

Connecting Remote Educational spAces with mediaTed PresenceE (CREATE)

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Abstract

In this article, we explore the methodological aspects for the longitudinal evaluation of a mass communication system that brings together a physically distributed educational community. There is a significant body of related research, but no integrated approach. In the 70's and 80's, early video-art installations have explored the links between television, architectural space and community identity. During the 90's and onwards, the artistic inspiration has caught on with research labs, which developed several distant communication systems. Nevertheless, previous academic research has not been evaluated with casual users in public spaces for prolonged periods of time. As a matter of fact, the most interesting effects of distance communication systems on everyday life, such as community identity, community awareness, and civic participation have not been documented. We plan to deploy an ambient and social interactive TV platform that supports social communication in a positive way. In particular, we describe materials, tools and techniques for a systematic longitudinal evaluation of the social effects of the media communication system on an educational setting. Furthermore, we frame this research program in the wider context of media and architecture academic enquiry.

1 Introduction

In this research program, we examine how the shared experience of mass communication could be extended with collaborative interactivity and user generated content that connects everyday life across physically distributed ('diasporic') communities. The disciplinary scope of this research program concerns interaction design in computer mediated mass communication and includes some novel technological aspects. Besides technology integration, the research program puts particular emphasis on a longitudinal study that will investigate the social effects of locative media in an educational setting.

Previous research on the impact of Information and Communication Technology (ICT) in education settings has focused on the learning process itself (e.g., if and how learning is improved through computers and networks). In the proposed research program, we regard a complementary to the learning process issue that has been motivated by the growth of distance education programs and by the strong interest of the European Commission in

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cultural exchange programs within educational settings.^{1 2 3 4} In brief, we aim to study whether ICT could be employed in public physical settings in a transparent way and whether ICT could have a positive effect on social awareness aspects of the above cultural exchange programs.

In particular, there are no current research findings that inform the *design of ICT* to support distant cooperation and cultural exchange activities *during off-line periods*. For, example students perform an *overhead of on-line learning activities through ICT* (e.g., *email, forums, content sharing*), which might be sometimes *unrelated to the actual purpose of cultural exchange* (which is regarded to be an off-line activity in the face of e-learning ICT tools). Moreover, everyday school life has also an *informal social component* that takes place in public spaces (such as cafeteria). Finally, *school settings could be distributed* and very remote, especially in the case of primary and secondary education. Therefore, there is a potential use of ICT in the casual social aspects of distance cooperation and cultural exchange programs in educational settings.

In order to provide support for remote and casual social awareness, we aim to *augment the familiarity and accessibility of mass communication with subtle interactivity* (e.g. social presence visualizations) and user-generated content. Despite the criticism concerning the value of television (Putnam 2001) and mass communication, there are studies that reveal several worthwhile aspects, such as social communication. Indeed, media content is a shared experience and it is employed as a placeholder for interpersonal and group communication (Kubey and Csikszentmihalyi 1990). Although television has been implicitly assumed as a domestic technology, there are also several uses of media content in public space (McCarthy 2001.). Previous research has proposed several techniques that *employ sensor data and visualize remote social activity*, but there are no research results on the longitudinal effects of these visualizations. For this purpose, we aim to employ *user evaluation techniques to assess activity visualization techniques on distant community awareness during off-line periods*.

In terms of methodology, the proposed research program aims to make a contribution towards the understanding of the long-term effects of locative media (e.g., public shared displays and mobile personal terminals) on the casual social aspects of distance collaboration (e.g., current status of remote partner's work in joint project and highlighting of hot topics). For this purpose, we will employ *a longitudinal evaluation of the employed ICT*. In terms of measurement constructs, we aim to evaluate *whether 'social presence' is enhanced by the use of locative media*. Communication media differ in their degree of 'social presence' and this is one factor that molds interaction. Short

¹ European Schoolnet (EUN) provides major European education portals for teaching, learning and collaboration and leads the way in bringing about change in schooling through the use of new technology. <http://www.europeanschoolnet.org/ww/en/pub/eun/about/euninfo.htm>

² myEUROPE is a Web-based project which involves a network of more than 8000 schools. It aims to help teachers raise their pupils' awareness of what it means to be a young citizen in Europe <http://myeurope.eun.org>

³ In Classroom4EU students across Europe share opinions on two questions: What would you want other young Europeans to know about your country? And What do you think all young people in the EU should know about Europe? <http://classroom4.eu/>

⁴ ETwinning is a virtual meeting point for the exchange of information between schools <http://www.etwinning.net>

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(1976) defined social presence as the sense of awareness of the presence of an interaction partner in a mediated environment. Notably, social presence has been associated with enhanced online social interaction (Tu and McIsaac 2002). Therefore, it is expected that the proposed system might have positive effects to the core activities of distance collaboration (e.g., learning), although this is not the primary objective of the project.

