Collaboration in Second Life: Exploring Social Traps

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ABSTRACT

The use of social software, such as Second Life, for scientific collaboration opens many issues. We need to compare real-life ("first-life") and Second Life in terms of groups and social dynamics to explore potential problems and determine how to address these problems. Social traps are examples of social dilemma situations, where an individual acts for personal advantage that is damaging the group as a whole. Traps can be avoided, nevertheless, by the proper cooperation between the group members. A laboratory analog of social traps was implemented by Brechner in the 1970's. We built a a Second Life analog for Brechner's experiment to explore social traps and how coordination takes place in a 3D virtual world. While some of the groups that were not allowed to communicate succeeded in avoiding the trap, communication had a significant effect on how the participants regulated their resource. We observed very similar response patterns compared to the original experiment. That shows a great potential for using virtual worlds like Second Life as collaborative tools.

Author Keywords

Second Life, social traps, collaboration

ACM Classification Keywords

H.5.3 Information Interfaces and Presentation: Group and Organization Interfaces—*Computer-supported cooperative work*

INTRODUCTION

Virtual worlds are persistent virtual environments in which people experience others as being there with them — and where they can interact with them [8]. Second Life [7] (SL) is an online 3D virtual world that is accessible via the Internet. Users are represented as "avatars" who build the contents of the world. Users join SL to socialize with other people, build things, do business, and join groups.

SL can be used to hold conferences, and meetings [6]. It supports large number of audiences, and allow them to interact in forms that are not available in video conferencing, for instance. SL has been used for collaborative scientific, engineering, and educational applications [3]. As a 3D environment, it supports applications such as collaborative design where the avatars can navigate around or inside the 3D models. Buildings, products, conferences, and classrooms in SL came out of collaboration between strangers and/or friends. Working in groups usually involves some sort of conflict between the individual and group goals. Groups and teams in SL are interesting as they came out of voluntary participation of individuals. That, in turn, motivates us, as researchers, to study why people are willing to work together in SL, and the conditions under which the collaboration emerges.

We explored social dilemmas, i.e. how the individuals make their decisions to collaborate or not in situations where there is a conflict of interest, e.g. due to the limited resources. The common resources dilemma, e.g. social traps, is an example where it is of the best interest of the individual to selfishly consume a common resource. Without cooperation, the group could end up damaging its own resource. We used SL to replicate a laboratory experiment designed by Brechner [4] to simulate the conditions that produce social traps.

Communication between group members was shown to have a positive effect on cooperation in social dilemmas even if it was mediated [2]. We observed very similar group behavior patterns in SL. Although our results are not conclusive, they indicate that SL has great potentials as a collaborative tool. In addition, it shows that people are willing to collaborate with strangers if they have enough incentives.

This opens many interesting questions. Will SL generation be more tolerable with technology problems and develop new communication protocols for cyber collaboration? Are the teamwork practices in SL transferable to the real world and vice versa? What are the possibilities/impossibilities for SL and similar environments to be used at work places where metrics like "efficient use of time" matter?

One limitation of our study is that the interaction in our experiment was limited (camera movement and object touch). Group interaction in the aforementioned applications involves more complex interactions with objects and takes longer time. Will the users still collaborate if the interaction is cumbersome? Additionally, do we need new interaction techniques and/or devices for groups working in SL?

SOCIAL TRAPS LABORATORY EXPERIMENT

In the original experiments the participants worked in groups of three to draw points from an "artificial" common pool. The pool was represented to participants using a visual display comprised of n small light bulbs arranged in a vertical line (n is the pool size). One light was illuminated to mark the total number present in the pool at a given time. Each time a point was drawn from or added to the pool, the illuminated light moved down or up, respectively. Each participant

was given a counter and a response button connected to the pool. Ten presses of the response button added one point to the participant's counter and subtracted one from the pool. The pool was replenished automatically at fixed rates. The replenishment rate varied with the pool level. The higher the pool level the faster the pool was replenished. If the participants consumed the points faster than the replenishment rates, the pool would empty, i.e. the group would fall into a trap and the experiment would terminate.

