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Korjaus:

Osatutkimuksessa on virhe kappaleessa 4.3 sivulla 8 kohdassa: “15 of the group members liked more following live videos than send them while 8 liked sending more.” Lukujen kuuluisi olla päinvastoin, osallistujat siis todellisuudessa mainitsivat enemmän negatiivisia kommentteja livevideoiden seuraamista kuin lähettämistä kohtaan.

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Live @ Dublin – Mobile Phone Live Video Group Communication Experiment

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Abstract. Live video has gone mobile. In this paper we present an experiment on mobile phone live video group communication, conducted in Dublin, Ireland. We observed 24 people who self-organized into groups for sending and watching real time internet videos on mobile phones over two days. A total of 49 first person view live videos were sent during the experiment. This paper reports observations on attitudes, opinions, communication and context, as well as technical issues regarding the experiment. Findings include varying preferences between live vs. delayed video as well as between following vs. sending live videos. We describe some of the positive and negative feelings that the experiment caused. Finally, we also discuss implications of this technology for wider user populations.

Keywords: Mobile phones, live video, mobile video, video communication, interaction

1 Introduction

It is nowadays possible to share live video content from mobile phone to internet and thus to multiple watchers. This means that there is a new interaction method available in everyday environment, with the benefit that communication between group members can be enhanced by live video streaming. Video communication can happen on move, in mobile context, thanks to built-in video cameras and sharing capabilities such as internet browsers of current mobile phones.

In this paper we present the results of an experiment which was conducted in 2007 in Ireland. We wanted to better understand possibilities of live video in the area of mobile phone communication and study peoples' attitudes towards live video sharing and following as well as being recorded for live video stream in mobile context. We describe real time video material which was recorded by study participants and analyze responses towards the experiment based on field observations, a questionnaire and group discussions.

We observed 24 people who self-organized into groups for sending and watching live internet videos on mobile phones over two days. Each person in each group had the possibility to send and follow these videos from a mobile phone or to take part in

sending as a member of a group. Videos were shared to the internet which in theory made them available for anyone, though the intended audience was the experiment group members and some people who were invited to observe. General thoughts about the experiment included quite equally positive, negative and neutral opinions. Most of the problems and negative feedback were caused by technical issues.

We were interested in how participants use live video as a part of their group communication. Participants' activities and feelings as cameramen, audience and targets were observed. We note also related work as well as discuss reflections and influences of mobile live video sharing for future group video communications.

2 Related work

Video calls over the internet are now becoming within the reach of the masses. Recent versions of telephony and messaging software such as Skype and iChat allow shared video conversations, while mobile networks (for instance, 3G) are enabling mobile video calls. In general, video has arguably become a first-class internet data type (witness the rise of YouTube (<http://www.youtube.com>)). The literature seems void of similar mobile live video group communication experiments like the one presented here. The experiment setup therefore provided a novel possibility to examine in practice the issue that has been discussed but not widely experimented in practice.

2.1 Related research

There is not much specific research on mobile live video group communication available, but lot of research has been done on capturing and sharing visual content in mobile contexts. The findings there apply to our study as well.

Koskinen et al. report that people familiar to each other rely on mutual trust for controlling sharing of sensitive material [1]. When sharing something to a public internet page, anyone may see the posted content. We note that, since the audience is anonymous, this spreading to secondary context (extended context which is reached via technical tools) of unknown scale and composition creates privacy concern for the creators of the content as well as the targets for recording [2]. Media-archaeology studies by Huhtamo reveal that camera has always had a de-humanizing effect on person carrying it [3]. We observed that the attitudes of target persons towards continuous video capturing changes during one month from excitement to irritation to ignorance [4]. In a mobile still imaging study, Kindberg et al. found that there is major difference between sending an image at time of capture or sharing it later; choices for sending time depend on timeliness communication requirements [5]. A mobile video telephony study by O'Hara et al. suggests that key drivers for video communication in mobile contexts are sharing special occasions and showing things to talk about. Same study discusses also social and practical barriers such as privacy management in public spaces and problems with ambient noise and lightning toward video communication [6]. Jacucci et al. noticed that in large scale events spectators experience the event together also many other ways than watching [7] and that event

information, media sharing and awareness between group members are all important, media sharing being the most central of those [8].