In the context of casual support of social awareness in distant collaboration, ICT and Television hold the potential for a different model of sharing individual and collaborative experience; one that is subtle and transparent to other concurrent activities. In practical terms, we aim to investigate the interplay between large-scale shared displays and meshes of small-scale personal mobile terminals that could be collectively employed to produce, distribute and control media content. In general, we aim to explore how locative media enable new forms of social practice and contribute towards enhancing and perhaps expanding social encounters in everyday places, within an educational and distance collaboration context. For this purpose, we will explore the use of ambient video-links (e.g., a public display that is dynamically updated to reflect the status of distant partners), which support distant cultural exchange and learning activities. Indeed, the majority of the European educational organizations have been involved in human resources exchanges and joint projects that aim to promote mutual understanding and long-term cooperation between the wide diversity of European cultures (for example the Erasmus and the Comenius programs by the European Commission). *Although ICT has been widely employed as collaboration 'tool,' for learning, the value of advanced ICT as 'medium' of continuous and subtle social presence and awareness has been neglected so far.*

2 Definitions and scope of this work

Among the broad research directions in this interdisciplinary field, there have been some interesting findings that frame the motivations of the current research program. Adams (1992) studied the phenomenon that TV is described by people and considered by the media researchers as a physical place. On the other hand, Reeves and Naas (1996) have explored extensively human reaction to mediated experiences. Wildman (2001) traces the historical impact of communication technologies (radio, TV, telephone) to the design of the homes and reports that each of these technologies, slowly, yet boldly, transformed the design of domestic space. In addition, media researchers found that the design of the domestic space has an influence on the way people watch TV (Pardun and Krugman 1994). Although TV is implicitly assumed as a domestic technology, there are also several uses of TV in public space (McCarthy 2001). Furthermore, the closer integration of powerful communication mediums, such as TV, in the fabric of the social and build space is of central important to the future of human-computer interaction (Dourish 2002). In this context, Ambient ITV is defined as a rich audiovisual user experience that spans physical places (private, public) and devices (TV, mobile, public display).

The concepts of 'media' and 'architecture' have been treated by so many different

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researchers and disciplines and it turns out that very common terminology such as media-architecture or media and the city have ambiguous meanings. Still, it is possible to distinguish between few main directions of academic research, which we describe next. For the sake of simplicity, we refer to all the above terms with 'mediacity.' Although some existing works might possess aspects of more than one of the following categories, we find that most of them sit comfortably within that taxonomy:

1. **Mediacity as immersion in a virtual environment:** Inspired by early science fiction literature and technological determinism it refers to virtual worlds, such as online multiple-player games (e.g. Second Life, World of Warcraft, etc).
2. **Mediacity as analysis of architectural representations in media content:** Based on the media studies methodologies for content analysis it refers to the exploration of the ways buildings and cities are represented on media, such as film, photography. Since architectural creations hold symbolic meaning then media studies provides a suitable methodology to analyze past and present forms.
3. **Mediacity as a design and representation tool:** Building upon the success of early Computer Aided Design (CAD) tools researchers have been exploring the use of novel media technologies (e.g. smart video projectors, augmented reality systems) in the design process. The main benefit is that new tools will bring shape to new forms.
4. **Mediacity as mixed reality environment:** Driven by wide adoption of place based multimedia computers (e.g. mobile phones, phone cameras, large-scale screens), and the pervasiveness of geographic information systems (e.g. car navigation) researchers have been studying the impact of those media technologies on the understanding of physical space. Since new media technologies are employed during everyday life, then the responses and behavior of users changes according to those tools.

