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Space Syntax and the Management of Encounter in CMC

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0 Abstract:

Recent years have seen the rapid and extensive deployment of computer-mediated communications systems in organisations, which allow people to æmeetÆ online and communicate synchronously or asynchronously. This paper discusses the relationships between these technologies and aspects of Space Syntax Theory. It may appear initially that these technologies might undermine the ability of the theory to understand the emerging, distributed and virtual organisation. Indeed, many teleworkers have reported that the loss of encounters with colleagues and others, typical of the workplace, has created problems for teleworking. However, telecommunications technologies have been understood in spatial terms, as a æplaceÆ (in, for example, the work of Samarajiva). This notion is extended to describe how space syntax can assist in the design of virtual spaces. First, the paper will show how spatial ideas can help understand current online collaboration tools, such as ICQ and Virtual Places, Secondly, how they can assist in the design of 3D virtual spaces which support chance encounters, which have been shown to be so important in innovation. And finally, how this idea might be exploited to inform the co-ordinated design of new work places that have both physical and communication spaces.

1 Introduction

Recent years have seen the emergence of new ways of working, alternatives to the traditional office environment, which include satellite work centres, neighbourhood work centres, telecommuting and hotelling. Indeed, it is claimed that some 11% of the US workforce are now telecommuters Conventional concern by employers is being somewhat reduced due to the reported productivity increases, and theflexibility

found by employees. (See B+langer and Webb Collins, 1998, for a valuable review of distributed working arrangements).

However, this shift to distributed working, and the introduction of communication media might seem to pose a problem for those areas of analysis concerned with the layout of the office environment, the urban environment, and their role in the social. The need to handle emerging work forms is one that has already been addressed. For example, Penn, Desyllas et al. (1997) consider the introduction of hot-desking (hotelling) in the work patterns of one of their case study organisations, but the role of computer-mediated communications (CMC) is one that has not been discussed in the literature to any extent.

This paper is concerned with the role that the ideas drawn form the Space Syntax literature can have in distributed working and in understanding CMC in practice. That is, can the methods for the analysis of physical space be applied to the areaknown as æcyberspaceÆ.

1.1 CMC as a Spatial Experience

The notion of cyberspace is one that has been used and abused, to point where any use of a spatial understanding to the digital world might appear meaningless. But the evidence does suggest that users do, indeed, have a spatial relation to the Internet, one that draws on our understanding of physical architecture and space. For example, Dieberger (1998) describes how the social connotations of the names given to the virtual spaces were employed by users of a text-based shared virtual space. Users had a number of spaces in which they could interact, and it was noticeable that after meeting in an informally named space, if the conversation began to move into work-related themes, the users would suggest to each other that they move into the more serious space: one title æthe conference roomÆ.

Taking an empirical approach, Matlock and Maglio (1998) undertook a study of the language used by web users as they described their activities, and it was found that they often view themselves as moving along a path towards information. Matlock and Maglio argue that this may be due to the fact that in the physical world we must walk towards and grasp objects, and that theseæimageschemataÆ (Johnson 1987) are used in the more abstract, virtual, world. Thus, users refer to the Internet as a multidimensional (usually two, but occasionally three-dimensional) landscape. There is, it seems, a natural disposition to see the new information systems in spatial terms. Samarajiva and Shields (1997) widen the position further to include communication networks more generally, including advanced telephone networks.

The Internet has begun to see the emergence of a new class of tools which makes the issues in Space Syntax more important. Until recently, the use of the Internet was broadly broken into specific communication tools, such as email, CU-SeeMe, etc., and the publishing approach embodied in the World-Wide-Web. As more users use the Internet for both working and socially, and as many of these now work on permanent lines provided by employers, the issue of general user co-awareness has arisen asa major research topic. That is, having an overall idea of which other users are

present online. Describing the function of the built environment Hillier argues that, æThrough its low level-level effects on patters of movementàthere are also high-level implications for space at the micro-level which come through the creation - or elimination - by spatial design of the patterns of natural co-presence and co-awareness of individuals that make up virtual communitiesÆ (1996: 188). As these issues of awareness arise in CMC, it seems likely that the language and methods of Space Syntax can be usefully employed in support of the other kind of virtual community, that which exists online through the patterns of online use.

1.2 Awareness in CMC

In the physical world, be it the office or the urban environment, one of the major concerns has been the importance of chance encounters. These unplanned meetings, which may take place in the corridor, the street, or other sites, have been shown to be crucial to the information flow, and innovation, in organisations (Isaacs, Tang et al., 1996, briefly review the main results). It is the lack of these chance encounters that many teleworkers have observed as a problem with this style of working. Tom Erickson, who teleworks greatly, has observed of his own behaviour that when he does visit the office æIn fact, I take part in ôplanned spontaneityö - I wander the hallways on purpose so I can bump into peopleÆ (Schotz, Bellotti et al., 1998: 52). Thus it might be reasonable to consider that that communication technologies threaten the social, and some do. Penn, Desyllas et al. (1997) describe a company who banned internal telephone calls and memoranda to increase the rate of internal physical movement. An alternative approach is the development of general co-awareness tools that distributed online workers can use.

