

TOWARDS A THEORETICAL MODEL OF COMMUNICATION VIA LOCATIVE MEDIA USE

Charalampos Rizopoulos¹, Dimitris Charitos², Dimitris Koutsompolis³, Nikos Kaimakamis⁴

New Technologies Laboratory in Education, Communication and the Mass media
Department of Communication and Media Studies
National and Kapodistrian University of Athens
5 Stadiou str., 105 62 Athens, Greece

¹c_rizopoulos@media.uoa.gr, ²vedesign@otenet.gr, ³dkouts@media.uoa.gr, ⁴nikaimakam@yahoo.com

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Abstract

This paper proposes a communication model that aims to describe and explain computer-mediated communication via locative media. The proposed model takes into account elements of theories of communication and media studies, Activity Theory, as well as Castells' concept of the space of flows and the ecological approach to visual perception.

1 Introduction

The convergence of information and communication technologies (ICTs) with geographical positioning systems (GPS), has led to the development of systems that constantly and dynamically update their output according to the users' location. More specifically, since 2003, the idea of associating mobile computing, wireless networks, and digital media with real locations, through the use of location-detection technologies, has resulted in the concept of *Locative Media* [15]. Locative media are systems of technologically mediated interpersonal and group communication that allow for the augmentation of traditional urban environments with features and content accessible through the use of location-aware systems.

In this manner, geographical location is reintroduced as an important parameter of human-computer interaction within computer generated (or enhanced) environments supporting computer-mediated communication. In the case of mobile locative media, the information space within which mediated communication occurs is mapped onto physical space, which is inhabited by the physical bodies of communicating individuals, resulting in a hybrid environmental experience that also affords the possibility of face-to-face interaction. Indeed, by allowing face-to-face interaction to occur, these media bring back the "compulsion of proximity" [1] into computer-mediated communication.

Additionally, locative media may be regarded as systems of situated, context-aware communication. In the case of the Internet as a medium and a context within which information and symbolic content is communicated, the

actual location of this information or the users' themselves is of little importance. Locative media, on the other hand, afford the possibility of relating a part of this content to physical locations, thus in a way *spatialising* the Internet. As a result, novel forms of mediated activities based on the user's location, as well as hitherto unforeseen possibilities for interaction, may emerge in which actual physical location is viewed as an important aspect.

Locative media may utilise the aforementioned technologies for the purpose of supporting communication and social interaction [5]. However, a review of current literature reveals that, from the point of view of communication and media studies, the study of multi-user locative media systems has not been given adequate attention. Consequently, the objective of this paper is to investigate the properties and characteristics of communication during locative media use. This paper proposes a communication model of locative media use that is based on existing models of communication (Newcombe's ABX model and the co-orientation approach) which are modified by incorporating selected elements from other theoretical frameworks that demonstrate a high degree of compatibility with these models and the characteristics of locative media use in general.

2 Aims and objectives of the LOCUNET project

LOCUNET (LOCation-based Urban NETwork) is a research project that aims to investigate the social dimension of locative media use in a modern urban setting. Emphasis is placed not on the technological developments that make possible the use of such media, but on studying the user's interaction with other users and groups of users (computer-mediated communication) and the system itself (human-computer interaction). It is expected that the resulting theoretical framework will inform the design, development, and evaluation of locative media aimed at supporting communication and social interaction by contributing towards the generation of relevant design guidelines.

The locative media system, which has been designed and is currently under development, will be used for the purpose of evaluating and updating the proposed model and

the comprehensive theoretical framework that is the main objective of the LOCUNET project. The system supports communication amongst mobile GPS-enabled devices and desktop computers. Both mobile and desktop users will participate in a structured game-like activity which will take place in the historical centre of Athens, Greece. This application will involve two competing teams, each consisting of both mobile and desktop users. From the participants' perspective, the objective of this game-like activity will be to capture a number of digital "objects", accessible only through the users' equipment and "scattered" throughout the selected area. The team that captures most of the objects will win the game. The digital objects can be picked up by users and transported to an area designated as team headquarters.