Enabling technology. Various video sharing applications are available for current high end mobile phones with internet capabilities. One directional live video streaming from mobile phone to internet, from one to many, can be done for example using software by ComVu (<http://comvu.com>) and Qik (<http://www.qik.com>). Also Kyte (<http://www.kyte.tv>) enables sharing live image material to internet. Live two-way communication is possible via mobile phone video call. Videos recorded with mobile phone can also be sent delayed directly from mobile phone to YouTube (<http://www.youtube.com>). Many kinds of one and two-way video communication software are available for PCs.

3 Experiment

The participants of the experiment were 24 colleagues from a research department. Because the participants knew each other in advance, they formed a natural group of people, shaping also natural sub groups. Two of the participants were female, others male. The experiment was arranged on a group trip where the participants traveled together to an unfamiliar city. Author was a natural member of the group, taking part into the experiment activities and acting as an observer and also moderator in group discussion but not answering to questionnaire. The participants extended their natural group communication during the trip with live video sharing capabilities of their mobile phones. All participants were experienced mobile communication technology users and some of them had used live video software before the experiment. 23 participants took part in the questionnaire and group discussions.. The participants shared live video streams to public internet pages, without restricting the amount of viewers. Anyone may have followed the videos, but the links to the web pages and streaming time notifications were shared only to the participant group and some other familiar people who were invited to follow the videos from their mobile phones or PCs. These members of extended audience participated to study only in roles of audience, not taking part into the other activities. Some sms feedback (to live video stream senders) from the extended audience are cited in this paper, though.

3.1 Technical Setup

ComVu Pocket Caster live video software was used mostly in Nokia N95 multimedia computers in the experiment. Each participant had suitable equipment but not all of them were able use the software in their mobile phones during the experiment.

3.2 Experiment Setup

The participants got the instructions for experiment by email in advance. Technical specifications for the needed device as well as instructions for installing the needed

software for the device were given. We asked participants to use these devices with installed software as their primary mobile phones during the experiment. Group members were also asked to define a group to their phonebooks, including phone numbers of all participants and extended audience, to enable fast and easy group sms sending. They were also guided to create in advance a text message template for announcing upcoming live videos and share a link to the sender's live video web site. We asked participants to send message before each live video stream sending action.

The experiment started with an information sharing session on site right after arriving in Dublin. In this session we announced general schedule for the experiment and gave last minute technical support. Groups started to build up then.

The experiment lasted for two days, from Friday noon to Sunday noon. Participants spent leisure time in Dublin in dynamic ad-hoc groups. People inside groups as well as between groups communicated during the period by normal everyday communication methods (such as sms and call), they are used to use, but extended with live video sharing. The sub groups were dynamic, some participants moved from group to another during the time period but there was still some general stability in the groups. People were encouraged to save live videos for future viewing. Notification group messages were sent before live video streams. Quite often there was also sms feedback from videos coming from the audience, including messages from experiment participants as well as from the extended audience.

As a parallel task to the live video experiment reported here, participants recorded also mobile phone videos which were not shared live but submitted to YouTube.

Before the end of the experiment we arranged a questionnaire and group discussion concerning the experiment. General feelings toward live video in mobile context were asked as well as willingness and possible reasons for this in the everyday life. More specific questions were such as: preferences for sending and following, subjects, places and times; comparison between sending vs. watching and live vs. delayed video; feelings of being a target for recording; problems during the experiment and thoughts of seeing through someone else's eyes. Most interesting questionnaire topics were further discussed in group discussion. Although delayed video sharing is not the subject of this paper, some comparison between live and delayed video experiences is presented in this study, based on the questionnaire answers and group discussions.

After the trip we collected the recorded material that was successfully saved. Also data about sent notification messages and received text message feedback were collected. We also arranged a group discussion three weeks after the experiment. During that we watched part of the saved live videos again. For example, technical quality and differences of requirements for live vs. delayed videos were discussed.

4 Results

Mobile phone live video group communication was successfully tried out during the experiment. Eleven of the 24 participants succeeded to broadcast live video from their mobile phones. Every participant was taking part into sending as parts of groups. 49 live videos were shared during the trip, and 33 of them were successfully saved. All participants saw live videos during the trip and were targets for capturing.

