Using Social Interaction in Generative Design of Shared Virtual Spaces

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Abstract

The proposed paper outlines research findings in the field of generative design of visual virtual chat spaces.

It discusses social interaction as a central determining factor in the generation of virtual spaces through and for chat communication on the World Wide Web. Social interaction in a chat room is based on communication using written text. The research and design results of this project involve the translation of chat statements into three-dimensional virtual objects according to
- criteria derived from theories of virtual and social space,
- the production of space through action and interaction of the users of the interface and
- the translation of the components of written text (words and characters) into three-dimensional virtual forms.

The generation of a dynamic, virtual, social structure is based on criteria deduced from systems of interaction within social space. The visual social structure, reflected in the shape and spatial relation of the three-dimensional objects, evolves as source for feedback processes and therefore as "re-generation" of social interaction.

This paper documents the design, implementation and evaluation of the described system. It represents an outset and a first manifestation of a new project in cultural-differentiated user-interaction-centred generative approaches in interface design of chat room applications.

1. Introduction

Using social interaction in the generative design of shared virtual spaces seems quite broad at the first glance. In the project and research findings described in this paper I used social interaction in form of textual communication to generate a shared virtual space. In the visual virtual chat application, the communication process itself re-generates a shared virtual environment. Examining theories of social interaction in relation to space led me to the hypothesis that many examples of shared virtual spaces reveal structural similarities to social space and social interaction. These spaces exist only as result of the users action and

interaction. Social interaction in shared virtual space may produce different expressions and reveal structures that may have been implicit but not visible or identifiable in social interaction patterns in physical space. I have examined the generative potentials of social interaction in a chat room with regard to the generation of a shared and dynamic virtual space. In this chat space, the statements of each user are made visible in a three-dimensional VRML-World using abstract shapes. I deduced the generative criteria for this chat space from theories of interrelation of different modalities of "space".

Our senses seem to tell us we are "living in space", but research findings in the fields of physics [12], sociology [8] and philosophy [11] claim that we constantly (re-)construct our space, environment and reality. According to these findings, the feeling of "living in space" is a result of mankind's history of development and constitutes just a learned acceptance of one interpretation of the world. Our view is influenced by Newton's [9] definition of absolute space (also referred to as the definition of space as a box). The theory says that space is a container and that all matter (living or non-living structures) are located within it. Matter is affected by space but does not effect the space surrounding it. This view was reflected in science, culture and architecture until Einstein [12] proposed the concept of relative space. In Einstein's physics, space is just a relation of positions of things to each other. Space is not absolute but relative to the system of reference. Matter, space and time depend on each other and can't be observed separately.

The idea of relative space was adopted by other disciplines in the sciences, as well as art and architecture. In the social space theory, the idea of relative space is appropriated and extended by Martina Loew [8]. The theory says that social space is produced by the human beings interacting with each other. Space does not exist "a priori" but is continuously reproduced. The current state of space is a temporary product of the order of matter on the basis of action. Social space is built upon the relations of human beings, institutions and objects.

Human beings interact. Our environment is defined by the interaction of different living and non-living structures. Social interaction of human beings is largely based on verbal and non-verbal communication. In chat-rooms, social interaction is based on written verbal communication. However, the chat space I want to discuss in the following sections also relies on visual communication and feedback processes between visual and verbal communication, as well as spatial recognition of the virtual environment constructed by the actions of each user. As an ongoing process this project is now entering a phase in which not only the computer-represented aspects of language (ASCII-characters) are taken into account. Natural language itself, and its use in chat communication, is proposed to serve as a source of generative seeds and principles for the design of shared virtual spaces.

2. Scope

To start, I would like to introduce some terms I have used in the description of the experiments I have done in the field of chat communication. The type of a visual virtual chat space that I want to discuss in this paper is a new concept in the field of shared virtual spaces. The visual virtual chat space has a different approach than that of MOO's, virtual communities, avatar worlds or collaborative design spaces. The main distinguishing characteristic in these shared virtual spaces can be found in the form, process and result of social interaction. A traditional chat room's social interaction is clearly restricted to verbal communication. A visual virtual chat room has another dimension. In addition to verbal

communication, a visual component adds another component to the social interaction process. But this visual component is not a separate world, such as in avatar worlds, in which users can interact with one another separately and independently from the text-chat component. The text and the visual component in the visual virtual chat space are bound together and each can not be transformed independently of the other. They depend on each other because one component (text) influences the other (visual) component directly. Strictly speaking, the verbal component produces/generates the visual one.

3. Generative processes in shared virtual spaces

The processes of generation of shared virtual spaces can be derived from the modes of interaction inherent in these spaces. The generative processes I examine are worked out from the principles of social interaction in chat rooms. In this example, users of a chat room application generate a shared virtual space through textual communication. This space of communication is mapped using the components of text (words and letters of the alphabet). The dynamic output (virtual environment) in this generative process relies on two components. The first is the programmed interface and algorithm as a framework for the user's interaction and the second is the input of the users themselves. The conceptual framework for the generative processes used in this visual virtual chat space is derived from the idea of a relative social space, the idea of remote presence (place versus space) and the dynamics of the communication process in chat applications.

The sharing of virtual space through social interaction connects different physical spaces. The symbolic and remote presence of the participants carries the possibility for generation of a collective shared virtual space. This non-physical space is dynamic and changing through further action and interaction. Interaction itself is the seeding process that produces complex virtual expressions aimed at expressing the shared virtual space visually.