THE REPLICATED EXPERIMENT

Apparatus

Figure 1 shows our "virtual" apparatus with three seats for the participants' avatars. In front of each seat was a table with a black box was used to act as a counter. A click on the box corresponded to pressing the counter's response button in the original experiment. In front of the three seats was a visual display in a form of a vertical line of small black balls. The number of balls was corresponding to the pool size (24 in our experiment). Red color was used to distinguish the ball that represents the number of points present in the pool at a give time. The pool was replenished automatically according to the rates used in the original experiment.

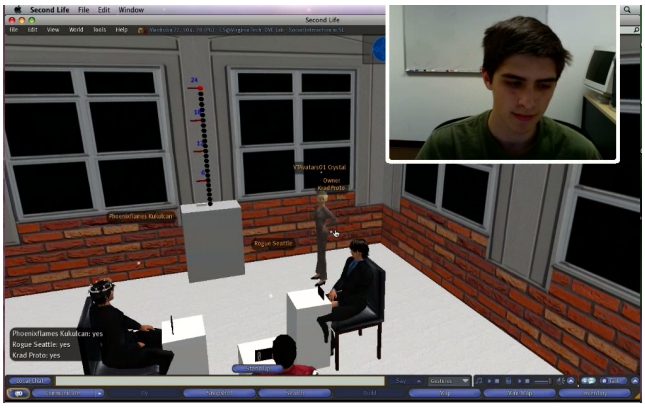

Figure 1. Virtual experimenter providing the instructions

Participants

We had 12 participants (eight males and four females) forming four groups. The age range was 18 to 39 years ($\overline{x} = 27.08$, $\sigma = 7.74$). Six participants were experienced SL users spending between two and 30 hours per week in SL. Four participants were new to SL, the other two were not new to SL but they used to spend only a few minutes per week in SL.

Design

We used a between-subjects design, the participants were assigned randomly to their groups. They did not know neither the real nor the SL identity of the other two members in the group i.e., they were completely strangers to each other. The experiment had one independent variable, the communication during the experiment. Two groups were allowed to communicate during the experiment by any method of their choice, while the other two were not. In the recruitment process, we ensured that the participants were familiar with at least one communication method in SL (text, audio, or gestures). Similar to Brechner, we have measured two dependent variables so that we can compare our results to his. The first variable was a number of points returned to the pool by the replenishment timers (indicated the participants' ability to regulate the pool). The second dependent variable was the group cumulative responses over time (represented as a curve). The x-axis shows time and the y-axis shows the total number of the participants' clicks on the counter so far. The slope of the curve indicates the rate at which the participants were clicking on the counter. A steeper slope denotes faster group response and vice versa. Additionally, we recorded the experiment sessions in real life as well as in SL.

Procedure

The participants were instructed to log in the experiment land, where they met a virtual experimenter (an avatar). The virtual experimenter provided instructions corresponding to the original experiment instructions. The replenishment process was explained and an example was shown to participants, with a special emphasize on the fact that the experiment will not go its normal length, that is 15 minutes, if the pool was depleted. The participants were offered a training trial before the experiment began to elaborate on the illustrated procedure. At the end of the experiment, the participants were compensated with a number of Linden dollars equal to the points they gained in the experiment.

SECOND LIFE AS A COMMUNICATION MEDIUM

The results from Brechner's experiment [4] showed that some of the groups that were not allowed to communicate succeeded in avoiding the trap. Communication, nevertheless, had a significant effect on how the participants regulated their resource (Table 1). Communication groups were able to reach better strategies to consume the points from the pool and thus the pool was replenished with more points.

Table 1. Points replenished as a function of pool size and communications (from [4], page 53, Table. 3-A)

		Pool Size		
		24	48	
Communication	Yes	212.838	236.333	$N_{cell} = 6$ groups
	No	40.500	180.000	

In this section, we discuss the effect of communication on coordination between group members, especially when the communication is mediated. The positive effect for communication on cooperation is one of the most consistent and robust findings in experimental social dilemma studies [2]. Cooperation rates are higher and more stable with communication. In addition, without communication cooperation gradually declines [2].

In an experimental analysis for social dilemma experiments, Bicchieri and Lev-On [2] suggested that the communication effect is caused neither by the ability to identify and humanize other agents nor by the content and dynamics of generic discussion [2]. The effect of communication was explained in terms of the focus theory of norms [1], the norm of "promise keeping" in particular.