General thoughts about the mobile phone live video group communication experiment were quite equally positive, negative and neutral. Most of the negative feedback was caused by technical issues. When participants were asked to define feelings about watching live during this experiment in couple of words, the received answers were: *fun, excellent, superb, pretty good, relaxing, ok, hard, challenging, technically challenging, frustrating, crappy and boring*. Sending live video was commented to be: *fun, fun and easy "after a lot of mess", meaningful when something fun to send, very nice, ok, new interesting way, quite easy, cumbersome, impossible, still immature tech, technically difficult, boring and too complicated, consuming battery quickly, not working in practice, a violation of privacy and good idea but technical problems*. These simple questions and free text answers give support to the preconception that people have widely variable personal opinions towards video communication. Some people like to send and some prefer following.

When video was meant to be shared live, watching it later was considered quite boring because audio quality was always not good and the events were gone and seen already. Possible interesting fun parts were difficult to find again and even if they were found, the quality was not good enough to create a pleasant viewing experience.

More than half of the participants would like to send live video even more actively in the future if the technological and financial circumstances were optimal: 12 participants would share the material with familiar people and 6 with anyone. 3 participants would not like to share live video at all.



Fig. 1. A live video stream frame. One of the groups is sharing their experiences to the audience. One of the participants (left) acts as an ad-hoc commentator in this situation.

4.1 Communication during the Experiment

General sms, mms and voice call communication was happening during experiment just like it would have happened during a normal weekend with the group of friends traveling together. Information such as location details and schedules were messaged or called. ComVu Pocket Caster software was used only for live video sharing.

Live Video Communication. Usually many members were participating in each video, one being a cameraman, very often someone(s) acting as a commentator(s) or interviewer(s) and others being targets for video recording or audience. Sometimes

the cameraman acted as a commentator and an interviewer. Based on the field observations and group discussions, videos with commentators were liked most. Commentary helped to understand the context such as location, event and situation. Commentary was often used in the beginning for introducing the location, possible plans, the people present and the person behind the camera. Usually there was also an end speech, reporting again some context information and possible plans.

Sometimes speeches were pointed towards extended audience, and sometimes for certain participant who might be interested in some special information. Those kinds of private messages in public live videos enabled live video communication to function in multiple levels. One example of the targeted live video communication was a situation where a member of one sub group decided to move to another sub group after dinner. Groups shared videos which included information about locations, group composition, cues telling where is “the place for the best party” and navigation information. Videos for extended audience were mostly group greetings and fun making. There were guesses about different weather in cities and mentioning audience members by name. Because of the revealing characteristics of video format, basically all videos, even the “only for entertainment” ones included some information which the others could utilize. One participant mentioned his favorite video being the one from the lobby bar because that way he saw who were there and he decided to join. The video was not mentioned in that purpose specifically but as greetings for the audience not participating to a trip. This result suggests that single live video functions in many communication levels as well as in context sharing.

Video messages were one-directional but sometimes one of the group members sent and one received video, which made it possible to have two-directional video communication, with 2 devices. If many streams were running at the same time, many devices were used in group to follow them all. About 15 seconds delay in starting live video caused some communicational problems. That and delays in group message deliveries is one reason why it was not always clear if there were audience already or anymore. Most of the videos had a fun, comic mood, with any content and context. This resulted from the short use period, leisure characteristics of the trip and excitement for new thing. Even though knowing the audience is important, the action of recording in group situation has a certain value, in shaping the group dynamics [see also 4] which in some situations lowers the influence of the audience.

The experiment results confirmed our initial hypotheses of popular and unpopular contexts for mobile live video communication. Out of 33 saved live videos, 10 were taken outdoors (park, beach, street), 6 at bar, 5 at airport, 3 at museum, 2 at hotel, 2 at bus and one at office while leaving to trip (Because the experiment was made on a trip, home and work locations were not included). Outdoor videos were often recorded on move, which gives an intense first person view feeling. Indoor videos are more static, moving the camera, not the cameraman. Quality is better in most static ones. On move videos are ad-hoc, lasting usually longer, showing mostly walking and talking group, and showing and commenting the surroundings. Indoor videos are often concentrating on interviews, greetings and showing people, special events such as music gigs and museums or bar conversations and joking.