3.1. Shared Virtual Space

"Shared virtual spaces are complex multi-user online environments that use strong spatial metaphors for navigation, communication and interaction scoping, and object manipulation and may support 3D immersive displays."[3] In addition to the preceding definition, shared virtual spaces have, according to Disz [3], the following capabilities: immersion, sharing of object and virtual space, co-ordinated navigation and discovery, interactive control and synchronisation as well as interactive modification of the environment. In the following discussion, I have assumed these definitions of shared virtual spaces with different emphasises.

How do I define a shared virtual space? The beginning of my research formed an investigation into theories of space. The interrelation of different theories of space (evolved in the developmental process of science and philosophy) forms a framework for the perception of space. Ideas about space and the actual perception of spaces are defined by the oppositions relative and absolute space as well as physical and psychological space.
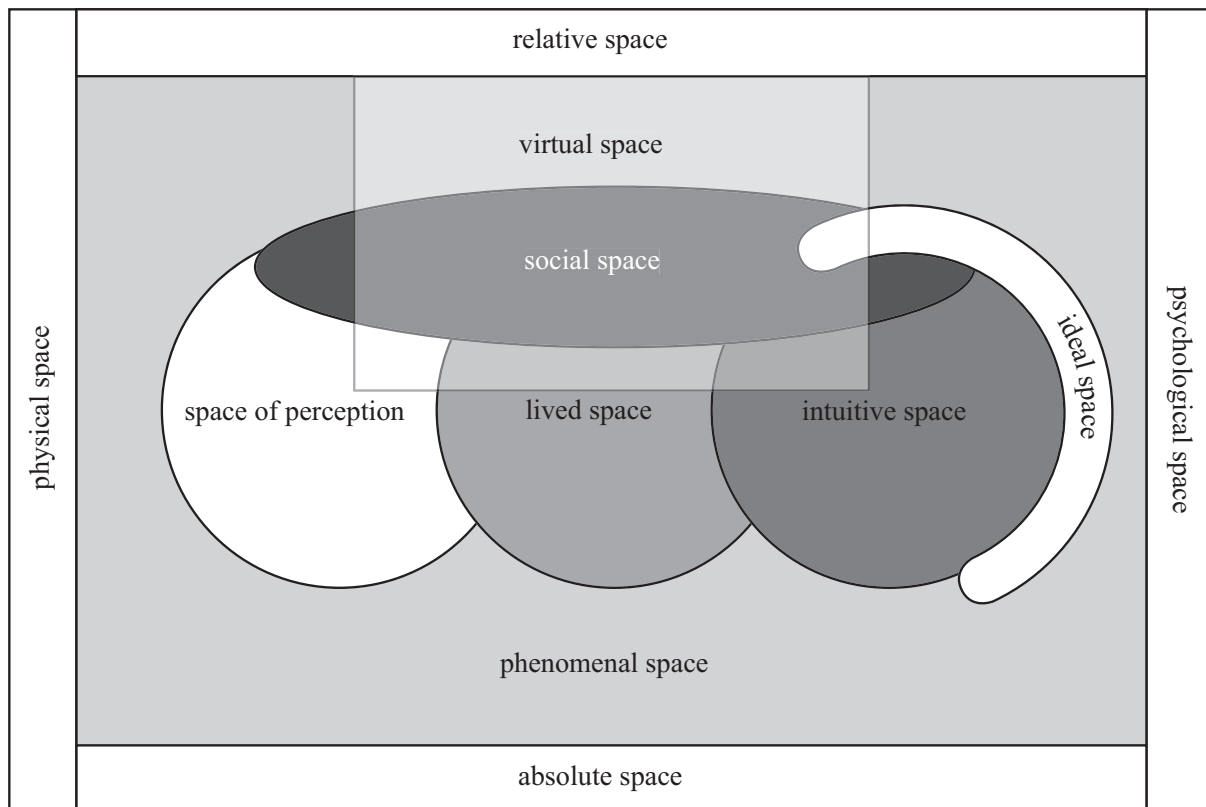
Figure 1 model of different related spaces, redrawn from Heymann, (pp.65) [6]

The interrelation and permeation of spaces in our perception makes it possible to extract criteria for the generation of a shared virtual space. Rosemarie Stroeker [11] defined the process of perceiving space as an inter-permeating, transient and merging process including (but not limited to) the space of perception, space of action (lived space) and intuitive space. The permeation of spaces within social interaction of human beings can be seen as a potential seed for generative design processes. The ability of a single human being to be physically situated in one location but mentally (psychologically) in another is an indication for the existence of different permeating spaces. This phenomenon makes it possible to form social networks and to build up social spaces between places and people who are physically apart from each other. A shared virtual space is networked. Networked spaces are perceived in a non-linear manner due to the simultaneity of the perception and presence of different spaces at the same time. The possibility to form or inhabit different spaces simultaneously is the first condition for generation of a shared virtual space on the basis of social interaction.

According to figure 1, even virtual space takes part in the inter-relational theory of space. "The virtual is opposed not to the real but to the actual," according to Deleuze [2]. Virtual space is an alternatively generated reality. Virtual space is just a view on real space, just a part in the inter-relational field in the theory of space. Possible structures of virtual space can be visualised just like other types of real space e.g. physical space. But the process of visualisation/actualisation of the virtual makes structures visible which are not perceivable in real/physical spaces. The possibility of visualisation of the structure of virtual space is the second condition for the generation of a shared virtual space.

In the process of the constitution of shared virtual spaces, an individual plans and acts in one space, but the result is shown in another space. The individual occupies two spaces at the same time and perceives each of the spaces differently. The individual is physically located in

one place and has a remote and symbolic presence in the other space. Mapping individual space is the third condition for the generation of a shared virtual space.