Social norms are informal behavioral rules that are not supported by formal sanctions [2]. Individuals prefer to follow social norms if they recognized the situation as a familiar situation in which they make and keep their promises and if they have the right expectations about the behavior of the others. Face-to-face communication provide an individual by a lot of contextual cues e.g., voice tone, eye contact, gestures, etc., focusing the individual on the promise keeping norm and eliciting the right behavioral script. Bicchieri and Lev-On [2], classify the mediated communication channel as "thin" and "rich" as close as it reproduces the features of face-to-face communication. If we evaluate SL accordingly, SL would be close to reproduce face-to-face features as any audio chat tool. SL lacks also face-to-face features like visibility (communicators are visible to each other) and co-presence (communicators share the same physical environments) as described by Clark and Brennan [5]. SL users can, nevertheless, share the virtual environment and see each others' representation (avatars).

Commitment production consists, according to [2], of three aspects; the capability of coordinating a social contract or mutual promise, the credibility of promises, and making promises public knowledge. These aspects were argued to become problematic in the computer-mediated environments in which affect the credibility of the online promises and consequently online cooperation. We report in this section our observations on how the three phases were achieved in our experiment. We believe that would highlight some of the potentials of SL as a collaborative environment.

Coordinating Mutual Promises

The two main problems in coordinating social contracts in mediated environments are the altered conversational structures and the difficulty of creating leaders to coordinate the promise. In SL experiment, audio chat required the familiarity of the group members with turn taking protocols, which was not the case with our groups. Instead, communication groups used text chat to decide on a strategy for drawing the points from the pool. When a participant starts to type in the text chat, the corresponding avatar appears to be writing. That made the others aware of the participant's status and helped maintaining the sequence of the conversation. At the beginning of the experiment, usually one participant in the communication groups would initiate a conversation about the strategy they should follow or to stop the others if they start consuming the pool before the group agreed on a consumption strategy.

The Credibility of Promises

SL has many features that helped the participants to asses the intentions of each other and made sure that they keep their promises. When a participant start clicking on the counter to draw points, a ghost effect would appear between her hand and the counter indicating that she clicks on it. Moreover, if the participant drew a point, the red ball would go down to indicate the new level of the pool and the rest of the group would see that clearly. Furthermore, most of the participants moved their cameras to check on their colleagues score.

Figure 2 shows how the participant in the upper right corner was very relaxing while he was waiting for the pool to be refilled. The group was not allowed to communicate, the participants would draw points till one or two points before the end where they stopped. They did that for several times before one of them decided to end the experiment.

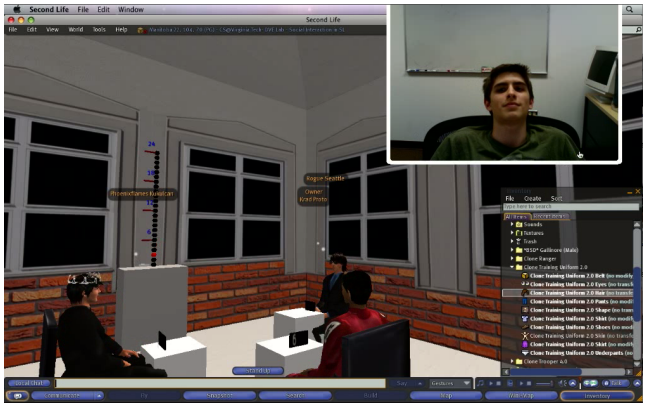

Figure 2. No-communication group — the participant is waiting for the pool to be refilled

Making promises Public Knowledge

Communication groups conversed about their strategies. Additionally, none of the groups reported network delays. That allowed the information to reach all the group members almost at the same time and made it public knowledge.

The SL features, such as avatar representation and the shared space between avatars, created high sense of presence and co-presence between the participants. Additionally, feedback and awareness mechanisms helped the participants to produce commitments and keep their promises during the experiment. That, in turn, argue for the richness of SL and similar 3D virtual worlds as communication channels despite the lack of the regular face-to-face features.

EXPERIMENTAL RESULTS

Communication Groups

Communication groups succeeded to avoid falling into the trap and they were able to reach better regulation strategies for their resource ($\overline{x} = 113.5$, $\sigma = 31.82$) as opposed to the no-communication groups ($\overline{x} = 20.5$, $\sigma = 23.33$). That shows that the participants succeeded to communicate effectively and reached a common strategy to draw the points from the pool. Video recordings revealed that text-chat was the main communication method between the participants in the communication groups. The original experiment [4] classified different group responses into six classes based on the cumulative response curves. Table 2 shows the results for the groups with the pool size of 24 (N is the number of groups per condition).