In addition to the objects, there is another type of accessible element called "info-pack". An info-pack is essentially a container of digital information. This information may be in the form of text, images, audio, or video. Info-packs cannot be picked up; however, users may generate info packs at any time during the activity. A number of pre-generated info-packs will also exist. These elements will have been created by the activity designers prior to the start of the activity.

3 Communication and locative media

In this section, existing communication theories and models are explored and discussed in order to propose a theoretical basis of a model which explains the activity of communication via locative media. Additionally, elements of theories that deal with communication flow, human activity, environmental perception and behaviour are also highlighted.

3.1 Types of media theory

The field of media theory is characterised by divergent perspectives. According to McQuail [11] (pp. 12-14), two types of variation are most commonly encountered. The first is the separation between media-centric and society-centric (or socio-centric) approaches. The former conceive of media as largely autonomous entities which initiate social change as a result of the unstoppable advances of communication technologies. The latter, on the other hand, posit that media are essentially a reflection of political and economic forces. Therefore, media theories are considered special applications of much broader social theories.

The second type of variation in media theory is between culturalist or materialist approaches, which favour cultural or material aspects of media respectively.

The interrelation of these two types of variation produces a taxonomy of media theories that consists of the following four categories:

1. *Media-culturalist* perspective, where emphasis is placed on media content and form and the subjective reception of messages as influenced by the receiver's personal physical and social environment.

2. *Media-materialist* perspective, which emphasises the technological, organisational, and financial aspects of media.
3. *Socio-culturalist* perspective, which emphasises social factors and their influence on media production and reception and the role and function of the media in social life.
4. *Socio-materialist* perspective, which construes media and their effects mainly as a reflection of political, economic, and material forces and conditions.

There are aspects of locative media use that fall in one or more of the aforementioned categories. For instance, access to and reception of media content is influenced by the user's location, i.e. the user's personal environment, which may or may not be identical to that of other users (a clearly media-culturalist view); a predominantly technologically oriented outlook of media content generation and reception would fall under the media-materialist category; the relationship between media content exchange and the wider social context in which it occurs could be seen as pertaining mainly to a socio-culturalist approach, whereas the ease of access to digital information may be considered a reflection of contemporary social, political, and economic conditions.

The model proposed in this paper will touch on all four categories, but will mostly emphasise social over technical aspects of locative media use. As such, it may be considered less relevant to the media-materialist perspective when compared to the other categories.

3.2 A basic categorisation of communication models

According to McQuail [11] (pp. 68-74), media use may be described by one or more of the following general models:

3.2.1 Transmission model

This model in effect summarises the historically dominant view of communication, namely the transmission of a fixed amount of information from a sender to a receiver, possibly entailing a process of selection on the part of the sender based on his/her knowledge and estimation of the receiver's interests. In general, the process is guided by the interests and demands of the receiver (or, in the case of mass communication, the audience). This model applies to media activities which are instructional, informational, or propagandistic in nature or purpose.

3.2.2 Ritual / expressive model

In contrast to the transmission model, which restricts communication to the acts of transmission and reception, this model views communication as ritualistic, directed towards the (potentially indefinite) preservation of existing society. Communication is associated with concepts such as sharing, participation, fellowship, and common faith. The goal is not to convey information, but to underline – and even reaffirm – shared beliefs. It is decorative rather than utilitarian; it is expressive, relying on shared emotions and understanding, and undertaken for the purpose of pleasure, irrespective of its usefulness in terms of material outcome (or lack thereof). Furthermore, it entails

an element of performance. The ritual / expressive model is related to art and entertainment.

3.2.3 Publicity model

This model views communication mainly as the attraction of attention. In advertising and mass media contexts, this is often synonymous with the generation of revenue. Here, the fact of attention is more important than its quality, and the way of attracting attention more important than actual content. Communication is competitive, as the amount of available attention on the part of the receiver is finite and often sought after by numerous media. Typically, the only temporal definition that really matters is the present.

