Interaction in Networked Virtual Environments as Communicative Action: Social Theory and Multi-player Games

Tony Manninen

Department of Information Processing Science, University of Oulu, Finland
tony.manninen@oulu.fi

Abstract

The ambiguous and highly subjective meanings assigned to the word "interaction" makes it difficult for the researchers and practitioners, who work in the area of virtual environments and applications, to communicate and join their research efforts. The aim of this work is to provide more understanding on the interaction occurring inside Networked Virtual Environments (Net-VE) by analysing the communicative and social aspects of computer-mediated interaction in multi-player games. The work is conducted using conceptual analysis by applying Communicative Action Theory as a scientific framework. The main contribution of this work is the proposed interaction taxonomy which is analysed in the light of social theory. The successful application of social theory framework as a tool to analyse interaction indicates the importance of joining the research effort of various disciplines in order to achieve better results in the area of Net-VE interactions.

1. Introduction

The aim of this paper is to provide more understanding on the interaction occurring inside Networked Virtual Environments (Net-VE) by analysing the communicative and social aspects of computer-mediated interaction in multi-player games. The underlying approach selected for this research is to utilise entertainment industry solutions (e.g., games domain) in other application areas, such as distribution support or Computer Supported Co-operative work (CSCW).

Bowman and Hodges [1] point out that the current applications within entertainment sector do not usually require complex interaction between the user and the system. Although the user may be interacting frequently, the interactions are mostly simple in nature. This may lead to the conclusion that interaction is a major reason for the lack of real-world usage of more complex applications, thus, suggesting various research topics for the areas, such as, human-computer interaction and computer-mediated interaction. For example, the enabling nature of *rich interaction* and the corresponding benefits to the users can be considered as an interesting area for further research.

According to NRC [2] the meaning of word interactivity is not yet fully explored, thus, suggesting further and deeper studies of multidisciplinary approach. Furthermore, the report states *t*hat research should also concentrate on understanding interaction in terms of how it is defined and perceived, what is expected and needed, and what are the analogues, for example, in theatre, storytelling, improvisation, and entertainment industry.

The **research problem** of this paper is related to the conceptual aspects of interaction. The main task is to find out whether it is possible to map the proposed interaction taxonomy to actions described by Habermas' Communicative Action Theory (CAT) [3] and what are the benefits of analysing interaction in multi-user games by using social theory. The answers to these questions have been searched through conceptual analysis by applying CAT as a scientific framework.

2. Net-VEs and Interaction

Virtual Environments (VEs) provide another means of simulating real world places and activities. A VE is computer-generated simulated space with which an individual interacts [4]. Further definition and expansion of the term is provided by Singhal and Zyda [5]: "Networked Virtual Environment (Net-VE) is a software system in which multiple users interact with each other in real-time, even though those users may be located around the world." These environments aim to provide users with a sense of realism by incorporating realistic-looking 3D graphics and even stereo sound, to create an immersive experience.

The definition of interaction in the context of this research can be considered to follow the lines of natural

interaction occurring in real life environments. The main focus of this interaction study is *inside* the VE, thus, the emphasis is on the perceivable behaviour and actions of the user's embodiment.

With more channels of communicating, ambiguity is reduced by providing more dimensions of elaboration for any message. In recent years, a significant consideration in developing Net-VEs has been to enhance the shared behaviour and interaction within the VE. Even the high-quality environment is still lifeless if it lacks the shared behaviour and interaction among the objects. This means that creating virtual environments with realism in them requires collaborative interaction among humans and machines [6].

Interactivity is the extent to which the user feels convinced of the mutual effect that he or she and the environment have on one another. Better interactivity produces a more pleasing, better-controlled interaction with the virtual environment. Level of interactivity is a function of the speed of response, the range of possible user interactions and the mapping of controls [7].

The main reason for the creation of the interaction classification model is the generally ambiguous understanding of what the concept of interaction exactly includes. The tentative interaction taxonomy acts as a concrete set of examples and categories of interactions that can be found in current Net-VEs (e.g., games). The basis for the taxonomy is the categorisation of various interactions in terms of purpose, context, and acting entities (e.g., body parts, fellow team members, etc.).

3. Communicative Action Theory

The scientific framework, used in the analysis of interaction in Net-VEs, is the CAT presented by Habermas [3]. The theory has been applied, for example, to information systems development and use, and to communication-based business activity modelling. The work presented in this paper follows the principles and guidelines provided by Janson et. al [8].

CAT consists of six main types of social actions available to participants. The success-oriented *instrumental action* is performed by the individual aiming to advance his or her personal interests. The individual seeks to bring about a wished for condition by behaving according to technical rules derived from empirical knowledge or theoretical models. The goal-oriented *strategic action* occurs in the social world and involves two or more individuals who seek to bring about a desired state of affairs. This means that an individual, while assessing the expected results of his or her action, takes into account the action of at least one counterpart. *Normatively regulated action* occurs when members of a

social group act in accordance with common values. The members expect that their counterparts will behave in a particular way under certain situations. *Dramaturgical action* is the presentation of self in a public forum. It disseminates understanding about the individual's strengths and weaknesses, whether true or fake. *Communicative action* aims to bring about consensus through rational argument. The individuals arrive at a common description or a consensus of the situation through a process of negotiation, and they co-ordinate their action plans based on the aforementioned situation description. *Discursive action* aims to establish a set of common norms for all participants. It entails the explanation, discussion and even criticism of the validity norms that govern communicative action.