Due to a different constitution of these (physical and virtual) spaces, the action of the individual has another impact on the social structure of space. In the real/physical space, our actions are determined and guided by given structures. These structures are mainly institutions which are build up collectively and result in a spatial representation, which is a fairly stable result of this process due to a reproduction of the same structures in the same way. The constitution of the shared virtual space that I describe shows similarities to such structures in real/physical space but there is no stable result of this process. Our own actions define the space that in turn determines the context for subsequent action. One can see a direct impact of one's action on this temporary formation of space, which one couldn't observe in real/physical space. The constitution of a shared virtual space seems to be determined and guided by the participants whereas in real/physical space the spatial structures and constraints seem to be socially given and fixed. On the other hand, the shared virtual space can only be accessed through an interface, which is also a structure that guides our action and interaction. The shared virtual space I will describe is dynamically expressed in the interactions between users and the structural definition of these interaction spaces but within the boundaries of a framework - the interface. Social space is an expression of the meeting of individual spaces in interaction. The mapping of individual action and social interaction space is the most important prerequisite for the generation of the shared virtual space.

3.2. Social Interaction in a Shared Virtual Space

Types of social interaction in shared virtual spaces can be divided into verbal and non-verbal communication. Verbal communication in shared virtual spaces includes spoken and written language. Non-verbal communication refers to physical language (gesture or mimic). Correspondingly, interaction in shared virtual spaces can be "communication-centred or artefact-centred" according to Xiaolong and Furnas [13]. "While the former focuses on contents and implications of exchanged messages, the latter emphasises the mutual understandings of artefacts and users' activities related to artefacts." [13] This strict distinction between communication and artefacts does not apply to the shared virtual space that I will present. On the one hand, the chat application bases on textual communication. But on the other hand, the users generate artefacts as visual expression of the communication process, which influence their activities.

Referring to Figure 1, social space takes a special position in the relational field of spaces since social interaction involves spaces of both perception and cognition (spatial sensation and behaviour) as well as ideational/imaginary space (social conventions or implementation of abstract ideas of space). Social interaction is based on our sensation of space, but this sensation is also related to our social and collective view on the idea of space, which might differ from culture to culture. In turn, the personal view and perception of space influences the collective view of space amongst the participants in the shared virtual space. Every interaction re-generates and re-structures social space. Social interaction in the shared virtual space that I refer to is able to actually produce (generate) changes in the visual environment of the space in ways that are not possible in real/physical space. Social interaction generates new relations between the virtual objects and moreover re-structures the virtual environment. The re-structuring of space is made visible through the interrelation of verbal and non-verbal

interaction. This positive feedback process can be observed in the shared virtual space I bring up later on. (Figure 2)

This feedback process is a result of the process of self-organisation within the chat system. The self-organisational process is characterised by a non-linear communication flow and movements towards dynamic attractors (probably as many as there are user in the system!). Spontaneous self-organisation is difficult to observe in text chat systems that are programmed for non-linear and parallel interactions under local system conditions (World Wide Web connection speed, server-regulated order of incoming text to display on the screen). Text-based chat applications provide view visual indicators on social roles/social settings or possibilities for giving feedback.

In contrast, in a visual virtual chat space social interaction is not only expressed in the textual communication flow but can also be perceived in the visual environment of the space. Social interaction can be stimulated by the visual environment, which is expressed in the spatial relation of the virtual objects. Changing relations between the virtual objects help to build up an awareness of the "social setting" of the virtual environment. Even those interactions within the shared virtual space in which one does not personally participate have a visible effect on the environment one perceives. One could say that social interaction in the shared virtual space is not just object-orientated but environment-orientated. The relations between the virtual objects are dynamic. Furthermore the interaction-dependent spatial relations are the seed for continuing social interaction in shared virtual environments.

The interface for the visual virtual chat space I am describing is on the one hand the point of access to this space and on the other hand the structure upon which the space is generated. The chat space interface embodies special social conventions and structures to guide and map personal action and social interaction in the form of textual input, an algorithmic visual display and ordering system and the self-organising process of the communication flow continuing in textual inputs and changing visual outputs. The shared virtual space is self-organising within the constraints of the given framework - the interface. The interface is on the one hand limitation but on the other hand the only way to access the space, which is in fact generated within and through the process of entering the space.

