliability of delivery and configuration issues, as well as relatively high pricing per message.

Photo blogging, or moblogging, is the activity of publishing pictures taken on a mobile phone on a web page or a blog. The main idea is that unlike with regular digital cameras, there is no intermediate transfer step between capturing the photo and publishing it. The wide variety of photo blogging applications and services enable features that range from privacy control to discussing the pictures (e.g., Kodak Mobile [16], Photos to Friends [10], Buzznet [7], Nokia Lifeblog [21]). The main characteristic of photo blogging is that it resembles publishing in its distinguishable user roles: the content creators (i.e., the bloggers) and the consumers of the content (i.e., the people viewing the web pages). This publishing activity does not support the kind of real-time and lightweight chatting and sharing that is typical of instant messaging, where there is seldom time or the need to refine the message or its graphical presentation.

In addition to the most popular commercial solutions for mobile group communication via multimedia, there has been academic research in the area. In their paper, Sarvas et al. [26] studied the sharing of mobile pictures from the perspective of the picture's lifecycle from capture to archive in the photo blogging type of system called MobShare. The system provides a way to send pictures from a multimedia phone into web folders that can be viewed and commented on by invited acquaintances. The user study showed that the web publishing activity familiar to photo blogging supports social discourse similar to the discussions arising around paper pictures, which clearly happens after the photographed event [25].

Independently of the event context, studies of sharing multimedia have already been undertaken. A study by Koskinen et al. [17] points out that content in MMS messages between friends is rarely independent of previous communication. People have also started to create collections of pictures on the same topic, such as variations of a joke that had been circulated within the group. In both studies, the communication of moods was one of the main use purposes as well. Battarbee's study echoes these findings [4].

Mobile devices can also be used for recording digital media that is assembled into a coherent story at a later stage. Mäkelä et al. [18] found that pictures were taken not only about special situations, but often to create stories, illustrate everyday life in a funny way or to make art. Frohlich et al. have found that if people are co-located, as is often the case in events, the storytelling aspect loses importance [9]. They studied the requirements for groupware for sharing photographs. They propose a two-dimensional model where time and place are the axes. Although the background and focus of their study is in domestic photography, the model points out the need for groupware support for sharing photographs at the same time but from different locations.

Flipper is a system [8] that supports the groupcentric sharing of pictures for persistent groups (buddy lists). Its shortcomings are the impossibility of sharing pictures with a group of people that is not predefined. Moreover, the pictures are organized merely according to the person who shared them, making it difficult to organize many pictures according to particular events.

In [22] a system is described that combines photo annotation tasks with instant messaging. Sharing and annotating digital photos can happen online over the Internet while people are chatting online.

The system, in addition to manual annotation, can extract information from conversations to generate extra annotations. In [27] with “The Personal Digital Historian”, users explore digital archives of shared materials, such as photographs, video, and text documents on a tabletop interface. The tangible digital photo album by Balanović et al. [2] tries to replicate the functionalities of traditional paper photo albums.

In a study on the Swedish Rally, the Roskilde rock festival and a sailing competition in Sweden, Nilsson et al. [19] noticed that the primary interest of the visitor is to experience the event in action, such as seeing the cars drive by from a few meters’ distance. This goal was supported through socializing with other visitors by exchanging information that supplemented the experience. This work was continued by developing mobile media prototypes for large-scale events, focusing mostly on the question of what type of timely information should be provided to the visitor [20]. That is, visitors were seen purely as consumers of mobile media, and how they can create and share multimedia was neglected. Reeves et al. [24] propose a taxonomy for analyzing the public use of interfaces from the perspective of the spectators’ experience. They propose four HCI design strategies based on the use or manipulation of an interface which leads to effects perceived by the spectator. Their focus is on the spectator of the interaction performed by a user rather than a spectator of an event.

Studies on tourists currently provide little insight into the topic. However, Brown and Chalmers studied city tourists, paying special attention to information needs as well as map and travel guidebooks usage [6]. Their finding was that personal experiences are often shared with other people, usually between travel companions but also with other people, such as other tourists.