3.2.4 Reception model

This is the model with the most profound differences to the transmission model and is based on the assumption that the message is not received and understood as originally sent. The message is open and polysemic, and meaning is generated and attributed depending on the receiver's context (physical, social, or cultural). Although messages are often given an intended meaning, receivers can discard it and interpret the messages according to their own experiences and contexts. This model underlines the fact that receivers do not passively accept whatever information is transmitted, but, in decoding the message, they rely on subjective factors such as past experiences and cultural values.

3.2.5 Introducing the four models to the context of locative media use

The transmission model provides a mechanistic description of the process of communicating via locative media. It may apply to purely or predominantly informational locative media applications, whether mobile or not.

The ritual / expressive model revolves around group activities in a ritualistic context and is important for the investigation of location-based activities which entail such a component, such as location-based games (of which ritual and performance are key aspects). In the case of LOCUNET, the scenario application is game-like in nature. Therefore, this model is relevant to our investigation of the communicational dimension of locative media.

The publicity model applies to locative media applications that aim at advertising; tying location to attention attraction may result in increased frequency of impulse buying (which translates to more revenue), as users will have easier access to products that may satisfy their needs (whether actual or perceived).

The reception model is of great importance to the theoretical investigation of locative media use, since the user is given a more active role in the process of communication. Locative media entail the reception or access of digital information depending on the users' actual position, but their pervasive, 'always on' nature is mitigated by subjective factors (the user's experience, mood, cultural values etc.) which may facilitate or hinder their use.

Users tend to prefer media they perceive as more efficient and convenient, i.e. media that can reach the intended au-

dience more quickly and with less effort [4]. Locative media may be considered efficient and convenient on account of the fact that, due to the convergence of ICTs, it is possible to access a variety of functions previously available only on desktop systems and/or specialised equipment (e.g. video and sound recording, Internet access, etc.). Furthermore, the reception and interpretation of a message will be influenced by both the social context and the physical environment. Additionally, the user can be both the sender and the receiver, and a mobile device is constantly within easy reach. Thus, using it can be less time-consuming, as it does not require the allocation of time solely for this purpose.

3.3 Communication patterns during locative media use

Like media that preceded them, locative media transform the pattern of communication flow from sender to receiver. According to Bordewijk & van Kaam [11] there are four basic patterns of information flow: *allocation*, *conversation and exchange*, *consultation*, and *registration*.

Allocation is the unidirectional flow of communication from a central source to a number of peripheral receivers simultaneously. Typical examples of this pattern include lectures, 'traditional' broadcast media (radio, TV), and concerts or performances. The place, time, and medium of communication are usually chosen by the sender.

Conversation and exchange refers to direct interaction between potentially networked individuals. The choice of partners, as well as space, time, and medium lies with the receivers, who essentially bypass the centre. Examples of conversation and exchange include communication by post, e-mail, or telephone. In certain cases, as the ones just mentioned, the process may involve an intermediary, who might not play an active role in the process of communication (e.g. service provider).

Consultation is an individual's enquiry for information at a central information store, such as a library or a database. Reading a newspaper may be considered consultation if the time and place of reading (as well as the articles read) are decided by the individual.

Registration may be viewed as the reverse of consultation. In this case, a centre obtains information from individuals at the periphery. Any means of information gathering that rely on surveillance fall under this category.

The four patterns described above may be interrelated in terms of two main variables: central vs. individual control of information, and central vs. individual control of time, place, and choice of the subject, as shown in table 1.

		Control of information store	
		Central	Individual
Control of time, place and choice of subject	Central	Allocation	Registration
	Individual	Consultation	Conversation

Table 1: The four patterns of communication [11] (pp. 147)

In general, new media (including locative media) have facilitated the move from allocation to consultation and conversation. However, locative media have reinforced registration, due to their ability to store information about the user's habits, which may subsequently be forwarded to interested parties (such as advertisers, government or law enforcement agencies, etc.).

3.4 A communication model of locative media use

Locative media may be regarded as an advanced form of convergent media, since they incorporate the 'three Cs': communications networks, computing/information technologies, and content [6]. As such, they may be used at virtually all levels of social communication (as proposed by McQuail in [11], p. 18). These levels are (in ascending order):

- Intrapersonal (e.g. processing information)
- Interpersonal (e.g. dyad, couple)
- Intergroup or association (e.g. group, local community)
- Institutional / organisational (e.g. political system, business firm)
- Society-wide (e.g. mass communication)

As such, an equally versatile approach is needed to form the basis of any communication model of locative media use. The 'co-orientation approach' [12], which is in turn based on Newcombe's ABX model, is deemed appropriate, as it focuses on interpersonal and/or intergroup communication within a wider social context, while at the same time it can be used for the description of mass communication with minor modifications.