The qualities of social interaction mentioned above constitute the seeds for the generation of a shared virtual space. The interface is the structure to access the space and guide the interaction. The actual expressions of this space are generated by the use of the interface and so by the users themselves. An example of the visual (three-dimensional) virtual chat environment is shown in the following Figure 2.
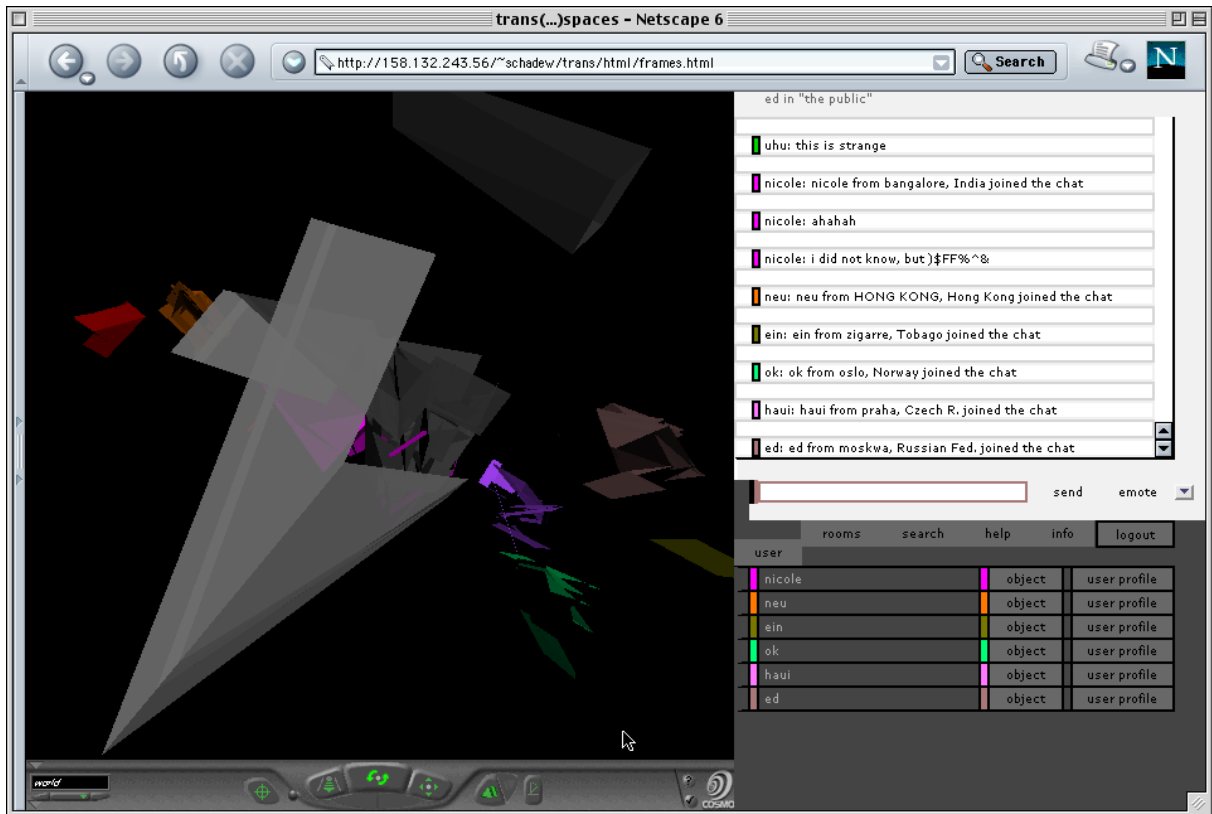
Figure 2 - Chat-Interface "trans(…)spaces"

3.3. Application

The generative principles extracted from the social interaction process have been applied in the design of the visual virtual chat space "trans(…)spaces".
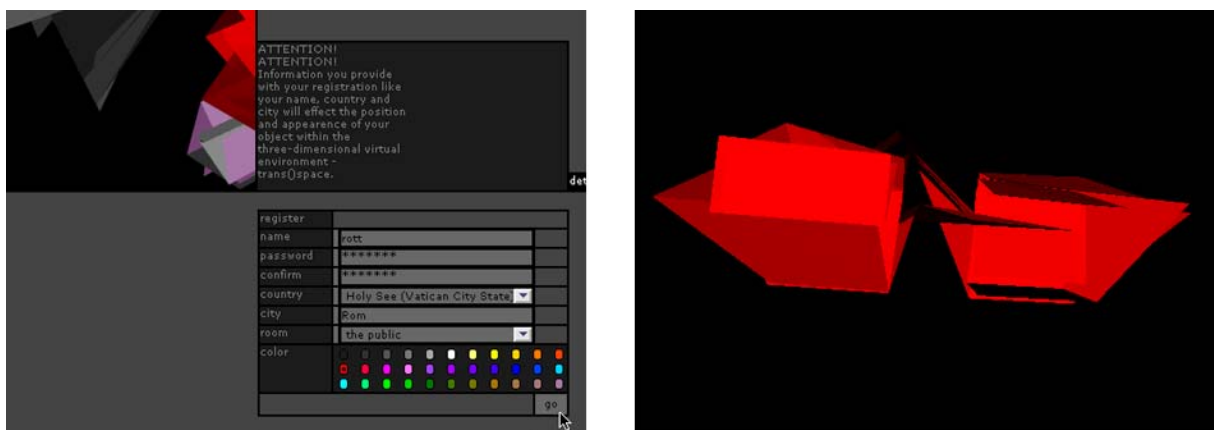