Questionnaire results showed that the most popular context for following live video was the bar (9). 3 participants considered vehicles as the best environment, 2 wanted to see videos anytime and 2 requested a place where they can hear the audio

well. The popularity of the bar environment for video communication arises from the fact that there people usually want to show where they are, know where the others are and what are the most popular places. That helps e.g. in planning the continuation of the evening. Other reason is the leisure time and relaxed feeling. One difficult thing in bar environment was considered to be hearing audio. On the other hand privacy concerns caused by public audio communication are bigger in places with less noise.

Live video was commented to be fun addition to group communication during the trip. With less technical problems it would have been used even more. Many fun moments were experienced during sending and following the videos in group and talking about them afterwards. There were even some “legendary” videos (such as a girl surprisingly appearing from below the bar table) which many of the group members may remember for a long time.

Group SMS Notifications on Upcoming Live Videos. Participants sent a group SMS before starting to broadcast live video. Messages were sent 20 times. This means that messages were not sent each time live video was sent and also it happened that streaming was not working at first attempt and needed to start again so there was no need to send new info message because timeframe was so small between attempts.

The following notification messages were sent (links to personal ComVu web pages are here replaced with “[link]”): “See my video feed NOW at [link]”, “At Temple bar: [link] “Comvu(name): [link]”, “Yo! Go now to [link] if interested seeing entertaining live video by (name)!””, “Guinness fifo queue: [link]”, “Live from Guinness stockhouse: [link]”, “[link]”, “Live stream from above the rooftops of dublin. Guinness gravity bar: [link]”, “Video stream coming soon: [link]”, “Feel the boogie. Live jazzy blues music: [link]”, “Yo! Go now to [link] if interested seeing entertaining live video by (name)!”. The notification messages show that participants either used a general message just to share the time and web address of their live video or defined more specifically the intended content or location. The fastest way to send an alarm message and video was to use ready-made default notification message. Default messages were used in sudden situations, while specific ones were for static or planned situations.

Feedback from Live Video Audience. Although live videos were one-directional, interaction happened anyway. It seemed to be natural to answer to the live video with sms. Text messages were received from the participants in Dublin as well as extended audience from around the world. Freely translated SMS feedback messages were such as: ”Showing well :)”, “Rainy here, I would rather be there in Dublin... Have fun!””, ”I guess we were late from the broadcast” “Do you have a fan club? I’ll join”. Text feedback was considered very important, giving a feeling of interaction and proves that someone was really following the videos. Simply getting feedback was more important than actual message content.

4.2 Roles as Cameramen, Audience and Targets

The attitude towards video capturing and the part the user likes to act is personal. This experiment proved the assumptions that some people like to be recorded and flirt to

camera while others rather disappear from the scene. There are also persons who ignore recording. In this experiment 7 participants liked and 5 didn't like when they noticed being captured on live video. 5 persons ignored being on video and 2 persons commented that they hoped not to say anything stupid when they are on live video. Some people are willing to watch the videos, while others are not so interested in following videos; same applies to recording videos. Ongoing era of social software gives possibilities for showing up as well as spying. There were sympathizers for both these viewpoints in the group of participants.

In the future 8 of the participants would like to follow videos by familiar people (friends, family, peers or traveling company), 5 of the participants by people with common interests, 5 by anyone, 3 by celebrities and one by professionals. 12 participants would like to share the live videos with familiar people (friends, family or colleagues), 6 with everyone and 2 would not like to share them at all. Participants would like to use live video for example for greetings, events, parties, travel and unexpected or exiting situations. Results suggest that video communication between familiar people is most popular but there are also persons who like to have wider audience as well as see live events from around the world, not depending on the recorder, but the content or time.

4.3 Live vs. Delayed and Sending vs. Following Live Videos

15 of the group members liked more following live videos than send them while 8 liked sending more. When we asked about following live vs. delayed videos, 16 answered to prefer following live videos and 5 watching videos later. Asking same live vs. delayed question regarding sending the videos, 13 answered to prefer sending live videos while 5 prefer sharing videos later. Some participants didn't have a clear opinion. The participants didn't put as much requirements for live video as for delayed. Live video has an important ability to give information about what and where is happening "right now", and future plans, while delayed videos should contain interesting content and/or good technical quality to be useful. Based on the study we notice that live video is mostly context oriented while stored, delayed video is focusing more on content. Delayed videos were automatically stored to public web page, while live videos by default were visible to audience only real time. One characteristic of delayed video is the possibility for the cameraman to see the video. Communicatively interesting thing is that seeing videos during group discussion after the trip, made it easier to recall the event and discuss afterwards. Watching the videos later caused some fun moments to the "owner" sub groups but others had some lack of interest in following them. Some discussion about the locations and activities happened, for example from the places which not all sub groups visited (such as coast) and from the places which many groups visited different time (such as park).