The following section will describe a number of simple awareness tools of which the author has had experience in actual projects. In addition the role of ideas from Space Syntax as means to explain some of their successes or failings will be discussed

2 Online Awareness Tools

2.1 ICQ

One genre of applications (generally known as æbuddy listsÆ) operates by making one aware of the status of a named colleague. The best example are ICQ and PAL. Figure 1 shows the basic floating frame for ICQ, and which would sit on oneÆs desktop permanently. It lists a number of other users who also have the system, and who have accepted to be on my nominated list. The first two are shown as being online, while the remainder are off-line. I can use this awareness information in a number of ways. The system allows me to send a real-time text message to those online, or to initiate a higher quality audio or video communication, if the other party has the appropriate software at their end. Text-chat is also possible to more than one other user, allowing group exchanges. If a user is off-line, I can send a message that functions in a manner not unlike a conventional email, except that it is handled by the ICQ server. In the authorÆs own experience, the text chat is currently used briefly to exchange greetings, and state the number of the nearest phone, initiating a telephone call. That is, its use is primarily as an awareness tool, just to know who is around, and other media are usually employed for more effective communication. It is also possible to manage the state of oneÆs presence as seen by others. At the

bottom of the frame is a small field to allow the user to set there degree of availability to other users, and includes æinvisibleÆ (they see me as off-line), ænot availableÆ, away, do not disturb, and privacy.

[figure 1 about here]

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The problem that occurred with ICQ is that it requires that all those on the contact lists be explicitly listed. In other there is no support for æweak tiesÆ, the network of acquaintances who do not know each other well - the connections and conversations with people outside of oneÆs own work team, as they can provide an alternative view on problems, and new resources to solve them. Genuine innovations seems toneed input from individuals without the immediate work group, but from the wider organisation. As Hillier observes with regard to urban networks, they æare not self-contained groups but distributions of probabilities within a larger, continuous systemÆ (1996: 257). I found that I did not have the chance online encounters with those people at work who I would normally, due to our shared environment, and shared general interests as academics. We must, therefore, look to beyond the small predefined group.

2.2Virtual Places

Other tools aim to create co-awareness between users who are present at the same æplaceÆ on the Internet, usually determined by a web-page address. For example, Virtual Places (VP) allows users, who must each access the WWW through the special browser, to see other such users who may be on the same web-page. For example, in Figure 2, I am viewing the Middlesex University home-page. If another user were also looking at that page (through the VP browser) I would see an avatar representing them (my own avatar is the face-like character to the left of the web-page). The list of all other users on this page can be found on the right hand frame, each of which can be further queried for more information, as details of email address, interests and similar details are stored on the central server. All userson each page can communicate to every other by typing into the lowest field, and the conversation appears in the frame just below the web-page.

[Figure 2 about here]

The initial idea of applying ideas of space syntax to Internet-based systems arose from the observation that the common graphical method of documenting the overall structure of a typical web-site, in which a home page connects to a number of ælinkedÆ pages, has a similar appearance to a justified graph of a simple building. That is, one can see each web-page as a room, with connections to others. But VP failed as a general CMC tool as the chances for encounter are very limited. As the typical user moves from one small set of content to another, they pass quickly and invisibly from

one page to another. Thus I might spend only some seconds in the Middlesex home page, before quickly moving on down the tree structure to the information pages that are of specific interest. Each room (web-page) is typically very small, with limited content, and users appear and disappear from these rooms without the need to pass through any form of shared transit spaces, the online equivalent of the corridor. For although, as Maglio and Matlock (1998) show, users may feel they are moving through an information space, this perceived movement is not shared with others.

It is interesting that a built architecture exists which exhibits many of the features of VP in use. There are in Rio de Janeiro a number of motels aimed at a specific market, where privacy is of great importance (Guimaraens and Cavalcanti, 1982). Typically, visiting couples to the motels enter the main compound by car, paying at a booth. They drive the car into a garage that can be closed behind them. The motel room proper can be entered directly from the garage by a connecting door, or occasionally upwards by a staircase, if the building is of a two storey layout. Access for the service staff is by a totally separate set of corridors, and takes place after the room is vacated. The combination of the use of car, and the lack of shared spaces, such as foyers and corridors, for the visitors reduces the opportunity for chance encounters between them. The separation of service access reduce the chance of encounters between visitors and staff.