### 3. A FIELD STUDY AT THE RALLY

#### 3.1 The Setting

The field study took place at one of the 16 rallies that comprise the FIA World Rally Championship. There are 353 kilometers of driving tracks, called Special Stages (hereafter stages) that cover approximately 4500 square kilometers in central Finland, with Jyväskylä city as the central point. The number of spectators in total reaches 300 000 in some estimates, 88 percent of which are from Finland. Some information services are provided for the visitors, the most important being a radio channel, which conveys the split times of the drivers. Supplementary information is presented in specials on TV. The most important sources for static information are 1) the official program published by a Finnish car sport magazine and 2) the accompanying sheet that has a map of the stages, the timetables and instructions for approaching the stages by car. The event takes place along the stages where the cars are driving and at Pavilion, a congress center in Jyväskylä. Pavilion hosts an information center, an expo, and a service park which is semi-open to visitors where the cars can be spotted between the stages. At the stage, safety personnel are spread throughout the stage, at about 100 m distance from each other, and spectators are guided behind red tapes that mark the safe zones. The cars drive past at two-minute intervals, and the personnel signal their arrivals with high-pitched whistles.

#### 3.2 Method

Two participant groups were recruited through a local travel agency two months before the rally. A small town group consisted

of 7 males who were over 30 years old (group A) and a capital area group (group B) consisted of 3 males and 1 female of about 25 years of age (and a dog). Both groups had visited the rally also previously. They volunteered to participate in the study for no monetary compensation. They were approached well before the rally and were introduced to the researchers and the study. Eight SonyEricsson K700i phones – four for each group – were utilized. Phone accounts were paid for the users. An introductory tutorial of the use of the phones was given to all participants to ensure the necessary skills to operate the devices. They were asked not to delete the content that they had created during the rally, since it was to be analyzed later on by the researchers. In the rally, each group was shadowed by a researcher, who was recording the activity with a video camera. Of the three rally days, half of the first and the second day in full were observed. While group B traveled as a group in the same car during the whole rally, group A split into two groups on the second day, as three members woke up early to go to three stages while the remaining four woke up at lunch and passed the afternoon in town in the service area and at the expo. For this reason we were also able to observe in-group usage of MMS messages (over 50 items). After the rally, the phones were collected and all of the pictures, video clips and MMS content were extracted for analysis. In addition, we provided all participants “next to real time content” of the event through MMS. We arranged for two people to dedicate themselves to producing and distributing mobile media news, trivia, and tips.

### 3.3 Results

#### 3.3.1 Observing the Spectator Experience

*The sociality of spectatorship.* The rally is an intensely social experience for on-site spectators, which is over and over again created and maintained through social acts. Social interaction takes place throughout the day and involves, besides the other group members, strangers as other visitors or members of the organizing staff of the rally. The interaction with people external to the group can last from a few seconds to a few hours and includes 1) joking, socializing, exchanging directions and advice with other spectators while walking the kilometers from the parking places to the stages or along the tracks; 2) arguing, discussing and socializing with the members of the safety staff or teams competing in the rally; 3) less explicit interaction with passers-by by exchanging glances and acting in ways to attract attention.

*Protagonism and active spectatorship.* The field study revealed the variety of ways in which spectatorship at the rally is an “active”—not passive—experience. As mentioned above, the spectators are not merely observing the rally cars but, for example, are engaged in navigating in a vast area, settling and conquering positions (i.e., actively searching for spots where cars can be seen well). In maintaining an active role, the spectators were also exhibiting their knowledge and competence by giving tips and directions to other spectators and engaging in discussions with the safety staff or with members of the rally teams.

*Group identity and image.* The spectators wore distinctive uniforms and were often taking pictures of other groups and themselves. Members of group A wore a red cap (supporting a specific driver) and black shirts. Group B manifested group identity by carrying a Finnish flag (being a Finn), casually

wearing a T-shirt as a hat, or all wearing white T-shirts or black caps. There was continuous and reciprocal interest in people passing by, and the group often made explicit comments. Passers-by were often evaluated, sometimes purposefully, in a loud voice so that the evaluated people could hear (e.g., Estonian supporters sparked critical remarks).