In the context of this research we are mostly concerned with the latter definition of mediacity. Moreover, we attempt to move one step forward towards the consideration of mediacity as a communication medium instead of mere tool.

3 Related work

In this research program, we will explore if and how the connectivity of distant communities could be reinforced through locative mass media communication (O'Hara et al. 2004), which support shared experiences, such as content sharing and collaborative interaction. Locative media offer new ways of combining the emerging ubiquitous nature of digital technologies with the significant qualities of physical environments. Like dwellings or fireplaces, locative media could promote social interaction and become a placeholder for shared experiences. Although video has not been very successful in distant personal or group communication (Finn 1997), it has several worthwhile qualities. Indeed, according to Fish et al. (1990): "The history of video as a communications technology has been a mixed one, showing great successes as a method of broadcasting entertainment, a mixed record as a method of educational distribution, and a dismal record as a mechanism for interpersonal communication."

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3.1 Art and telepresence

In the past, there have been several artistic works that explored the connectedness of places. For example, Hole-in-space was a public communication sculpture. It connected an art exhibition center in New York City with a department store located in an open-air mall at the west coast. The visitors of the two places had a surprising encounter with each other. Passers-by could see, hear, and speak with each other as if encountering each other on the same sidewalk⁵. Very similar artistic work has been performed recently under the name Hole-in-earth⁶, based on internet and computer technology, instead of video links. Indeed, telepresence is a favorite theme between artists and there has been a major contemporary video link and installation connecting New York and London⁷.

What is common between the above works is that participants had a surprising counter with each other. Suddenly head-to-toe, life-sized, television images of the people on the opposite coast appeared. They could now see, hear, and speak with each other as if encountering each other on the same sidewalk. No signs, sponsor logos, or credits were posted -- no explanation at all was offered. No self-view video monitors to distract from the phenomena of this life-size encounter. Self-view video monitors would have degraded the situation into a self-conscience videoconference

3.2 Human-Computer Interaction and video mediated communication

Besides artistic exploration that did not provide any formal evaluation of the concept, previous works in Computer Supported Cooperative Work (CSCW) and video-conferencing have been installed in researchers' offices, or student dormitories and have been used to link distant offices of the same organization (Jancke et al. 2001). Researchers have investigated technical feasibility and user acceptance about whether collocated face-to-face meetings could be replicated with video portals that connect remote places. Moreover, researchers have developed computer based tools that support meetings that take place over a distance or over different time-zones (Adams et al. 1999). They reported on several issues, such as the privacy concerns of users and the awkwardness of initiating conversations (Bly et al. 1993). Although video conferencing increases social presence, it also increases privacy concerns (Boyle and Greenberg 2005). Thus, there is increased reluctance to employ real-time video conferencing as a means of interpersonal communication. As a remedy, *we propose the evaluation of a transparent and subtle ambient television system that creates video feeds based on local data, but broadcasts feeds based on abstract visualizations of those data*. For example, the presence of many people as captured by a local camera, might be visualized as a particular color at a remote place, depending on remote activity and preferences as well.

⁵ Galloway, K. and Rabinowitz, S. (1980). Hole-In-Space. <http://www.ecafe.com/getty/HIS>

⁶ Hole in the Earth: a digital installation in public space - by Maki Ueda <http://www.ueda.nl/earth/index.html>

⁷ The telectroscope was the first prototype television system. The term was also used in the 19th century to describe imaginary systems of distant seeing. Most recently, the term has been used for the name of a piece of installation art with a visual high speed broadband[1] link between London and New York City constructed by Paul St George in May 2008.

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Notable examples of related research includes the work performed at Xerox PARC (early 90's), which was followed up by MIT Media Lab (Karahalios and Donath 2004) and Georgia Institute of Technology. *The majority of previous efforts have been focused in the office environment and they have not formally evaluated the effects on behavior and attitudes over a long period of time (e.g., for more than six months).* With regard to the education context, the most relevant work has considered the collaboration between teachers who are geographically distributed (Groth et al. 2005). *Although, there is a large body of research that treats ICT applications in distance education⁸, there is no work on the casual aspects of education and on the longitudinal evaluation of ICT that supports social awareness in an educational context.* For example, most of the EC-funded cultural exchange and student collaboration programs employ standard ICT, such as email, chat rooms, forums, and file sharing to support projects' activities. Indeed, 'tool' approaches to ICT have not been very successful in enhancing distant work (Olson and Olson 2000). Could the casual (off-line) aspects of distant collaboration hold some opportunity for enhancing the social aspects of ICT?