The need to publish information and serve awareness creates a conflict of interest in the future design of web-sites. The typical web-site is designed around the principle of information design, which divides the material into its components. However, this fine grain structure, although efficient for the single user to navigate the information provided, does not support social interactions. Hillier (1996: 270) suggest that we consider what might happen is we were to design our buildings and organisations with such efficiency in mind. Both the organisational structure and the building lay-out would match the current state of knowledge of the system. Indeed it is likely that attempts would be made to minimise intrusion of other groups on each other. However, as has been shown this would compromise the ability to innovate through weak ties and chance encounters. The concern is that all to much of the work in web-site design is based on the efficiency of the information design. As we move to a system of shared web-pages and virtual communities, so the needs for such architectural and urban design become crucial. It is as if we were content with the design of museums as only containers of knowledge (Markus, 1987), and not fully acknowledging their role in the social interaction of their users (Choi, 1997). Should not a museumÆs web-site show the same concern for the interaction of its online users?

2.3 Active Worlds

The need for such transit spaces lead the author to investigate the role of shared 3D spaces to provide the intermediate spaces between content areas that would enhance encounter. The idea of using Space Syntax approach to 3D virtual spaces has been employed previously (Ingram, Benford et al., 1996). They note that real settlements have differentiation, without necessarily having boundaries or compartmentalisation. An analysis of the lines of sight and access shows that they allow for ægradations of accessibility and awarenessÆ. It is these gradations that we can create in a shared

3D space, gradations that are difficult to generate with the awareness tools, ICQ and VP, described above.

A simple virtual building (see Figure 3) to support distributed collaboration between the author, research colleagues from other institutions, and postgraduate students of the CEA, was built in AlphaWorld. This is the first, and major, shared space that be accessed via the Active Worlds browser. Users are represented in the space by a 3D figure, an avatar, that the user can move through the space with either the mouse or cursor keys. As they do, the frame displays what the eyes of the avatar see, although one gets a sense of being there oneself. Text chat is available, in the usual manner: Text is typed into the lowest small field, and the flow of conversation in the vicinity is displayed in the field above it. Each surface in the virtual building can be linked to conventional web content. So, for example, I maintain all of my documents in a web-based repository (BSCW) to facilitate collaboration with colleagues. The virtual space is divided into a number of rooms, whose walls link to this online content. To access content a user would thus enter the space, click on the wall, and the associated material would appear in a separate web-browser, such as the BSCW workspace shown in the right hand window in Figure 3. If another user was nearby, to access material in another room, there is a chance for encounter, and text chat can be initiated.

[Figure 3 about here]

This approach addresses the problems found in ICQ and VP, due the presence in a 3D space of the graduations, as identified by Ingram, Benford et al. Each user can see others users at different levels of presence due to the smaller size of more distant avatars. There is also the ability to micro-manage awareness through the user of walls and windows, in a manner typical of the traditional physical workplace. It supports weak ties, in that any user with the browser can enter the space and encounter its inhabitants, but the privacy of content is maintained by separating the space from it. Users have occasionally had encounters with colleagues of colleagues in the virtual space, whom they would not normally meet, but these encounters are not random. They are based on the shared interests of the documents linked from the space. Furthermore, unlike VP it also maintains some stability of presence, as a user would typically access a number of documents from within one space, and not be æteleportingÆ from one small area to another as occurs in VP. This stability, centred around the task at hand, not the specific information being viewed, allows for encounter matches our intuition of the workplace.

3 Combining Physical and the Virtual Spaces

In addition to understanding existing tools, employing methods designed for built architectures offers the hope of dealing with an emerging subject of the relationship between the physical and the virtual in the work-place. Graham and Marvin (1996: 243) critically note that æa powerful body of ideas has developed around the notion that electronic flows and spaces can simply displace or substitute for physical travel and physical urban functionsÆ. However, the evidence that is accumulating seems to indicate that this position is overstated. For in the majority of shared network

environments, especially those involved with collaborative working, people æinhabit both the online space and the real world simultaneouslyÆ (Mynatt, Adler et al., 1997).

The author experienced the problem when the close relationship between my online and offline activities is not clear to other users. Often while inhabiting the Active Worlds space, I will leave the office briefly and on my return have found that someone has tried to initiate a chat, to get no response from myself. On other occasions, while chatting, I will receive a visitor or telephone call in the physical office, and been temporarily distracted. These distraction are not clear to the other users. But a solution is available. As the Internet has developed in terns of its technological infrastructure, it is now possible to transmit audio-visual data, such as a video image of the user. This has an important impact on awareness tools, as their re-location into a specific place, (in that we are concerned with the activity in a particular location) draws the physical and virtual worlds together. It has been found that simple video snapshots, of about 128 by 128 pixels that are only periodically updated, can function in a similar way to physical availability cues (Johnson & Greenberg, 1998). That is, from these small images of remote spaces, it was found that people were found to be less available when absent (obvious) or in conversation with others, but more available when in transition (such as entering or leaving the room), and when they appeared to not be working. The video awareness are interesting as they bridge the gap between the use of architectural elements to manage awareness and encounter, and purely computer-based tools, such as ICQ. Though mediated, they have their basis in physical spaces.