Newcombe's ABX model (figure 1) consists of two or more individuals (A and B) who simultaneously maintain orientations towards one another and a number of objects (X) in their common external environment. The model is based on the assumption that all parties involved will tend towards maintaining stability and symmetry in the relationship between themselves and the object(s), and that this tendency will be the cause of communication. Therefore, in Newcombe's model, communication is viewed as the effort to restore equilibrium in light of discrepancies in the orientation of A or B towards X.

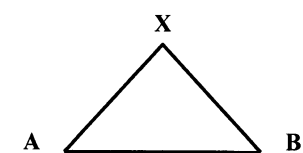


Figure 1: Newcombe's ABX model [12]

The *co-orientation approach* (figure 2) expands Newcombe's ABX model by adding a fourth entity that participates in the process of communication and by changing the individuals A and B (perceived as equal) to "elite" and "public" respectively. "Issues" refers to any matters of social importance to which the transmitted information is related, and "media" refers to those who are charged with recording this information. The lines that connect the nodes represent values, attitudes, and relationships, either one-way or bidirectional.

In the sections that follow, other theoretical approaches that are incorporated in the proposed model are described.

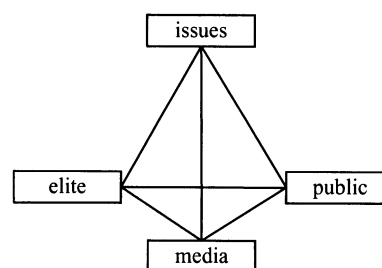


Figure 2: The co-orientation approach [12]

3.4.1 Castells' theory of flows

Castells [3] (pp. 441-442) presents a social conception of space as the material support of time-sharing social practices. He argues that our society is constructed around *flows*: flows of capital, flows of information, flows of technology, flows of people who commute, flows of images, sounds, symbols, etc., as expressions of processes that dominate our economic, political and symbolic life. He then introduces the concept of the *space of flows* as the "material organization of time-sharing social practices that work through flows", supported by information and communication technologies and networks.

Even though the *space of flows* appears as the dominant spatial form in our network society, these spaces, and people acting therein, still live within the *space of places* of their physical surroundings too. Castells [3] (pp. 441-442) identifies a growing tension and articulation between the space of flows and the space of places. While the space of places organises experience around the confines of locality, the space of flows links up electronically separate locations in an interactive network that connects activities and people in distinct geographical contexts. Cities do not disappear in the virtual networks of ICTs, but are transformed by the interface between electronic communication and physical interaction, through this combination of networks and places. At the same time, our cities are made up of flows and places and their relationships. The places of the space of flows are the corridors and hallways, usually experienced as "non-spaces" that connect places around the world. The city-dweller of the 21st century is usually mobile and on-line, moving physically between places, while remaining connected to the network at all times. It is therefore quite important to stress here that "we move physically while staying put in our electronic connection. We carry flows and move across places" [2].

In the context of global cities at the beginning of the 21st century, Castells [2] argues that public places, as sites of spontaneous social interaction, may again become the communicative devices of our society. Could then mobile and location-based communication technologies give highly mobile and individualistic 21st century city-dwellers the ability to connect to each other, to rediscover the joy of spontaneous social interaction, to become more active and to recreate communities and bonds of socialization? Could these media contribute towards transforming "non-places" of contemporary urban space into a socially meaningful network of places for interaction? Tuters [15]

suggests that locative media may transform the urban space of disconnected flows into a huge “peripatetic computer” of interpersonal contact that is a space full of potentially social places. This may lead to an electronically enhanced public space that can be enjoyed, as it becomes lively once again by aiding city-dwellers who are virtually strangers to meet in public places and participate in various collaborative activities.