3.3 Some research issues in collaborative and situated communication design

There is a research opportunity in the analysis of ICT that supports casual aspects of learning and that is employed in a distance education context. By "casual aspects of learning" we refer to activities that do not support directly the learning process, but which might provide opportunities and motivation for the main learning activities (e.g. the knowledge that remote students are currently very active on a joint project might motivate local students to join them). Besides established interfaces from previous research, *we aim to contribute to visualization techniques* with one or more of the following concepts: 1) how media content schedule (e.g. who controls the flow) affects the sense of time in public space (Lynch 1972)? 2) what types of user interfaces (e.g. mobile phone) facilitate and promote group interaction in locative media (Paek et al. 2004)? 3) what type of visual language (e.g., TV, desktop metaphor) is suitable for the display of public information?

For example, Acker (1999) outlined a key aspect of the interactive possibilities new technologies have unleashed. He identifies the "merging" of space and time and the complicated consequences of our new existence in multiple places simultaneously. It would be interesting to *evaluate the effects on education activities of a video-awareness system that is based on mass communication (Mazur 2000) instead of interpersonal communication.* In general, the most interesting effects of distance communication systems on everyday life, such as community identity, community awareness, and civic participation have not been documented.

In terms of methodology there are several research issues that have to be addressed. Traditionally, we have been designing and measuring the performance of new ICT in the

⁸ For example, there are more than 200 citations for one of the early articles on ICT and distance education: Dede, C. Merging technologies and distributed learning. *The American Journal of Distance Education*. 10(2), 4-36. 1996.

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face of usability. Today the context of the digital task has extended beyond the desktop to world of work, play, travel, and dwelling. Thus, the role of computing has changed. Information technology has become ambient social infrastructure. This allies it with architecture. The disciplines of architecture and interaction design both address how contexts shape actions. Architecture frames intentions. Interactivity, at its very roots, connects those mental states to available opportunities for participation.

The need to connect architecture and interaction design comes from overlapping subject matters and escalating social consequences. The two disciplines converge on the design of operable inhabitable systems. The path toward connection involves a shift from foreground objects to background experiences. These processes are ambient. Their benefits are to be found in the quiet periphery, and not in the seductive objects of attention (McCullough 2004).

3.4 Significance of the research program

In terms of scientific disciplines, universal access in the information society, diffusion of broadband multimedia applications, and the assessment of the social impact of information and communication technology (ICT) on everyday life are primary objectives in the Community's research framework. In addition, the employment of ICT in the context of learning and cultural exchange is a priority for European Commission.

The ultimate research question behind this research program concerns cultural aspects of the viability of distant communities and whether technological support could make remote everyday life as engaging as life in the urban or centralized areas. For example, in Greece, the main motivation for distributing universities over remote places and islands was to support local development and avoid the shrinkage of the population (Oswalt and Rieniets 2006) on the islands. The latter is a very worthwhile objective in Greece, where half the population lives in the greater Athens (capital) area. Could situated communication technologies, when guided by a user centered interaction design approach (McCullough 2004) overcome the distance barrier between distant partnerships?

For the above reasons, the proposed interactive video installation will be designed and evaluated with user-centered methods (e.g., cultural probes, ethnographic observation, usability tests in the lab, longitudinal survey) that ensure easy access to many people regardless of abilities and expertise. Moreover, the proposed system is based rather on television concepts and ambient user interfaces (e.g., mobile phone, presence, gesture, etc) rather than traditional personal computer interaction modalities, which require either high skills or high effort to use (e.g. mouse, keyboard, operating system).

Moreover, the system will employ broadband multimedia technologies as the main means of communication between system-user and between users from remote sites. The use of broadband multimedia in a public system is expected to be a showcase of the usefulness of the respective technology to the students and the local community in general. We expect to establish awareness of the benefits of broadband multimedia, connectivity and

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increase the positive attitudes and adoption of information technology and in particular with regard to everyday aspects of social life.