*Temporality and rhythms in spectating.* The rally event has a fixed temporal structure that is planned up to the minute (e.g., stage no. 1 on Friday starts at 08:34) that distributes events in a vast area in a rapid succession. However, events may overlap in time at different places, especially considering that there are background events such as the RallyExpo, a fair connected to the rally. While the rally drivers and cars manage to go through all the stages and servicing (which is also open to spectators), it is unthinkable for spectators to follow all the stages and service times. When analyzing the group's whole day, it was possible to divide their 14 waking hours into periods characterized by five recurring dominant activities: driving, walking to or from the track, waiting for the stage to start, watching the rally, and resting or preparing. These periods have different rhythmic and temporal qualities that are visible in three different aspects: first, the social interaction within the group and with other spectators (sociability); second, the occurrences of intensive peaks that required full attention from all spectators for a short time and that are considered to be "intense moments"; and third, in what we call killing time, we observed the spectators actively looking for ways to avoid boredom. Intense moments, however, do not only occur while watching the rally cars in action. The group purposefully chose a gas station to rest and eat at in order to ambush the leader of the competition between two of the stages and shoot videos of his car, while waving at him. Sociability, especially with strangers, seemed to increase during the day and usually increased while walking the kilometers to and from the tracks and waiting for the stage to start. Killing time was also present throughout the day, again especially while waiting for the stage to start and walking to and from the tracks.

*Spatiality and navigation.* The rally is massively distributed in space. Spectators engage in a variety of activities that emphasize the spatiality of their experience: in navigating as deliberately planning and executing a route, in exploring as finding and evaluating new places and territories, in camping as creating places and territories for the group or settling. Decision-making in navigation therefore happens at different levels (and in different places). For example, while in the cottage or apartment, the spectators must choose from several stages which are often located far from each other. The day before, a preliminary plot emerges in the group. It includes a route with a generic sequence of stages to be visited and a very rough schedule. Before or during traveling to the stage, the group decides from which direction to approach the stage and which road to use (arriving at the beginning, at the end, or at one of several spots in the middle). Approaching the parking place, the spectators choose a place to park. At the parking place, the right equipment is selected in consideration of the distance to the track, the weather, and how long they will stay. After arriving at the track, the spectators have to decide where to go. Sometimes they ask members of the safety staff or other visitors for information. They then decide to walk along the track, up the track or down the track. Along the track, once a suitable location is found, the group settles or camps, creating a place and a territory that the group considers the best

point of view to the track and the rally cars. This is not a step-by-step process, but a highly interactive one where decisions at forthcoming levels are anticipated and prepared for. Decisions about the overall plot are influenced by lower level navigation issues and the other way around, which leaves room for opportunistic side-stepping [28] from previous plans.

### 3.3.2 Creating and Sharing Mobile Media

For the analysis of the recorded media, our starting point was that they reflect spectator experience as lived with and through multimedia. The act of recording an event itself assumes a selective decision-making process where the participant has weighed the benefits of recording as higher than its costs (e.g., social disruption to on-going activities, cognitive and physical effort). Thus, recorded media can be claimed to be selected, meaningful, relevant, and valuable in reflecting the experience of the event.



**Figure 1. Example media: A) The cottage where the group stayed, B) cars lining up for the race, C) a WRC car, D) a group picture, E) a staged facial expression, F) a car logo, G) advertisement girls, H) a stranger vomiting across the street, I) a picture series of Danny getting into a muddy pond**

From the analysis, some interesting preliminary observations on the multimedia-mediated spectator experience can be made. In the trials, the participants created 527 pictures. First, less than half of the pictures (272 pictures) were related to the (sporting) event, but the aspects of "being there" were emphasized. These non-event pictures were mostly about the group members, other people (mostly girls, Figure 1G), and artifacts. This observation provides more evidence for our claim that spectatorship is not about sitting alone, experiencing events, and recording and sharing them; the active construction of the experience is important as well. The staged picture category illustrates this aspect well. The pictures in this category were not of real on-going situations or actions, but were staged, posed, or otherwise organized by the group (see Figure 1E).

Second, a large proportion of the pictures clearly represent emotionally loaded pictures having their meaning in the social interaction triggered by the picture. In addition to the staged emotions (e.g., Figure 1E), we observed pictures of gags (e.g., taking a close-up picture of a tobacco stump and asking others what it is) and pictures of new friends made while attending the event, which were evaluated and sent to the new friends via email. Moreover, the corpus contains ownership pictures (a logo of one



group member's car, Figure 1F) and pictures related to jokes (e.g., a picture of a someone vomiting deemed as funny, Figure 1H).

Third, the pictures represent a large spectrum of the social networks involved in the spectator experience, ranging from the self (Figure 1E) and group members (Figure 1D) to strangers (Figure 1H) and drivers (Figure 1B). The sociality of the spectator experience is well illustrated by the fact that 44% of the pictures involved people as their object. As will be discussed later, this sociality bears implications for design because the relationship between the recorder and the recorded is different than with pictures that represent artifacts or scenery.