One of the interesting results from Narine, Leganchuck et al. (n.d.) is the role of awareness tools in the use of the physical structure of a single building. They experimented with a system called Postcards, which takes frequent low resolution video images of workstation users and makes them available to co-workers. Their experimental group consisted of eight individuals, of whom six formed the core team. The members of the group were spread over 3 floors. They found that the users often used the system to check the availability of another members before telephoning or visiting them, especially if the other person was on another floor. Six of the eight always checked using Postcards, and the other two who did not were close enough to see those they wished to visit. That is, it impacts not only the classic market for awareness tools - the widely distributed group - but also the encounters between members of a group within the same building.

These experiences also match those of the author, in the Active Worlds space. Originally this was intended to support distance collaboration between myself, my research collaborators, and (should I working out of the building) the students. However, on one occasion I met two of the students in the virtual space, who had not seen me in the building, and were unaware of my presence in it. They were glad to see me as they needed some assistance that required my presence. Because much work can now take place on the desktop, through computer-based systems, there is a risk of reduced encounter, even before one moves to a teleworking. In my own situation, while at the CEA, I work primarily my office as many materials are all available online, with reduced need to visit colleagues offices, or the library, and so on; and I must make an effort to go elsewhere.

4 Conclusion and Future Work

It has been argued that the emerging information and telecommunication technologies can be partially understood in abstract spatial terms. In doing so we can apply the ideas from Space Syntax to help characterise many of the new awareness tools that have been released to support new, distributed, work patterns. For if, the æordering of space in buildings is really about the ordering of relations between peopleÆ (Hillier and Hanson, 1984: 2), then a technology that affects the relationships between people in an organisation would appear to be of interest. Furthermore, the tools and techniques of Space Syntax can be further applied to assist in the overall design of such spaces, just as Maglio and Matlock themselves employed a method based on that of Raubal, Egenhofer et al. (1997), who had investigated the structure of talk for wayfinding in airports.

Given that the basic ideas from Space Syntax have proved so valuable in understanding the benefits and failings of the awareness tools employed by the author, future work aims to investigate the use of the specific techniques documented in the Space Syntax literature to design virtual spaces, and the use of a combined approach to design joint physical-virtual workspaces, to address the issues described in the previous section.

The computer-based analytical techniques that have been developed by the Space Syntax community offer the possibility of generating appropriate spaces as required. For example, Broughton, Coates et al. (1998) have built a system for the generation of spaces which combine Lindenmeyer-systems (L-systems) and genetic programming techniques. This allows for the generation of spaces, which evolve over a series of generations to fulfil certain specific fitness criteria. They have used measures from Space Syntax in one experiment, in which the fitness criteria were:

1. The circulation must allow all ærooms*Æ* to be accessible
2. The æenclosureÆ must contain a number of rooms, specific by the user.
3. The configuration must evolve towards mean depth (Hillier & Hanson, 1984) specified by the user

Such an approach could be easily modified and applied to generate a shared space to match the changing requirements on a distributed project team.

Similarly, Ingram, Benford et al. (1996) created a series of automated software agents that embodied various search techniques to explore the opportunities for encounter in their Virtual City. These are of interest as they can be used to mimic certain types of user behaviour which require excessive effort on the part of the user. The need to manually move the avatar around the shared 3D space is one that has proved a problem to many users, compared with the ease of the point and click interface on the typical desktop. They implemented a ælongsight walkerÆ which took into account the directions which gave the longest line of sight. It is envisaged that future users of shared 3D environments would have both manual and automatic control. In general they would navigate the space through the use of the automated avatars, which would use the ælongsightÆ algorithm, moving from one work-space to another, through appropriate routes to enhance chance encounters. If so desired, however, they can take control for more exploratory movement.

The other main goal for the new future is to explore the design of joint physical-virtual spaces. The techniques of Space Syntax may provide a set of common techniques around which we can fully integrate the new technologies with physical architecture. One can imagine a variant on the automated generation of virtual spaces in which their links (through video cameras) with real spaces are also given, and an overall measure for mean depth, or other fitness critiria, can be derived for the complete justified diagram - both physical spaces and virtual spaces. The aim must be to eventually create a design approach in which the physical and communication infrastructure for an organisation are designed together and in support of each other in a seam less way. The tools of CMC can be seen not as a problem for the designers of built forms, but as a new resource.

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