The proposed case study on student co-operation programs in secondary education schools could provide original findings, because there are no similar efforts. Besides the foreseen benefits for the local community, the outcomes of this research could have wide applicability in similar community establishments that take place over a distance (e.g. commercial or governmental organizations). Therefore, the findings of this case study could be consolidated with those from other similar regions of the EU (Groth et al. 2005). Finally, there are several benefits for the eTwinning program, which considers ICT mostly as a tool. The novel approach of the research program could promote the awareness of situated ICT as a complementary communication medium, as well.

4 Research methodology

Due to the multidisciplinary aspects (e.g., novel technology, social aspects of ICT, physical space considerations) of the research program, we employ a broad set of methodological elements. The overall approach is user-centered, where the user is regarded to have many roles, such as casual passer-by, author of content, or employee in an organization. There are many concepts, artistic works, ICT systems that concern the issue of distance communication and physical space. Nevertheless, *previous related efforts have been temporarily installed, or they have been only informally evaluated*. In contrast, in the proposed research program most of the effort will be focused on the *design, data collection, analysis and publication of a longitudinal study* on the social effects that situated technologies have on diasporic communities, with particular consideration to educational settings.

4.1 Understanding distant education

Before the longitudinal study, there will be a system design and integration phase. We are going to seek potential secondary education schools that wish to participate in this study⁹. In this period, we aim to create enthusiasm and *gather user requirements, based on an ethnographic study of a remote collaboration session between two schools*. The ethnographic study will be performed by the use of cultural probes, which are considered to be a 'lightweight' and non-intrusive user requirements collection method (Gaver et al. 1999). Cultural probes data will be analyzed and visualized with affinity diagrams (Beyer and Holtzblatt 1999). In addition, we aim to *establish a set of benchmarks with regard to the measurement constructs*. For this purpose, we will introduce the concept of 'ICT in communication' and evaluate the social awareness and participation attitudes towards the current 'on-line' ICT tools, which the classroom employs for distant collaboration.

⁹ Several local secondary education schools that are active in the eTwinning EC program have been already identified and will be invited to participate. It will be also interesting to consider the participation of additional schools that have not been as proactive as the former in the adoption of ICT tools provided by the EC eLearning programs.

4.2 Learning by sharing experiences

We plan to deploy an ambient and social interactive TV platform (hardware, software, physical installation, content)¹⁰ that supports shared experiences in a positive way. The system will consist of shared screens (e.g., TVs in public space) and several *physical and virtual* sensors. By physical sensors we refer to Bluetooth receivers, video cameras and microphones that monitor the activity in a physical place. By virtual sensors, we refer to software interfaces that collect predetermined school-project data (e.g., forum discussions, exchange of media content), which they remotely visualize in an abstract way (e.g., active discussion threads could be highlighted and exchange of audiovisual files such as photos and videos run in the televised background of the shared screens).¹¹ There are several low-cost ways to mix broadcast video and internet data in real-time, such as the ybox.¹²

4.3 Subjects and materials

We will develop and test the preferred types of media content and interfaces that are going to be displayed on the system screens and perform a pilot study. The pilot-study will involve two Greek schools, which reside in remote places (e.g. on an island and on the mountains in the mainland), in order to troubleshoot technical and methodological aspects of this study before actual deployment to a remote school in a different country. In this way, we “bullet-proof” the technological aspects (e.g., robustness, acceptance, usability) of the system and pilot the longitudinal data collection tools and data analysis procedures. The same schools¹³ that participated in the pilot study will be considered for the longitudinal study in order to assess the differences between the proposed solution and traditional use of ICT. In the actual study, each one of the two local schools will be linked to one remote school¹⁴ that resides in a different EU country and they will be asked to perform their eTwinning project of preference.

4.4 Data collection instruments

Data collection will be based on the same cultural probes, data logs from the system's sensors and will be guided by the ‘social presence’ approach and instruments. The social presence approach is the groundwork for many theories on new medium effects. The idea

¹⁰ The technological platform will not be an end in itself, but a means to an end. The main objective is to evaluate technological support for human-connectedness in a diasporic community. For this reason, the deployed system will be based on integration and adaptation of existing components from related research efforts, which are described in the implementation section of this document.

¹¹ Due to privacy concerns there is no real-time video transmission between the nodes of the system. Video cameras are employed as means of user interaction with the situated systems. The system transmits visually abstract compound video feeds (for detailed info please refer to the related projects links at the implementation section) of aggregate activity data.