Figure 3/4. To log into the chat space the potential user has to input some information, including his/her name, a password, city and country of origin, and must make a choice as to the colour of his/her virtual object. All values influence the appearance and location of the user's virtual object.
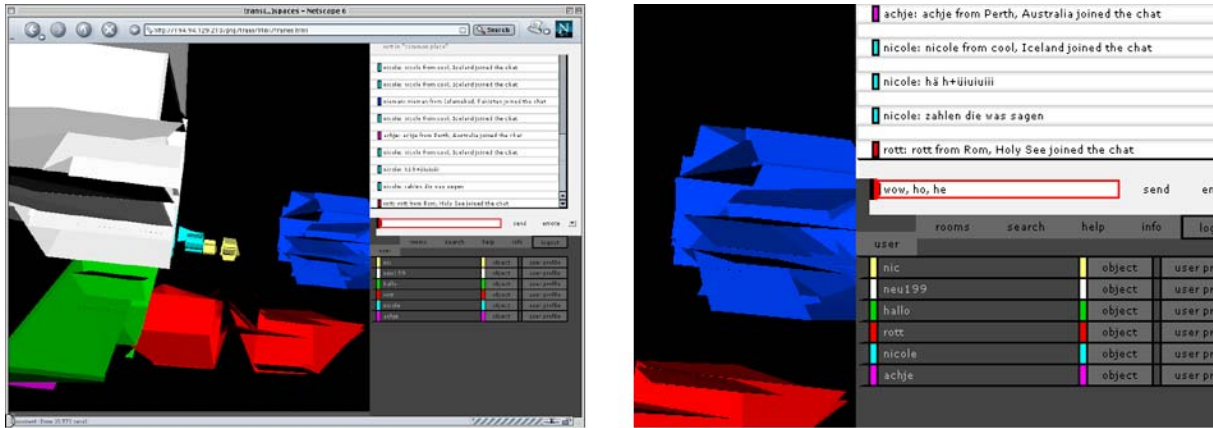
Figure 5/6. The entire sentence "rott from Holy See, Rom joined the chat" is processed to map the form of the object. The position within the virtual World (VRML) is calculated from the first characters of the name, the country and city. Each time the user enters a new string (statement into the chat-discussion), an algorithm computes the string into the new virtual object. The shape is changes with every new statement.
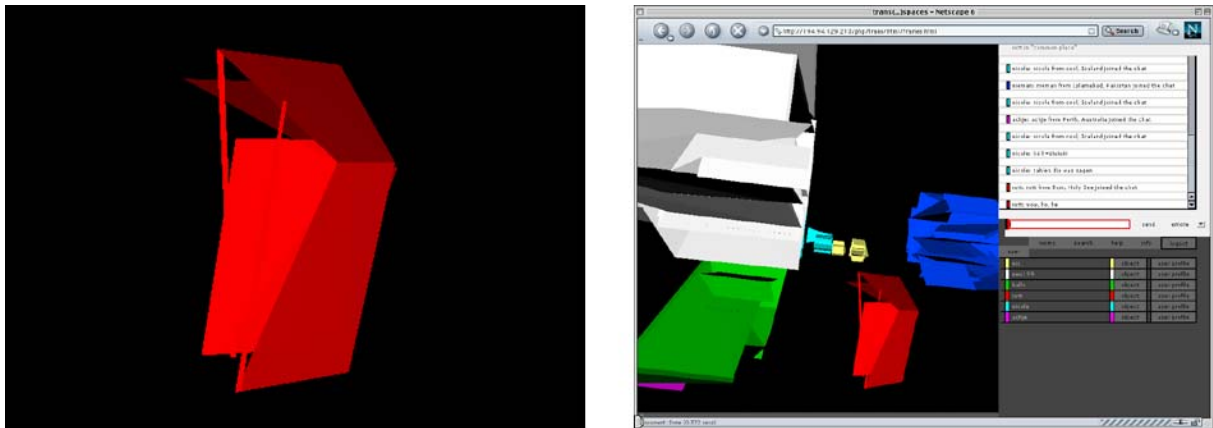

Figure 7/8. Not just the shape, but the entire virtual environment changes. The change in the environment is even better perceivable if a word matches an already registered one (within its first use). The form is moving towards the representative virtual object of the user, who said this word the first time. (Figure 11.)

The interface can be seen as an intersection - a connection of different spaces. The user enters from a real-physical place into a shared virtual space using the chat interface. I referred to the condition of permeating spaces as first generative prerequisite. The user enters the interface mentally. The body remains physically in the same place. The spaces are connected in the perception of the user. The origin of the user's object in the shared virtual space is related to the user's real/physical location but in the logic of the generated space. The login takes place on the basis of the data given by the user - name, country and place of origin.

The system for the interpretation of data and generation of the environment by the computer is drawn from the mode of interaction in a chat room - textual communication using characters of the alphabet, which form words and sentences constituting the medium of interaction. The computer's internal representation of characters is the ASCII System (Figure 9). In this conceptual model the user is origin of the communication process and output. The user is considered the central point of this model. The communication flows away from the centre of origin in a virtually undirected motion.
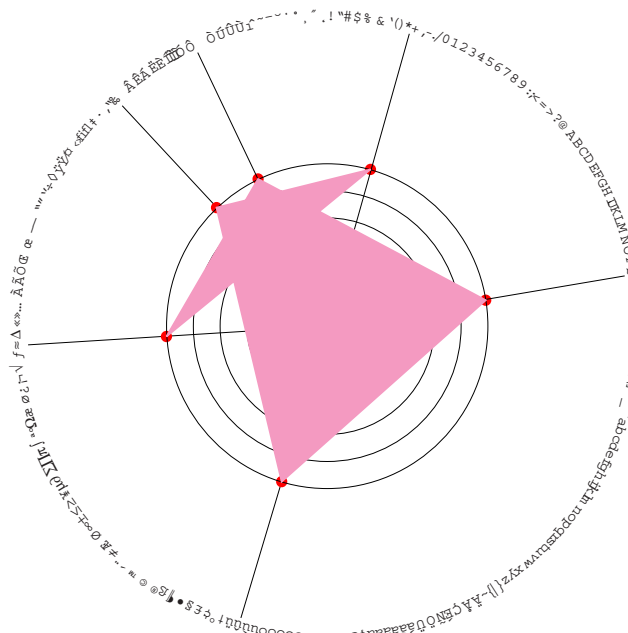
Figure 9. Representation of the modelling of a virtual object by an algorithm to extrapolate form from text using the ASCII system (computer intern character representation). The shape is created starting from the centre of origin, the user's login co-ordinates.