4. Previous Research

Interaction has been studied in several fields and under several names. Action, communication, behaviour, manipulation, and simulation are all closely related to the term interaction as used in the context of this research. The models, modes and types of interaction have been presented, for example, in the areas of human-computer interaction [9,10], affective computing [11], autonomous agents [12], virtuality [2], and VE design [13].

Some of the drawbacks found by previous research include the lack of techniques to handle the need for directional changes in the distributed modes of the group support systems. The lack of non-verbal cues and other components of body language that encourage engagement in a social interaction situation such as meeting are absent in existing distributed meeting systems [7].

5. Communicative Actions in Games

The analysed material is based on the author's personal experience on participating in game sessions. Some of the data has been collected using ethnographical approach by observing ongoing gaming sessions.

The games that have been studied include *action games* (e.g., Unreal, Action Quake, Counter Strike, Capture the Flag) and *role-playing games* (e.g., EverQuest, Ultima Online). The text-based games and flight simulators have been left out of this study.

The following section describes some examples of interaction types that can be found in the multi-player games. The nine top-level interaction categories presented by the taxonomy are illustrated according to the corresponding communicative actions and a set of concrete interaction examples is provided.

Instrumental: *Avatar Appearance* is a clear example of personal achievement. The games that have longer relationship between the player and his or her avatar encourage the player to make an effort in developing the character as a symbol for personal achievement. *Control & Co-ordination* involves possibility to prevent damage by running across dangerous area or by jumping over a pool of toxic waste. *Object-based interactions*, such as placing a bandage over the wound in order to stop the bleeding are common in material balancing games. For example, donning a special protective suit makes it possible to enter locations that would otherwise be impossible to reach. *World Modifications* are still quite limited in action games, but there are several simpler examples of breaking containers to collect consumables, or pulling a lever to get the drawbridge down.

Strategic: *Autonomous* category includes a set of pre-programmable actions and counter measures that can be used to anticipate other players' actions. There are examples of automatically blocking a surprise attack, evading stronger opponent when critically wounded, or even initiating counter attack without the player's direct command. *Avatar Appearance* can be used as decoy in cases where the team colours are used. Furthermore, wearing special equipment makes it possible to gain advantage. *Control & Co-ordination* is the main strategic class in all of the competitive games. Ambushing attacking team, defending the flag, and crawling in order to avoid exposure to enemy are examples of this type. *Language-based Communication* forms a strategic backbone in games that value the communication aspects. However, there are several examples of this action in fast-paced shooting games. Bluffing the opposite team by using false status reports, or distracting the enemy by feeding in irritating taunts indicate the use of this interaction class. *Object-based* interactions can be strategically utilised, for example, by using extra energy to gain advantage, or stealing the critical artefact before others can take it. *World Modifications*, such as, cutting the access by destroying the bridge, or, opening the trapdoor located under the opponent are examples of achievements that are based on the actions of others.

Normatively Regulated: *Autonomous* interactions are strongly opposed form of actions in a settings where the balance of the game is easily disrupted by using ready-made automatic procedures, although some amount of autonomic interactions may be forced by the system as essential part of game rules. *Avatar Appearance* can regulate the colours, skins, or shapes of the avatars inside the team. The visible equipment may also be used to indicate special role or abilities of a team member (e.g. red cross pack of medic or magic wand of wizard). *Control & Co-ordination* category includes "camping", or hiding in a special place while sniping other players one by one, which is quite strongly regulated by playing communities. Also, the soloing players in team-oriented games are usually the targets of dislike. *Gestures* can act as a secret code of a player group. For example, waving hand when encountering other avatars can be part of the protocol developed by a clan. Perhaps the strongest evidence of normatively regulated *Language-based Communication* is the debate and pursue of in-character language in RPGs. The role-playing enthusiasts want to have as strong suspension of disbelief as possible, and thus, they want the communication to follow the norms of the game setting. *Physical Contacts* and *World Modifications* are usually strictly regulated by the system, but there are occurrences of player community based regulations. For example, building a castle too close to other players' premises may lead to serious quarrels.

Dramaturgical: *Avatar Appearance* can be used to reflect players' style and attitude, truly or falsely. The equipment carried is used to show the power of the player, and even the names of the avatars can indicate a purposeful dramaturgical act. The *World Modifications* include examples of similar actions. *Control & Co-ordination* interaction is used in the tactical decoying of the opponent with false attack while concentrating on a strong ambush elsewhere. *Gestures*, such as raising both hands as a sign of surrendering, can be a strong part of the act if these types of interactions are supported by the system. Unfortunately, the use of gestures is still relatively limited in multi-player games. *Language-based Communication*, such as calling the medic when not actually wounded can be used to create false illusion of the player's current status. Similar action can be executed by using *Object-based* interaction, such as, using weaker weapon while preserving the stronger one for emergency use. *Physical Contact* category, and especially the elimination of other players can be used as idealisation purposes (e.g., fair play) or mystification purposes (e.g., surprise attacks).