Fourth, many of the pictures were organized as collages and series of pictures. These were related to funny events (e.g., one group's dog wandering into a mud pond, see Figure 1I), cool cars (from different angles and with technical information, taken from a magazine), and "extreme shooting" (a series of car pictures taken from an extreme position dangerously close to the road).

Several situations of sharing and creating mobile media were observed: hunting and documenting, competing, joking and communicating presence, and staging and portraying (see [14]). These are worth closer presentation.

*Hunting and Documenting.* Sometimes the recording of pictures or videoclips was part of a "hunting" or "documenting" collaborative activity; for example, when one of the groups "ambushed" the leader of the rally between two stages and recorded the passing of the car in a video clip (Figure 2 left). The other group of spectators engaged in a hunt and documentation for rally car trucks through photographing several trucks, including a toy truck in a gas station (Figure 2 right).



**Figure 2. Hunting and documenting cars and rally trucks**



**Figure 3. Competing with and comparing shots**

*Competing.* After the recording of a picture or a video, the spectators often immediately showed it to the other members of the group (Figure 3). Pictures and videos were often compared, and the members discussed their shooting techniques.

*Joking and communicating presence.* The recording of a picture may also be a part of a joke or a game, in the way that it is purposefully created to be part of a playful exchange or interaction: amusing themselves taking a picture of a strange insect on the shoe of one of the members, or making jokes in replying to an MMS message. A member of the sub-group at the

RallyExpo sends a picture (Figure 4 left) with the text "advertisement girl"; the member receiving the MMS message at the track replies with a picture (right) with the text "our advertisement girl."



Text from the Rally Expo:  
"Advertisement girl"



Reply: "Our advertisement girl",  
from the Rally stages

**Figure 4. MMS messages sent between group members when apart**



**Figure 5. Staging pictures**

*Staging and portraying.* Pictures (Figure 5) were also the outcome of staged situations or portraits that involved the participation of several members.

### 3.4 Event Content Services

We organized a "next to real time event content" service to experiment with different types of event content and to observe their influence on the spectator experience. Two people (students of media production) were employed to produce and distribute content in the form of MMS messages to the two participant groups. The producers used Nokia 6600 media phones to produce pictures and text of five different content categories: Rally results, Peculiar things, Rally cars, Practical tips, and VIP news. The two producers had special passes to access some of the restricted areas and sent on average 15 MMS messages each day (8 hours).

The participants of the study were interviewed after the event to elicit feedback. While generally praising the service, some participants preferred the Rally results category and others preferred the categories of Practical tips and Peculiar things. A general problem with the media was the poor technical quality of the pictures, which made it difficult to see details that were often important for interpretation and discussion (Figure 6).

However, the aim of the experiment was to observe the possible influence of event media on spectator experience. We recorded some incidents of how such content provided resources for participants to have discussions, to have a shared understanding of the event and even to engage in interaction with other spectators.

For example, one member of group B had a discussion with and showed the screen of his phone to a stranger who asked for stage results. As most of the event media content was purposefully sent during event "quiet times", they were sources for collaborative interpretations that spun off discussions of, for example, what happened the previous year at the rally. In particular, comparing the times of different drivers occurred often. We observed an advantage of mobile media in comparison to radio: the results are currently available on the radio but cannot be saved and viewed

again, which means that not only are they difficult to remember (making it difficult to compare the performance of different drivers), but also the radio cannot be always heard or is not always available.



Text: "Not everybody likes the rally"



Text: "The sports commentator NN, this time without audio"

APRIL 13 - Uusika			
1	Marcus SÄRNHELM Tina MÄNTYLÄ	Prolog	1:31:30.2
2	Marcus MARTIN Michael PARK	Prolog	1:32:12.5 +02.3
3	Cariem SAHIZ Markus RÄSÄ	Prolog	1:32:50.1 +09.9
4	Jaanis TUOHINO Jukka AHO	Prolog	1:33:02.2 +12.0
5	Sébastien LOEB Daniel ELENA	Prolog	1:33:07.4 +12.2
6	Jani PAASIWEN Jari VAREKKA	Prolog	1:33:25.1 +14.9

Text: "Results Stage 13"



Text: "Märtn final time 20:33:07"

Figure 6. Examples of next to real time event content

## 4. REAL-TIME ON-SITE MOBILE GROUP MEDIA

### 4.1 Design Implications

In what follows, we turn to report some general design implications; implications that, we believe, are critical to most if not all applications that aim to cater for intragroup interactions at a large-scale event. The first two subclasses of the implications below relate to enabling the kind of practices we observed on the field that are central to groups, and the last two subclasses stem from the appreciation of the event as a context for intragroup interactions.