¹² The Ybox is an open hardware and software spec for an IP-enabled set-top box in a candy tin. <http://ybox.tv>

¹³ In the unfortunate case that a school drops out of the actual study, we will administer the benchmarking study again to a new school that is going to participate in the longitudinal study.

¹⁴ By having two pairs of schools during the lifetime of the study we expect to reduce the risk of drop-outs and increase the likelihood of extra statistical analysis, such as between-groups

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is that a medium's social effects are principally caused by the degree of social presence, which it affords to its users. Social presence, or the 'sense of being together', is quite distinct from physical presence, or the sense of 'being there' in a mediated environment. One popular subjective method for measuring social presence is Ogood's et al. (1957) semantic differential technique. There are also studies that articulate the construct of social presence and develop a social presence questionnaire for examining on-line collaborative learning (Tu and McIsaac 2002). Moreover, there are several other enhancement and additions to the original instrument, which are going to be considered before the pilot phase.

5 Implementation

5.1 Subjects

With regard to the case study (secondary education schools), the eTwinning project includes among other wide-ranging themes a thematic topic on 'ICT in communication.'¹⁵ On that topic, students are motivated to think about the attributes of different communication mediums. We will collaborate with schools and teachers in order to introduce the topic of 'ICT in communication' as a prelude to the actual longitudinal study and as an opportunity to benchmark students' attitudes towards the current set of ICT tools. Students will be involved in the consideration of the human aspect of telecommunication technologies and they will be asked to fill in the respective questionnaires, which will form the basis for the benchmarking of the rest of the proposed research program.

5.2 Hardware

In terms of technology, we are going to consider several sensor/input devices, such as cameras, microphones, WiFi, RFID, and Bluetooth. There are several manufacturers and distributors of controllers and sensors, such as Arduino¹⁶, Phidgets¹⁷, and MakingThings¹⁸. In addition, we aim to build the prototype system with low-cost commodity personal computers: a cluster of PCs, PC graphics accelerators, consumer video and sound equipment, and portable flat-screen TVs. This approach has the advantages of low cost, as high-volume commodity components typically have better price-performance ratios and improve at faster rates than special-purpose hardware (Li et

¹⁵ Etwinning suggested theme on "ICT in communication."

http://www.etwinning.net/ww/en/pub/etwinning/ideas_and_practice/project_kits/ict/ict_for_communication.htm

¹⁶ Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. <http://www.arduino.cc>

¹⁷ Phidgets are a set of "plug and play" building blocks for low cost USB sensing and control from your PC. All the USB complexity is taken care of by our robust API. Applications can be developed quickly in .NET, Visual Basic, VBA (Microsoft Access and Excel), LabView, Java, Delphi, C, C++ and Python. <http://www.phidgets.com>

¹⁸ MakingThings provides software and electronics tools for people creating projects that interact with the physical world. <http://www.makingthings.com>

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al. 2000). Moreover, portable terminals (e.g. multimedia mobile phones) will be employed as a means to record, distribute and control content.

5.3 Interaction design

In terms of content and user interaction, we plan to employ and systematically evaluate in a realistic setting ideas from previous research during a long-term period. Donath et al. (1999) have designed graphical interfaces that reveal the social structure of the conversation by visualizing patterns such as bursts of activity, the arrival of new members, or the evolution of conversational topics. Techniques for the visualization of Threaded discussions have been also presented by Turner et al. (2005) and Donath et al. (1999). Moreover, there is previous work of distant photo-sharing application (de Greef Ijsselsteijn 2001). Finally, Mazur (2000) argues that Distributed Video Environments are essentially filmic media, and as such users of these distributed visual environments can capitalize on insights from the rich theoretic base of film theory and cinematic technique to engage meaningful interaction and support responsive communication (Mazur 2000). Additional interaction ideas will be considered on the basis of the early exploratory research. Finally, the majority of the content on the platform will be contributed by its users (teachers and students) during their respective educational activities.