4.4 Technology and Communicational Problems

Technology problems were mostly caused by immaturity of the technology. There were also difficulties in installing and signing in to software. Lack of field and high

battery consumption caused problems too. Also audio and video quality was complained, but accepted because of the mobile nature of the experiment. Usability problems were ones connected to communicational issues and multitasking. Combining video communication to sms and call was problematic. That was caused on the fact that one directional video took the device for its own use. Form factor of the device caused problems in multitasking, one proof being black videos, recorded with camera lens protector on. Moving between messaging, phone and live video applications caused some usability and user interface problems. Location and context of the other group members was only received via sms, mms, call and live videos.

5 Discussion

Our study in Dublin was just a small scale experiment, but it gave assumption that mobile live video communication has potential for future social media and it will also create new design challenges. This experiment lasted two days so we can't draw any conclusions how the video communication behavior would have developed during the longer period, but experiment results suggest that live video communication brings new level to everyday group communication. Earlier research tells that during longer use-period, targets in many situations start to ignore being captured to one-directional video [see also 4]. We don't have proves yet, but in two-directional leisure time video communication, camera may be ignored as a technology, but considered as a telepresence bridge between places.

Audience has an effect on cameraman as well as on target and audience. For cameraman and target it is important to know the audience to have a feeling of privacy. Most important thing seems to be to know if there is any watcher or not, but the more defined the audience is, the better feeling of privacy is reached. Because audience has an effect, what does it mean if sender or target does not know who watches? This is an important question which raises from open nature of the internet and social media. From audience's viewpoint, it's important to know whether the video is specifically targeted for someone.

There are usually "passers-by" captured to the video, unintended but as part of context. Restrictions for recording in public places vary in different countries, but typically it is not prohibited to record normal everyday life if intentions are not bad against certain people. There are no clear laws for this but it is clear that in some cases these unintended recordings and consequences of that may be unwanted for the captured passer-by. Tapes of the public surveillance cameras are kept strictly confidential if no special reason to use them, but mobile phone video recordings made by citizens on public spaces have no such protections, anyone can post them live or delayed. Ambivalent mobile video sharing has made this privacy thread very real [See also 2 and 4]. Although there are privacy threads, this is not necessarily bad or good thing; it is just a big change in society, we are facing. This is challenge for designers of the devices and services but it is also a challenge for citizens in this new situation. Study participants wanted to share both unexpected and planned situations, and mobile phone video camera made those both possible.

Many technical issues will probably be cured almost automatically during time but certain problems such as communicational issues (such as multitasking with devices) and battery consumption need some problem solving. Battery consumption of live video will not change easily but the mobile phone video should be available in every situation, without charging possibilities. Multitasking such as simultaneous sending and following video and using other communication features of the device at the same time needs solutions in the areas of hardware, software and user interface.

We found out that although experimented live videos were one-directional, communication was two-directional. To create a wanted interaction state, various communication methods, not only video, were used. There is certain need for two way communication, be it video, audio, text or something else or any combinations of those. Even though the participants were familiar with technology, usability problems were found. If masses of people will in the future use mobile live video for group communication in work and leisure, many usability challenges will arise. Live videos are good for communication and context awareness while delayed videos are used more for sharing content. That's the reason why users set less quality requirements for live than non-real time video content. Because of quality and instant characteristics of live video, re-watching it was considered quite boring. Participants liked commentary in live videos because it helped understanding context. Participants would like to use live video mainly with familiar people for sharing greetings, events and special situations, but possible use cases were not limited to those. There are interested people for all roles in live video communication. Study suggests that live video on mobile context gives new possibilities for group communication and future social media environment; most of the experiment participants want to share and follow live video in the future. There is still lot of work ahead to make it happen in large scale and design good system for various communication needs. Live video is not only beneficial for business conference calls and calls between two persons but also for fun leisure time group communication in mobile context.

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