*Support for orchestrating group identity and its formation.* As reported, the spectators exhibited many behaviors necessary for maintaining, expressing, and managing group identity—for example, by wearing uniform clothing and carrying flags, and also by continuously showing reciprocal interest towards, and expressing opinions and evaluations of, other groups. Current systems apply either a buddy list approach to a fixed group [8] or a “one to many approach” [26]. The problem of supporting a collective creation of (participative) content or identity remains unexplored. This draws attention to the following aspects:

- *Group identity.* Means need to be provided for creating, maintaining, and expressing group identity in the digital context. This can be achieved, for example, by means of logos and textual presentation (names) of groups in interfacing with other users and user groups in the digital realm.
- *Authorship and ownership.* One important aspect of managing and expressing group identity is emphasizing the authorship and ownership of media. Good pictures of rally cars, for example, were often shown to others with an

emphasis on who took them, and these pictures were shown repeatedly to others met alongside the rally track. Support for authorship can be achieved, for example, by propagating and presenting metadata on authorship with the data.

- *Dynamic recipient addressing.* This is important to support the opportune and ad hoc nature of group practices in an event context. Groups do not have a fixed structure and often overlap. Moreover, we often witnessed interactions with strangers as other visitors or members of the organizing staff of the rally. This can be achieved by easy to use mechanisms that allow the quick creation, modification, and finalization of groups.

*Mechanisms for group awareness and coordination.* As reported, for on-site spectators a rally is an intensely social experience, which is created and maintained over and over again through social acts. We witnessed how the use of the phone as a recording device was often triggered by what other members were doing or by the context. While the work on awareness (systems and theoretical frameworks, e.g. [11] [12]) is well documented in cases of collaborative desktop workspaces, current systems for mobile media sharing provide minimal support ([8], [26]). Here, the following concepts are relevant:

- *Twofold awareness.* We maintain that the novelty in this case is that awareness has to be supported in two areas: first, awareness of other members’ activities in the shared digital space, such as which media is being manipulated by whom (shared, created, commented on); second, awareness of the other members’ situations in the real world, as in the case of the rally spectator group that was distributed in different locations, engaged in different activities, as well as not always being available, and having differing dispositions to interact through the system.
- *Social Presence.* We observed in the field study how one of the uses the spectator group made of the camera phones was to build and maintain social or co-presence. Co-presence can be defined as achieving a sense of “being together” in a technology-mediated environment [5]. The above implications on awareness indicate some instruments to support this. The specificity of this domain is that co-presence has to be supported in the context of a shared event.
- *Synchronicity.* Achieving real-timeness is very relevant in an event context where situations unfold quickly and unexpected situations need a quick response. Not only is synchronous communication relevant, but also the relevance of media content is tied to specific situations.
- *Cues and teasers.* These invite participants to explore the content and contribute. These could be achieved, for example, with billboard lists of the best contributors or by providing means for the user to express and emphasize an important message in ways richer than picture and text.

*Means for meaningful construction of an event experience.* As reported, an event experience is constructed continuously for and with the group. For example, we observed joking, socializing, exchanging directions and advice with other spectators while the group was walking the kilometers from the parking places to the stages or along the tracks, as well as arguing, discussing and socializing with the members of the safety staff or teams

competing in the rally. While current mobile group media systems support the sharing of pictures with individual members or groups, we observed how the creation and sharing of mobile media was part of the *participative activities*, which indicates some particularly important aspects of the use of multimedia collections:

- *Collections of media items.* We observed many times that the unit of communication was a series of photos instead of just one. The collection would also include a specific sequencing. This means not only that the communication of many photos should be supported, but more that it would often be useful to manipulate a set of photos instead of individual pictures.
- *Easy re-use of media.* This need was apparent in many situations where the same photos were shown repeatedly to different people or manipulated in other ways on the phone, e.g. by skinning or by emailing them.
- *Structured archiving of media.* This is needed to relive the experience after the event and to capture the situations in which the media was created. Archives do not have to be restricted to mere storage of media per se, but can be structured or organized based on stories, time, or authorship to create richer and more engaging ways for reliving and telling the story of the experience.
- *Genres.* Support for different genres or formats is needed as we have observed the different roles of users and a diversity of activities of creation and sharing: joking, storytelling, documenting, hunting, and competing (see Section 3).
- *On-site presentation.* Since most of the group interactions take place on the spot, it is important to support also the use and presentation of media already from the screen of the mobile device. This implies different ways of selecting media and augmenting and orchestrating their presentation on the spot when the story of the picture is told to others.