Based on this model of thought the computer generates the initial object according to the values input by the user in the login process. The co-ordinates for the generation of each object in virtual space are based on the ASCII values of each character used in the login information. The ASCII values are inserted in the VRML (Virtual Reality Modelling Language) "geometry Extrusion" function, which builds up the virtual object. (Figure 10)

```
Shape {
        geometry Extrusion {
                crossSection [
                # rott from Rom, Holy See joined the chat
                4.5 11.4, 4.5 11.1, 4.5 11.6, 4.5 11.6, 4.5 3.2, 4.5 10.2, 4.5 11.4, 4.5
                10.9, 4.5 3.2, 4.5 8.2, 4.5 11.1, 4.5 10.9, 4.5 4.4, 4.5 3.2, 4.5 7.2, 4.5 11.1,
                4.5 10.8, 4.5 12.1, 4.5 3.2, 4.5 8.3, 4.5 10.1, 4.5 10.1, 4.5 3.2, 4.5 10.6, 4.5
                11.1, 4.5 10.5, 4.5 11, 4.5 10.1, 4.5 10, 4.5 3.2, 4.5 11.6, 4.5 10.4, 4.5 10.1,
                4.5 3.2, 4.5 9.9, 4.5 10.4, 4.5 9.7, 4.5 11.6,  ]


                spine [
                1.14 11 4, 1.11 10 1, 1.16 11 6, 1.16 11 6, 0.32 3 2, 1.02 10 2, 1.14 11 4, 1.11
                10 1, 1.09 10 9, 0.32 3 2, 0.82 8 2, 1.11 10 1, 1.09 10 9, 0.44 4 4, 0.32 3 2,
                0.72 7 2, 1.11 10 1, 1.08 10 8, 1.21 11 1, 0.32 3 2, 0.83 8 3, 1.01 9 1, 1.01 9
                1, 0.32 3 2, 1.06 10 6, 1.11 10 1, 1.05 10 5, 1.1 10 0, 1.01 9 1, 1 9 0, 0.32 3 2,
                1.16 11 6, 1.04 10 4, 1.01 9 1, 0.32 3 2, 0.99 9 9, 1.04 10 4, 0.97 9 7, 1.16 11
                6, ]}}
```

Figure 10 - VRML Code and interpretation of the code into the virtual object

With every following contribution of statements to the chat the virtual object changes. The object is an expression of the "social distance". Social distance is an important concept In defining borders of each person's social space and also borders of social groups. The object is equivalent to an individual virtual space around the person. In the chat system, the personal space is defined by propositions. Every proposition plays a part in defining not just the individual space but also the structure of the entire visual virtual space. The relation of a user to others in the space is dynamically defined by accordance with the keywords said in the chat. If a keyword matches one already held in the database, the object moves half the former distance to the object with the keyword-ownership. (Figure 11)
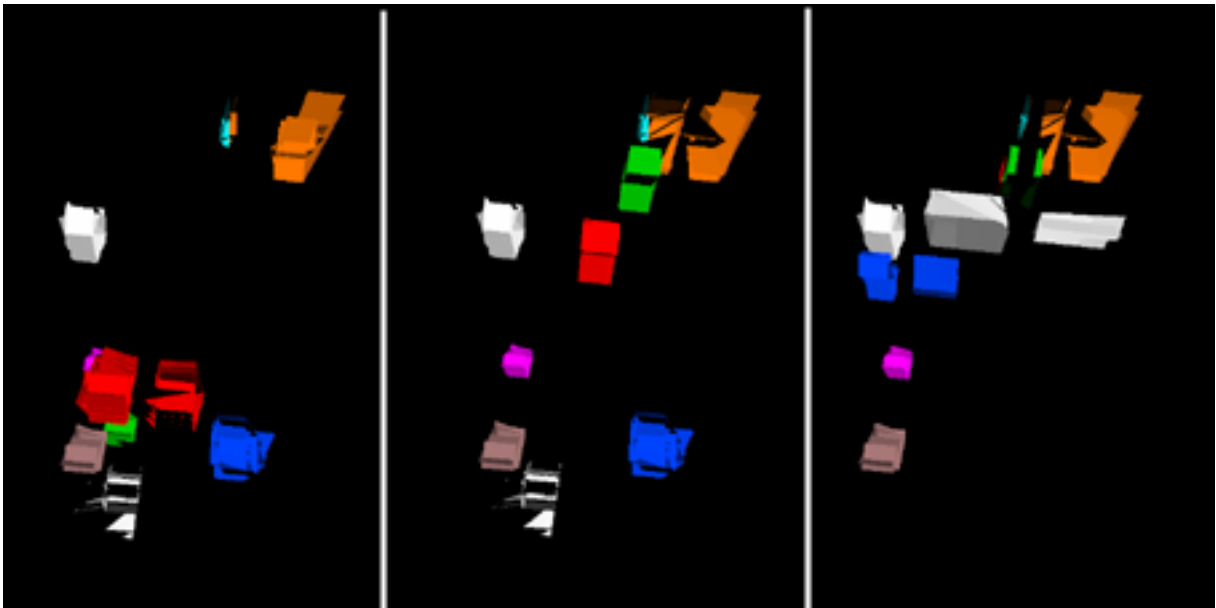

Figure 11 - movement

3.4. Evaluation

The two main types of generative output are the generation of the form based on the textual communication and the spatial expression of relations between these objects based on the thematic discourse (keyword accordance). Textual input and spatial output are interrelated in a positive feedback process.