5.4 Scenarios of use

History and common cultural roots: Two student groups (GroupGR and GroupIT) from schools in Greece (Corfu) and Italy (Venice) have been assigned the task to study history and in particular commercial exchanges and art production of the two respective cities during the past thousand years. Both groups commence their joint assignment by searching and retrieving texts, videos and photos from the public internet, which they store on the eTwinning platform. In addition, GroupIT uses mobile phone cams to take photos and capture videos of some buildings that have not been found online. Both groups use the authoring environment to upload the content to the CREATE TV distribution. Some members of GroupGR notice that the televised content contains pictures and videos of buildings that look familiar but do not belong to Corfu. After some extra background search they discover that the same Venetian architect constructed both during the same period. Now students are ready to build upon their exciting findings by preparing a joint presentation. They use the eTwinning platform to collaborate (chat, messages, exchange files) and keep track of the project progress. At the same time, the CREATE system is monitoring several of those activities through common web feeds (e.g. podcasts, blogs, etc) and automatically inserts overlays into the CREATE TV channel. Although Easter vacations are different in the two countries the absence of the distant partners goes more or less unnoticed because the CREATE TV station automatically schedules previously created content, as well as discussion threads. Thus, GroupIT has just returned from Easter vacations and they discover that their distant partners had good progress. During the next couple of weeks they feel that their project partners are working together thanks to a long record of televised activities.

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5.5 Software architecture

The driving conceptual model of the system operation builds upon the familiarity and the usability of television. Just like traditional broadcast TV the screens of the system remain always-on and broadcast the same audiovisual content, thus creating a shared experience. In contrast to the hierarchical and professional production model of traditional TV the CREATE system is based on distributed end-user production and enhancement of audiovisual content, just like YouTube. The scheduling of content on TV screens is decided by 1) the decisions of an editorial team, and 2) automatic analysis of existing content, such as popularity, comments. In addition to audiovisual content, the conceptual model of the CREATE system supports video overlays, which are created automatically by analyzing the data and the activities in existing eTwinning ICT tools. Finally, users provide real-time input to the system by portable devices, such as mobile phones.

There are few basic components in the software architecture of the CREATE system:

1. The *content authoring* environment allows users to schedule particular content into the broadcast. It also allows the users to define the automatic schedule parameters (e.g. popular content, or highly rated content).
2. The *content distribution* system stores and displays content between the project partners. It also manages multiple TV channels and content feeds.
3. The *content control* system provides several input interfaces that allow users to upload, edit, and control the presentation of the content on the screens.
4. The *content bridge* system takes care of the content exchange interfaces between the CREATE system and other existing systems, such as the eTwinning platform, mobile phones, etc.

6 Further research

The exact system components, the functionality, and the media interfaces that are going to be displayed on the system depend very much on the findings of the exploratory study at the beginning of the project. In particular, several interaction concept (Chorianopoulos 2007) will be explored before selecting the few that are going to be empirically tested in the field. Nevertheless, there will be a strong emphasis on the most natural input and output devices, such as mobile phones, touch-screens and big shared displays. The social aspects of the prototype will be evaluated with casual users along twelve months (the first three months will be a pilot-test of the technology and the data collection instruments) with a longitudinal toolset, as described in related studies of ICT adoption and use (Kraut et al. 2002). Additional data collection instruments include data logging in computers and interviews. The data collection and analysis will be performed continuously along the time span of twelve months, in order to record the temporal effects on the educational community. The analysis of the data will focus on the differences between the

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benchmarking results and those achieved during the different phases of the system operation. Moreover, the analysis will seek differences due to age, gender, culture, socioeconomic background, as well as differences of attitudes towards the alternative modalities of the interactive video installations (e.g., text versus abstract video representations).

In terms of scientific contribution, universal access and in particular accessibility research has been focused on the design and evaluation of information technology that considers the needs of people with (mental or physical) disabilities. While this is a very worthwhile effort, most of the researchers have ignored the situations where “healthy” people are temporally “handicapped” (e.g. driving and using in-car entertainment, or informatics and telematics systems). On the side of architecture and place, there are many people that are living in the suburbs and they are either too young or too old to drive, or just unwilling to travel frequently. Living aside the very interesting theme of “car as place” and by making an analogy with the “handicapped in-situ” people, these people are “confined” in physical space. Thus, we are elaborating on the research question: how information and communication technology could be used to enhance the sense of community in-place for people who live remotely or are not willing to travel regularly?

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