*Shared context and discourses.* The participants knew how to interpret a particular picture as a “media language act” in a particular context. A picture of a truck, for example, was meaningful to participants in the context of a “hunt” for rally trucks. In the same way, a picture sent as a MMS message was meaningful as a reply to another picture and because participants knew in what situations the other members were. In communicating through technology, these contextual inferences can be hindered, or the users can organize explicit cues. There are many ways in which systems can support the formation of “discourse context.” In Flipper [8], the sharing of pictures is organized simply according to who has shared them, providing no support for forming specific contexts out of groups of items. In MobShare [26], a participant shares pictures in a folder with a title, and other participants may leave comments. In this case, while it is possible to group pictures together and give additional context information and a title, the sharing is an act from an individual to a selected group and does not target a real-time usage but a post-event sharing. For example, the following features can be implemented to facilitate collective engagement:

- *Event-structure support of discourse.* We saw many ways in which discourse referred to or was framed according to the surrounding event context. Such pieces of context might

include the situation or the competition status at event locations, results from competitions, traffic congestion, the presence of services, upcoming happenings, accidents, the presence of celebrities etc.

- *Support for simultaneous and multiple discourses.* We observed how the creation and sharing of pictures happened as part of multiple discourses between which the participants were continuously switching (threads of MMS jokes, documentation, competition over pictures of cars at the tracks). Due to the fragmented and often sporadic nature of interactions in the group, the rapid and effortless re-establishment of common ground in discourses is an important design goal. This implies providing persistent discourse contexts through the system that, according to our field study, should support the participants in sharing during the event (synchronous, real-time discourse) and in collectively contributing the media (emergent discourse).

## 4.2 Exemplifying the Implications: mGroup

We have developed an application that concretizes some of the implications contained in the previous section. We describe here a prototype built as a client-server Java application for Nokia 6630 Series60 smart phones, to be used at large-scale events.

The application – mGroup – is a messaging system for groups of spectators and visitors based on the following principles:

- *Story-based content structure.* Users can create “media stories” and invite specific members. In the media stories, members can share collections of media items, by creating messages that open discussions, or by replying to existing messages. By using media stories, users can create different media spaces to support different discourses like in chat rooms. Stories are persistently stored on the server and users can easily switch between them.
- *Automatic album creation for the post-event reliving of experience.* Each media story has a designated web page. Any time a message is sent to a story, the server adds the new message to the HTML page. In this way, an annotated album of the group’s joint experience of the event is created automatically to support reliving the moments later on.

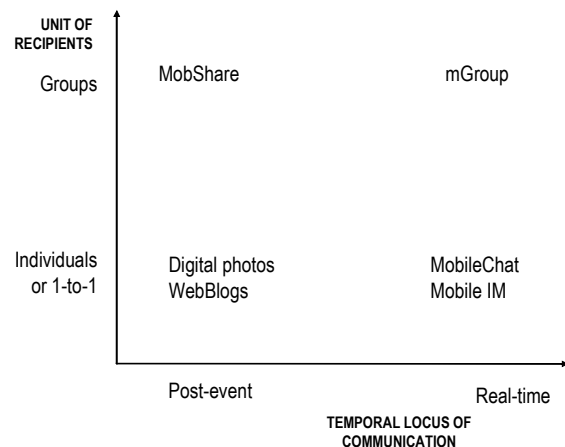
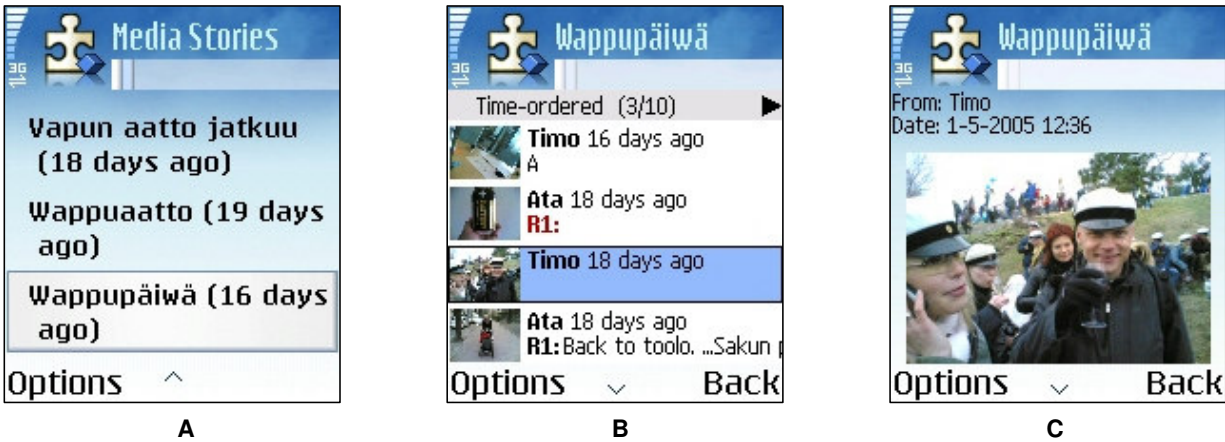