The object is the expression of the individual space, but the movement and location of the object in relation to the others is an expression of the self-organising principle of the social space. Due to the constant repetition of the generative process, the objects are members of one "family of form" [4]. The generation of a dynamic self-organisational social space is only achievable through the interaction of the users. The interaction takes place between the users themselves but also between the structures of the chat system and each user. The users structure space through their social interaction. This space sets the environment for further action. Every interaction and positive feedback process has an influence on the further generation of the space. The space is "re-generated". Just one part of the social interaction, the verbal communication, is used to map the interaction space in the first instance, but verbal communication generates visual communication and visual communication "re-generates" verbal communication. The "re-generation" of space is a generative principle within this social network. I was able to observe with different users that the generated shape and position of the object had a direct influence on the following chat-statements contributed to the discussion. The object enhanced the interaction processes, which had a positive feedback on the object (similar shapes). Similarity of the objects and enforced grouping of related objects strengthens the social community.

In this application structures of social space, which have not been visible before and could never made visible in real-physical spaces, have been composed in a visual interpretation. The process-orientated generative design approach is used to involve the users action in the design outcome. The generative principle of repetition is utilised to strengthen the feeling of one community. The familiar and established social characteristics of chat rooms are enforced with the generative abstract representation of the chat statements. People entering the chat are equal in their visual representation to a certain degree. They can influence their representation. People with the same interests meet easily. There is a very high likelihood meeting people with similar interests according to their chat statement, object shape and relational position with help of the structuring interface functions, as well as by chance due to the self-organisational communication process.

Much work in generative design uses computational processes to compose generations of form. Afterwards, the designer chooses some examples from the variety of results. I use computational processes to let the user interact with the generative processes in the user design of a shared virtual environment. I, the designer, don't choose the form or position of the virtual objects. Rather, I set the parameters in which the users generate their own environment. The space is generated dynamically and self-organisationally through chat communication within a given framework. The non-linear character of chat communication generates a new form of discourse, which is mapped in this application.

Attributes of networked spaces such as non-linearity, simultaneity and relatedness or connectivity are mirrored in the formation processes of this shared virtual environment. Networks are somehow paradoxical. On the one hand, they widen and extend the perceived space by opening up potential connections. On the other hand they connect places which are spatially far apart. In this sense they make distances appear smaller. Thus, the traditional perception of space is disrupted. There is not just one space, but many relational spaces constructed simultaneously. The permeation of different spaces is one generative condition of this chat space. From my point of view, this chat space builds upon a strong architectural metaphor, in which the architecture of social interaction is mapped into visual virtual architecture. This virtual architecture consists of relations and connections between the user. The user directly generates his or her environment.

4. Limitations, challenges and outlook

In its current state of development the chat system has technological limitations concerning the hardware and software that is used. The performance of the rendering is lacking in speed and the display in quality. The processing of the incoming strings of text and their transformation into the three dimensional environment is handled by the programming languages PHP and VRML. PHP reads the data from the MySQL database and writes it into the VRML function. The lack of build-in features for database connection in VRML makes it very difficult to handle large amounts of data efficiently. From the technological side, there may be solutions such as using JAVA3D. Some limitations may be overcome by new technological developments. But from my point of view the real challenge in this project lies in the research area of intercultural communication and the means that are currently used to communicate with other cultures using the World Wide Web and chat applications.

At this stage in the development of the application, the generation of form and environment is essentially limited to interpretations based on the internal system of computer-mediated communication (ASCII). From my point of view, a wider range of formal expression would be helpful in the context of intercultural communication. It seems to me that this challenge could best be addressed by an approach that involves even more utilisation of user action and interaction in the definition of visual virtual space. Issues that must be addressed in this context include the achievement of a more personalised or individualised expression whilst maintaining a recognisable "family of form" and a communal environment.

The usage of language in chat applications reveals dynamic cultural processes of communication and exchange. In chat rooms, the language of communication and exchange is mainly the English language. The use of English differs from user to user depending largely upon her/his cultural and linguistic background. Every user brings parts of her/his own personal usage of the language into the chat language, which bears little resemblance to "standard" English. Language as a cultural expression is dynamic (adoptive, morphologic) in cultural exchange processes. Culture is a process, with each culture living through exchange processes with other cultures. Is it possible and useful to make these processes visible and accessible in chat rooms? From my point of view, being aware of cultural differences can help in improving the process of intercultural communication.

Dynamic processes in the use of language are not easy to codify and map, but it is my hypothesis that these language differences can be expressed through algorithms, which generate differentiated visual output reflecting aspects of the particular use of language. I think the dynamic process within the use of language chat applications can become a generative seed for the visual communication of cultural processes.

The main generative approaches used in the design of this chat system are the process-oriented generation of shared virtual environments, the repetitive iteration of the process and the variations generated by the dynamic communication processes. This type of environment has no spatial precedent in other real/physical spaces. Communication appropriates space in this application. The process of communication demands a dynamic space. The space that is generated by communication is in constant flux as a result of the dynamic nature of the communication process.

4.1. Space of language in intercultural chat communication

These thoughts set the parameters for a new approach to the problem, which examines ways of mapping intercultural communication in a chat room application using natural language as a source of generative seeds. In the Project discussed above I have deduced generative seeds from statements within chat communication. The criteria I used as generative seed have been derived from the smallest components (characters) of the chat statements and the accordance of single words used in the chat-statements. As a next step I want to explore whether other aspects of language - not just characters, but words and the meaning of words (semantic) set in context (pragmatics) - could be used as generative seeds. A deeper understanding of intercultural communication in the World Wide Web and in chat applications requires studies into linguistic discourse in chat communication. Studies in discourse are based on the analysis of language beyond the sentence. Typical analysis of language, which are mainly based on grammar, syntax, morphology or semantics, are also important to the discourse analysis, but the context in which language is used influences the discourse to an even greater extend.