Figure 3 shows the responses for the communication groups. They fell under the category 3-4 called the "stair-step" configuration in the original experiment. This response pattern indicates that the participants responded by drawing points from the pool till a certain level, then they completely stopped

Table 2. Group response patterns (from [4], page 71, Table 6B)

Pool Size	Communi-cation	Curve Type 3-1	3-2	3-3	3-4	3-5	3-6	N
24	Yes	0	0	0	6	0	0	6
24	No	5	0	0	0	0	1	6

till the pool is filled and responded again. This pattern occurred only under the communication condition in the original experiment. The height and width of the steps indicate the levels where the group decided on to stop pressing and the level at which they resumed responding respectively.

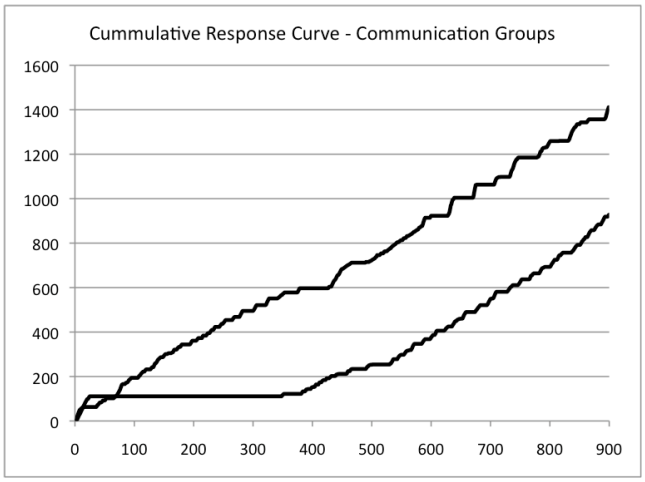

Figure 3. Communication groups

No-Communication Groups

In the case of no-communication groups, the pool was drained and the experiment terminated before its normal length. Figure 4 shows the response patterns for the no-communication condition groups. One of the groups had a response pattern similar to 3-1, a fast steady response for the group till the pool is drained. This pattern is common when the communication is not allowed and it is triggered by a participant who either did not understand the instructions or got greedy because he/she does not trust the other participants. In the post-experiment questionnaire, we asked the participants to state their reasons for depleting the pool. In one group, the person who drained the pool stated "*Maybe because I was not sure if the other players were going to stop until the pool fill with points again*."

The second group, nevertheless, had a response pattern similar to communication-groups pattern 3-4, with a large stair-step. The video recording showed that the participants kept drawing from the pool till right before it reached the bottom and they would wait till the pool is filled completely before they start drawing points again. The pool was depleted because one of the participants decided to end the experiment in order to find out what will happen when the experiments ends prematurely. This participant explained it in the post-experiment questionnaire as "*I triggered it. I plan to draw utility in other ways*."

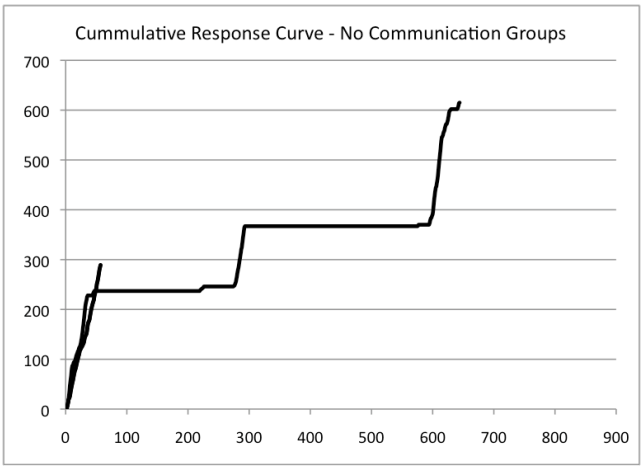

Figure 4. No-communication groups

CONCLUSION

Our results match the results from the original experiment [4] and demonstrate, in a way, the effectiveness of SL as a communication medium, in spite of the fact that mediated communication lacks many face-to-face interaction cues [2].

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