3.4.2 Activity Theory

Activity Theory is a psychological theory that aims to describe human activity and investigate the relationship between activity and consciousness. Activity Theory views consciousness as “the product of an individual’s interactions with people and artefacts in the context of everyday practical activity” [9] (p. 8). It has been previously used as a descriptive and analytical tool in HCI in general (e.g. [9]) and applied to intelligent environments [13], and there are certain aspects of Activity Theory that are particularly relevant to locative media use as well.

According to Activity Theory, human activity emerges when the subject identifies an object as a means of fulfilling a need (thus “objectifying” that need), and this becomes the objective of the activity. In fulfilling this objective, the subject breaks it down to lower-level, more manageable parts called “goals” and subsequently undertakes the actions that are necessary for the goals to be accomplished. In doing so, the subject performs automated tasks called “operations”. Operations are executed automatically, requiring only minimal cognitive effort. Operations are influenced by various conditions. A “condition” is anything that may influence the execution of an operation, from environmental conditions (such as inclement weather to) to factors directly related to the subject (such as illness). What differentiates operations from actions is the automatic execution of the former, as opposed to the deliberate execution of the latter. The relationships between the concepts described above constitute a hierarchical structure (shown in figure 3).

The model proposed in this paper incorporates the top-most two levels of the activity hierarchical structure.

A concept that is of great importance in Activity Theory is that of mediation. The relationship between subject and object is mediated by artefacts. Artefacts can be physical (e.g. tools) or non-material (e.g. language) means that the subject employs in order to reach the objective. Artefacts are used to enhance the subject’s capabilities or offer entirely new ones. When internal (i.e. the subject’s own abilities) and external resources are combined in this way,

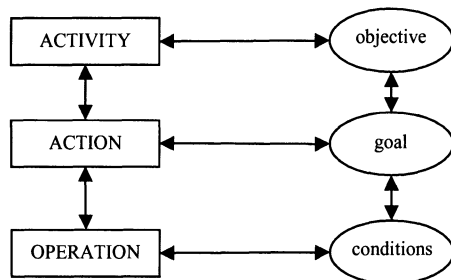


Figure 3: The hierarchical structure of activity [8]

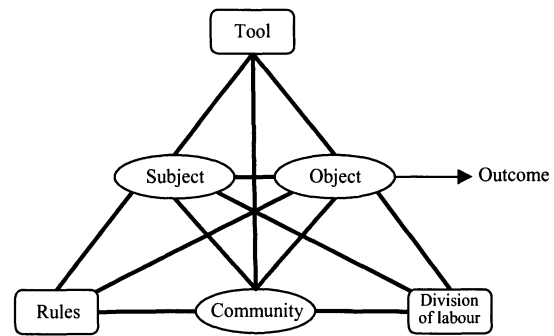


Figure 4: Engeström's activity system model [9, 10]

functional organs are formed [9]. The device needed to access digital information in a location-based activity could be considered a functional organ that gives the user the ability to access and manipulate previously inaccessible content.

Users need to possess the necessary skills in order to form functional organs. These skills are categorised as *tool-related competencies*, which refer to the user’s pre-existing knowledge of the objects’ operation, and *task-related competencies*, which refer to the user’s ability to associate the use of a functional organ with the accomplishment of higher-level goals.

Mediation is not limited to the relationship between subject and object. As the subject seldom acts in isolation, since individuals are typically members of a community and the society at large, and the community’s relationships are also mediated. The relationship between subject and community is mediated by commonly accepted rules, and the relationship between object and community is mediated by proper division of labour [9, 10]. Both these relationships, depicted in Engeström’s Activity System Model [9, 10] which is shown in figure 4, may be related to the ritual / expressive model of communication and are especially applicable to game-like activities (e.g. location-based games) such as the scenario application for the LOCUNET system.

Furthermore, there is a degree of similarity between Newcombe’s ABX model and Engeström’s triangular activity system model. Engeström’s model essentially consists of three interconnected ‘main’ triangles similar to Newcombe’s model: user – artefact – object; user – interaction rules – actors; and actors – task distribution – object. The environment could also be included in this model as a circle that surrounds users, actors, and artefacts, depending on whether the interaction takes place between remote or physically co-present actors [14].