The first exploration of the idea of generative grammar were made by Chomsky [1]. Schmidt proposed that the same ideas may be applied to architecture [10]. Shape grammar is an analogy of architectural formation to language formation, which happens, according to Chomsky, with the help of two components: a reservoir of words on one side, and rules, which determine the combination of these words - the grammar - on the other side.

The users build their own virtual architecture within their discourse in chat communication. They are not just using words put together by a set of rules, which is grammar, but the grammar is put into a context and produces a new typology of communication. Every user has her/his own set of rules. Each participants use of language is culturally influenced and unique. But these typologies influence each other as well. The chat environment is a new social environment, which produces its own context. The use of language in this context produces new set of rules for the generative design of its virtual environment. This applies not only to a grammar of shape, but also to a generative visual discourse, a visible rhetoric or visual communication in virtual environments.

Zellig Harris introduced the term "transformation" in the context of linguistics [5]. He transformed metaphorical descriptions into a mathematical theory of language. This theory claims that combinatorial constraints are socially transmitted in evolutionary terms. Landa commented on the idea of combinatorial constraints: "Combinatorial productivity would not result from a centralised body of rules, but from a decentralised process in which each word locally restricts the speakers choice at each point in the construction." (pp. 219 [7]) In a local speech community some word orders are more likely or frequently to appear than others. The word order is socially obligatory information. Syntactical elements are not separated from semantics or pragmatics, because combinatorial constraints will not allow one to change one element alone but only in combination with each other. Combinatorial constraints are morphogenetic: "as new constraints emerge from conventionalisation of customary usage, changing the probabilities that words will co-occur, language structure self-organises as a process involving successive departures from equiprobabilty (i.e. randomness) in the combination formed by replicating norms." (pp. 221 [7])

Harris' theory of transformation has implications for the generative approach to intercultural discourse mapped in a visual chat communication. In chat communication, not less than three typologies are included in generating one space. At least two of them are related to the local

cultural contexts of the individual users, which come into contact in a common pool to form one environment - the third typology. The new typology is generated through the new social community and its special/transformational use of the English language. This can't be achieved by the use of a universal grammar, so the environment is likely to be generated by combinatorial constraints. These morphological combinatorial constraints in the structure of chat language are self-organisational. The process of generation of a visual virtual space that is formed through chat communication has to be morphological and self-organisational, too.

New research experiments in the field of shared virtual chat spaces can be derived from the ideas of generative grammar and combinatorial constraints. The culturally differentiated use of the English language in chat applications can be used in research case studies on possible expressions of culturally influenced visual languages in shared virtual spaces. The use of language in social interaction might be able to be used to generate a shared social virtual architecture, which refers to unique cultural expressions (typologies) in one virtual community.

5. Conclusion

Visual virtual chat spaces are shared virtual spaces. They are characterised by their special social interaction process and outcome. This process is generative. The user of the chat interface generates the visual aspect of the environment. An algorithm in VRML translates chat statements into commands for the transformation and "re-generation" of the visual environment based on the ASCII values of the characters contained in the statement. Future work concerning shared virtual spaces will be related to natural language and the possibility of mapping intercultural processes through the differentiated usage of English to generate a culturally differentiated visual language in visual virtual chat spaces.

Acknowledgements

References

[1]   Chomsky, N. (1965) Aspects of the theory of syntax. Cambridge. M.I.T. Press.

[2]   Deleuze, G. (1995) *Die Falte - Leibniz und der Barock.* Frankfurt a. M.: Suhrkamp.

[3]   Disz T. L., Olson R., Papka M. E., Stevens R., Szymanski M., and Firby R. J. (1997) *Two Implementations of Shared Virtual Space Environments.* URL: http://www-fp.mcs.anl.gov/fl/publications-electronic-files/two-implement-652.pdf. On 19-Nov-02.

[4]   Fischer Th., Herr C. (2001) *Teaching Generative Design.* URL: http://www. generativeart.com /GA2001_PDF/fischer.pdf. On 12-Nov-02.

[5]   Harris, Z. S. A. (1991) Theory of language and information: a mathematical approach. Oxford [England]: Clarendon Press.

[6]   Heymann, Th. (1989) *Komplexität und Kontextualität des Sozialraumes.* Stuttgart: Steiner.

[7]   de Landa, M. (2000) *A thousand years of nonlinear history.* New York: Swerve.

[8]   Löw, M. (2001) *Raumsoziologie.* Frankfurt a. M.: Suhrkamp

[9]   Newton, I. (1803) *The Mathematical Principles of Natural Philosophy,* Book III, Andrew Motte, trans., London; H. D. Symonds, URL: http://campus.northpark.edu/ history/ classes/Sources/Newton.html. On 18-Nov-02.

[10]   Schmidt G. (1993) *Architectura et Machina.* Computer Aided Architectural Design und Virtuelle Architectur. Braunschweig/Wiesbaden: Vieweg.

[11]   Ströker, E. (1992) *Philosophische Untersuchungen zum Raum*. Frankfurt a. M.: Klostermann.

[12]   Thorn, S. K. (1996) *Gekruemmter Raum und verbogene Zeit: Einsteins Vermaechtnis.* Muenchen: Droemer Knaur.

[13]   Xiaolong Z., Furnas G. W. (2002) *Social interactions in multiscale CVEs*. Proceedings of the 4th international conference on Collaborative virtual environments. URL: http://www-personal.umich.edu/~xiaolong/p70-zhang.pdf. On 19-Nov-02.