Figure 7. mGroup in relation to existing systems.





**Figure 8. Browsing content in mGroup: A) The media story list where the user can select a story of interest. B) List view of messages in the chosen media story. C) The top part of a message shown in full size after a selection in screen B. The content shown is from a user trial at the Finnish first of May celebration.**

- *Support for communicating presence.* Each message sent within mGroup is delivered immediately to other members who can reply with similar one-to-many messages. Such immediacy also allows for exchanges about temporally short-lived situations. Knowing that every message reaches the whole group, members can expect that others are able to contextualize each message to a larger conversation. Messages may contain text and pictures in any combination. These message items can be arranged to create short stories to support different means of expression (such as joking, storytelling and staging observed in the field trial). In addition, each member’s online/offline status is shown in mGroup.

Figure 8 shows pieces of content on a phone screen from a small-scale user trial carried out during the Finnish First of May celebration. Figure 8A shows the media story selection screen, along with information about the most recent message in each story. Choosing a story with a key press takes the user to a time-ordered view with the most recent messages (8B), and each thumbnail is equipped with contextualizing information. The user can also change to a threaded view by pressing the right arrow key. By selecting a message, the user can see the full message (8C).

On screens B and C of Figure 8, the Options menu provides the user the possibility of creating his or her own messages. A message can be a reply to the selected (8B) or the shown (8C) message, or a new one that opens a new discussion. The process of composing a message is similar in both cases. When finished, selecting “Share” from the composer’s Options menu uploads the message to the server in the background, from which it is distributed to the other media story members.

The mGroup application will be evaluated and further developed in trials at music festivals and at the world championship rally.

### 4.3 A Design Space for Future Applications

To conclude the paper, we present an application space for future work in mobile group media for large-scale events. The application space is presented here in the hope that it will uncover new possibilities and ideas for supporting spectators with the means of ubiquitous technologies. We particularly want to raise

two critical dimensions of spectatorship as the basis for the schema: Protagonism and Event Contextualization. These open up a space where general technology-provided context-awareness meshes with content provided by event organizers, indicating new ways for groups to experience the event.

*Protagonism and Active Spectatorship.* The field study revealed a variety of ways in which spectatorship at the rally is an “active”—not passive—experience. As we have shown in this paper, spectators are not merely observing the rally cars but, for example, are engaged in navigating through a vast area, settling and conquering their positions. In maintaining an active role, the spectators also exhibited their knowledge and competence by, for example, giving tips and directions to other spectators, as well as by engaging in discussions with the safety staff or with members of the competing teams. This dimension is presented as three types of content production agency: user-created content, content broadcasted by event organizations, and mixed content. By mixed content we mean that organization-provided content is provided for the user’s creative disposal. Or conversely, media produced by users can be made public as part of the event.

*Event Contextualization.* The field study revealed a variety of ways in which discourses were grounded or drew resources from the event as a context. This dimension is presented as three types of contextualization: technology-imposed, user-managed, and mixed. By mixed we mean that computer-provided contextual resources are provided for the user to augment and structure intragroup interactions.

The application space, as presented in Figure 9, unearths novel areas for design and ways to think about spectatorship. Importantly, from the perspective of the end-users, these areas may be related to different social achievements. We here list three areas drawn from the diagram:

- Area A—Context awareness in general, and location aware features coupled with synchronisation with the event time structure in particular, can provide a greater variety of *event content*. The current context of the spectator and the state of the event determines which content is the most useful to users: real-time news, tips, route directions etc. This concept follows the current fashion of mobile tourist applications. It would help groups to orient to the surroundings and distant



event locations in a timely and self-paced manner (cf. radio news).