3.4.3 Ecological Approach to Visual Perception

Locative media are clearly spatial in nature. Thus, theoretical approaches that deal with the human’s relationship with the surrounding environment are appropriate for the investigation of locative media use. One such approach is the ecological approach to visual perception [7]. In this and other similar approaches, the environment is defined relative to the human. The environment cannot be separated from the living beings it contains; it refers to what an

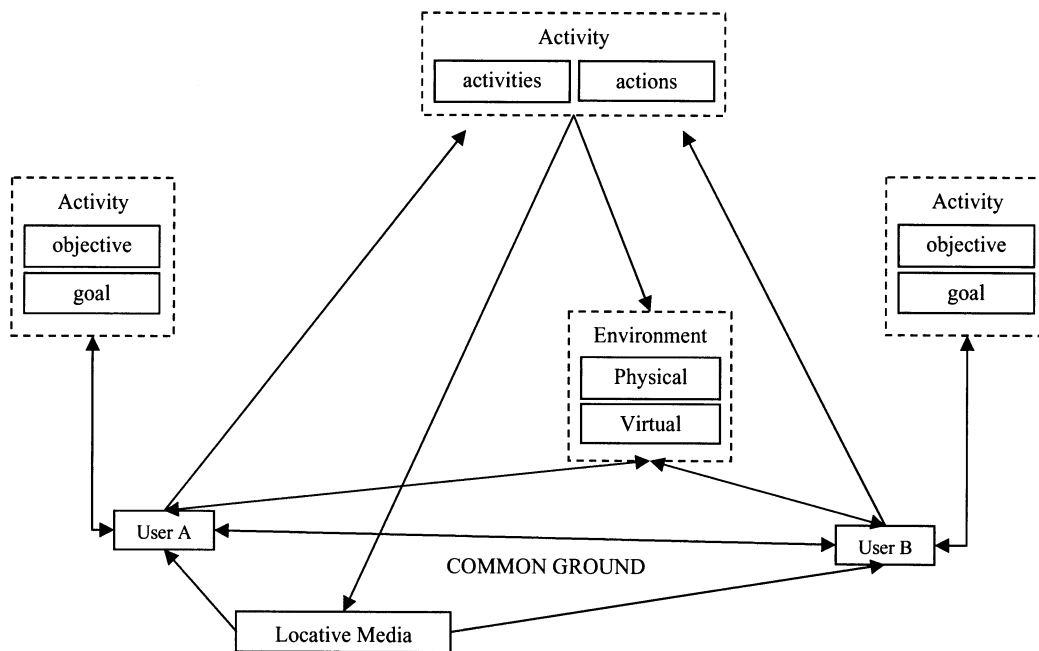


Figure 5: The modified co-orientation model that describes communication via locative media

“average” human can perceive. That is to say, the notion of the environment that is prevalent in the physical sciences does not pertain to ecological thought. As such, features that the average human cannot perceive and take advantage of (either microscopic or very large) are not considered parts of an ecological environment that pertains to humans.

Humans may, by using appropriate equipment (e.g. microscope, telescope), access superordinate or subordinate units of environment. This reveals a similarity with Activity Theory in the treatment of tools [13]. Gibson views tools as extensions of the human body, a view that may be considered consistent with that of functional organs in Activity Theory. The use of a tool is signified by its affordances, namely “what [the tool] offers to the animal, what it provides, or furnishes, either for good or for ill” [7] (p. 127). Simply put, affordances are readily perceptible ways in which a tool may be used, either to the user’s benefit or to his/her detriment. For instance, a knife affords cutting, irrespective of what or who will be cut (the user may end up cutting himself, for instance).

Affordances exist irrespective of whether someone will see them for what they are. In order to perceive them, one will have to be physically able to do so, and possess the skills necessary for their identification. Additionally, an important factor in the detection of affordances is the subject’s need to detect them. Affordances are opportunities for action, and it is quite possible that one will not perceive them if no action needs to be taken. These prerequisites for the perception of affordances are similar to Activity Theory’s tool- and task-related competencies.