Communicative: *Control & Co-ordination* can be aimed to find consensus in team configuration or attack/defence synchronisation. In RPGs the adventurer group is usually following at least some amount of communicative action. Most of the negotiations are executed through *Language-based* interactions, thus, making language as main tool for this action. In consensus-seeking settings, the *Object-based* interaction category includes interactions such as sharing the treasure equally among adventurer group, and exchanging artefacts by utilising win-win principle.

Discursive: *Autonomous* interactions and *Physical Contact* in the form of player killing can be highly criticised, partially limited, and even totally banned in

game settings that are easily unbalanced. Sometimes the decision to limit these types of actions may not be successful on player basis only. This has resulted in specific gaming servers that disable certain features, and gaming worlds that consist of separate zones with individual norms. Discursive action may also be executed in *Control & Co-ordination* category, if, for example, the configuration of teams is not balanced. The weaker team may problematise the original configurations based on the current situation.

The CAT can be criticised in the light of the conditions under which the communicative action takes place. The idealistic environment with freely speaking, highly contributing, and collectively acting individuals may be hard to find in real world. On the other hand, game settings and communities may enable totally different conditions than in other cases. The motivation and contribution issues may not be that uptight in the field of entertainment.

Second limitation of CAT is the language-centred perspective. The assertion that language enables and supports all human action is somewhat limited when considering the aforementioned analysis. Majority of the interaction types was not based on language, but instead, they were based on the actions and non-verbal behaviour of the individual.

6. Conclusions

The research illustrated in this paper describes the concept of interaction in order to lay the basic ground for further research. More understanding on the interaction occurring inside Networked Virtual Environments was provided by analysing the communicative and social aspects of computer-mediated interaction in multi-player games. The main categories of the proposed interaction taxonomy were analysed in the light of Communicative Action Theory.

The analysis indicates that there is a strong social aspect in current networked multi-player games. Even the games that contain a limited amount of language-based communication have several interactions that follow the types of social actions.

Furthermore, the findings suggest that the proposed interaction taxonomy reflect the types of actions occurring in multi-player games. Some amount of overlapping and confusion indicate that the taxonomy could also be constructed based on the six social action types instead of the categorisation selected by this author. On the other hand, the taxonomy of interaction could be presented from several perspectives, every one of them providing correct categorisation of interactions.

The successful application of social theory framework as a tool to analyse interaction indicates the importance of joining the research effort of various disciplines in order to achieve better results in the area of Net-VE interactions. The utilisation of real-world social patterns as basis for VE interactions might result in more usable and acceptable solutions.

Acknowledgements

References

[1] Bowman, D. A., and Hodges, L. F. (1999). "Formalizing the Design, Evaluation, and Application of Interaction Techniques for Immersive Virtual Environments." *Journal of Visual Languages and Computing*, 10, 37-53.

[2] NRC, U. S. N. R. C. (1997). *More Than Screen Deep - Toward Every-Citizen Interfaces to the Nation's Information Infrastructure*, National Academy Press, Washington, DC.

[3] Habermas, J. (1984). *The Theory of Communicative Action*, McCarthy, T, translator, Beacon Press, Boston, MA.

[4] Witmer, B. G., Bailey, J. H., and Knerr, B. W. (1996). "Virtual spaces and real world places: transfer of route knowledge." *Intl. Journal of Human-Computer Studies*, 45, 413-428.

[5] Singhal, S., and Zyda, M. (1999). *Networked Virtual Environments: Design and Implementation*, ACM Press.

[6] Lu, T.-C., Lin, M.-T., and Lee, C. (1999). "Control Mechanism for Large-Scale Virtual Environments." *Journal of Visual Languages and Computing*, 10, 69-85.

[7] Nunamaker, J. F. (1997). "Future research in group support systems: needs, some questions and possible directions." *Intl. Journal of Human-Computer Studies*, 47, 357-385.

[8] Janson, M., Iivari, J., and Oinas-Kukkonen, H. (2000). "eCommerce as Computer-Mediated Social Action." *Working paper* to be published on August 2000. University of Oulu.

[9] Norman, D. A. (1986). "Cognitive Engineering." User Centered System Design, D. A. Norman and S. W. Draper, eds., Lawrence Erlbaum Associates, Hillsdale, NJ, 31-61.

[10] Preece, J. (1994). *Human-Computer Interaction*, Addison-Wesley.

[11] Picard, R. (1997). *Affective Computing*, The MIT Press.

[12] Maes, P., Darrell, T., Blumberg, B., and Pentland, A. (1995). "The ALIVE System: Wireless, Full-body Interaction with Autonomous Agents." *ACM Multimedia Systems*.

[13] Kaur, K. (1998). "Designing Virtual Environments for Usability," Ph.D. Thesis, City University, London.