- Area B—Providing *platforms* for the on-line mixing of user-created content and content provided by the organizers. This could mean, for example, providing the event content as a context for group communication. Moreover, event content can be attached to the user’s own media to enrich and amplify it before sharing it with others. The concept could support not only the efficient and fun communication of experiences but also their archiving for use after the event.
- Area C—In this area *contextual, sensor-based resources* can be used for *addressing and targeting an audience* with media (for similar event systems which are not on a large scale see [15], [23]). One can envision many uses for such a possibility; for example, it could be used as a means for coordinating actions of the group (e.g., by leaving directions to the spectating spot for members who arrive late), engaging other spectator groups (e.g., by conquering territories with group logos), and competing with them (e.g., by seeing who took the best picture of the passing car).

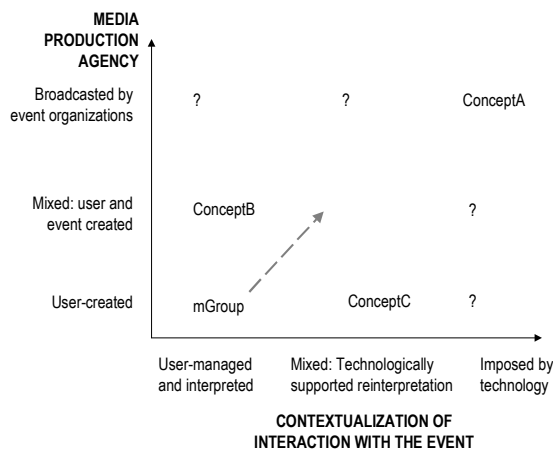


Figure 9. Application space

## 5. SUMMARY

Large-scale events are an important domain for research on groups and computational media. While current services target individual spectators, our research evidenced how spectatorship is about co-experiencing the event. Moreover, the increasing availability of mobile and ubiquitous computing provides new opportunities to support on-site groups of spectators. To define this novel domain, we have described the salient aspects of spectatorship at a large-scale event, a WRC rally. We have carried out a field study using camera phones to observe spectators in their creating and sharing of mobile media. Based on the findings, we have proposed a variety of implications that show the specificity of a new domain which we can call *Real-Time Mobile Group Media for On-Site Spectators*. Some of the implications have been exemplified in a novel application, mGroup, which is distinctively different from current mobile group media systems and incorporates some specific features that support groups of spectators. To better define this novel domain, we have also charted a design space for future applications that also describes the domain in terms of novel systems beyond the scope fo

mGroup. The practical experiences and the analysis in our research have helped us identify several relations between large-scale events and mobile group media. These advance current research knowledge by providing a different perspective on how (or for what) to design mobile group media applications. Moreover, we advance our knowledge of a new “non-work related” domain for group applications of great social relevance. The principles that guided us have been to ground the inquiry ethnographically and anthropologically. We can distinguish three major contributions for other researchers. The first contribution is the perspective gained on what the salient aspects of spectatorship are: its active nature, its sociality and interactional character, and the importance of shared experiencing in a group. These can be turned directly into implications as they orient design towards supporting a specific kind of spectating. A second contribution is a constructive undertaking in the form of the implications presented and of a novel system that demonstrates the relevance of alternative approaches to mobile group media compared to existing ones. The most important aspects in this sense are:

- The relevance of supporting synchronous (instant) manipulation of media in the group. This supports the construction of shared experience by providing resources for the creation and maintenance of context in manipulating mobile group media.
- The relevance of participative approaches to creating shared digital memories (shared media albums). Current systems favour the sharing of media from an individual to others, whereas mGroup allows every participant to construct the media story equally.

The third contribution is the charting of this new domain in terms of a wider application space along novel dimensions as the mixing of end-user content with content broadcasted by other event actors and the possibility to enrich the platform on which participants manipulate media with event-context awareness.

## 6. ACKNOWLEDGMENTS

We want to acknowledge our partners in the Wireless Woodstock Services Project, funded by the National Technology Agency of Finland (as a part of the Eureka Celtic Wireless Festival project), and especially Anne Mehtäläinen from TeliaSonera, Pekka Kanerva for implementation of the prototype, and AKK Sports.

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