In the context of locative media, it can be suggested that the user gains access to a different unit of environment (the ‘layer’ of digital information superimposed over the physical environment) through the use of the mobile device. The digital information itself may be seen as a set of

affordances for when the need for appropriate action arises.

4 By way of conclusion: the resulting communication model and its evaluation

A combination of elements from the theoretical approaches described so far results in a model that describes communication mediated by locative media. More specifically, the proposed model is based on a modified version of the co-orientation approach and incorporates elements derived from the theoretical approaches described in the preceding sections.

According to this model, a number¹ of locative media users, who may or may not belong to the same group, communicate with each other through wireless location-aware devices. Additionally, they may engage in interpersonal communication with each other, provided that both are located close to one another in the physical environment at the same time. At all times, users influence and are influenced by the environment(s) they inhabit. The users, the environment, and the medium define a common ground, that is, a shared context of locative media use (the base of the pyramid that is formed by the interconnected elements of the model in figure 5). Users of the same locative medium inhabit the same digital environment (the digital “layer” that is superimposed over real space). It is primarily through this environment that they obtain information regarding the whereabouts of other users and the state of the activity at any given time. Additionally, they themselves are integral parts of their respective physical envi-

¹ Although the model may accommodate more than two users, only two are depicted in figure 5 for the sake of convenience.

ronments, which may coincide depending on the users' proximity to one another.

The proposed model incorporates the distinction between activity and action and, consequently, the one between objective and goal (both from Activity Theory). Either combination (activity – objective or action – goal) may apply depending on whether locative media use is an objective in itself (possibly for entertainment purposes). Each user's objectives or goals define his or her activity or action respectively, and are an accurate indication of group identity and cohesion. The existence of common goals is an important characteristic of a group (see also [8]). Generally, one's commitment to the group one belongs to is indicated by the importance one ascribes to one's personal agenda, compared to the importance one ascribes to the attainment of group goals. By monitoring the degree to which group members pursue their collective objectives / goals during the use of the LOCUNET system, we attempt to make inferences regarding their relationship with other group members and the cohesion of their group². This evaluation approach enables us to investigate social interaction as it occurs at both the group and the individual level.

In light of the above observations, whether a group goal is to be considered an *objective* or a *goal* (as per Activity Theory) is dependent on the context of use. In any case, one of these concepts is placed at the top of the pyramid in figure 5, as it affects or is affected by all other elements in the model. More specifically, the environment is enhanced by the addition of digital information in it, and this digital layer may be accessed by the users through the medium. In other words, the medium gives users the ability to sense and act upon digital content bound to a real-world, physical location. Users stay constantly connected and carry this ability with them to connect through the medium to the space of flows, while navigating in the space of places, as Castells suggested. In Activity Theory terminology, the medium enhances the user's capabilities, thus forming a *functional organ* through which the user may take advantage of a hybrid³ type of environmental context within which he/she may act.

In addition to inter- and intra-group relations, our investigation will focus on the users' perception of the environmental experience as a result of the system's use. This investigation will attempt to identify the characteristics of the user's environmental experience and to hypothesise on how these characteristics may function as one aspect of the common ground in which locative media use takes place (as evident in figure 5). More specifically, the perceived *sense of place* will be investigated so as to determine whether users feel more present in the physical or the digital environment, or even in a hybrid one that borrows elements from both.

² Group interaction is not the only possible course of action, of course; it is possible that users disregard group practices and pursue their own, personal goals. The proposed model can accommodate both cases.

³ For the purposes of this discussion, a hybrid space is defined as a space that is both physical and virtual.

To conclude, it should be noted that different locative media may connect to one another in various ways: more than one activity may occur at the same place simultaneously; a user may take part in more than one activity at the same time; or the same locative medium may host more than one activity. In the near future, we could then experience locative media may which form *ad hoc* networks, possibly leading to the formation of locative media equivalent to the World Wide Web, but with strong connections to the physical environment. This possibility is another way of describing the prospect of spatialising the Internet, as earlier suggested in this paper, by relating a part of its content to physical locations through the expansion of locative media.

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