Research Bots in Second Life

Doron Friedman[1,2], Anthony Steed[1], and Mel Slater[1,3]

[1] University College London,
{d.friedman,a.steed,m.slater}@cs.ucl.ac.uk
[2] The Interdisciplinary Center, Herzliya, Israel
[3] ICREA-Universitat Politecnica de Catalunya, Spain

1 Introduction

Since SL is a commercial product, we do not have access to statistical data, and it is unlikely that such data would be made public by Linden Labs (the company behind SL). Thus, we have developed automated software bots that are able to wander around SL and systematically collect data. In addition, we have built these bots to have some social capabilities of their own; this allows them not only to observe and collect data, but also to participate in social interactions, thus essentially carrying out social experiments within SL.

In a previous paper [1] we have presented a study, carried out by our bot, related to spatial social behavior. We found an indication that SL users display distinct spatial behavior when interacting with other users. In addition, in an automated experiment carried out by our bot, we found that users, when their avatars were approached by our bot, tended to respond by moving their avatar, further indicating the significance of proxemics in SL. In this paper we report the findings of our bot regarding virtual age.

2 Background

Video games have been recognized in the past as a potential for artificial intelligence research (for example, see [3] and [2]). As Loomis et al. [4] note, collaborative virtual environments (CVEs) are also a useful tool for research in psychology.

Recently, Yee, Bailenson and colleagues have studied social space within SL. In [5] they uncover patterns of social space use that would be expected, such as gender differences, and eye-gaze avoidance for situations where the interpersonal difference is only 2-4m. Our study, carried out by our bot, raises some issues around this finding, as reported in a previous paper [1].

3 The SL Bots

SL is intended to be built first and foremost by its users, and it thus provides facilities for content creation. Programming is achieved with the Linden Scripting Language (LSL), which provides a wide range of capabilities; at this time LSL

includes 330 built-in functions, including: vehicles, collision detection, physics simulations, communication among users, inventory management, playing audio and video files, and more. However, LSL was clearly not designed to construct bots; scripts are only attached to objects, not to the user's avatar directly. We have come around this limitation by attaching a ring to our avatar. The ring object can then run a script, and the script can then be used to move the avatar and animate it, so that it appears walking while moving, as well as performing other tasks required by our bot.

Our bot has a basic capability for wandering around and finding locations or objects of interest. The implementation is as follows: the bot selects a random direction and starts walking in that direction, until it either reaches an obstacle (such as a wall) or the target. If it reaches an obstacle it selects another random direction and keeps moving in the new direction. While this approach is simple and not necessarily efficient, it has proved successful in practice, and even allowed our bot to occasionally wander in and out of closed buildings, passing through doors. Typically, as in the study described here, the bot is instructed to locate other avatars. When it detects one or more avatars it stops and carries out its social task, until it is terminated, or until it find itself alone again.

The bot has simple interaction capabilities: when it encounters other avatars it greets them using their name. The bot can also play a large range of approximately 50 pre-recorded animations. However, we have found out that such animations do not play an important role in SL. While users are able to allow their avatar to play pre-recorded animations, this is not similar to real-life NVC. For example, users very rarely use these animations, and when they do, these are typically high-level animations, such as dancing. In the real world, NVC is a continuous process, which plays an important part in communication, and is mostly unconscious.

Our bot has capabilities for data collection: it can be instructed to collect information about the objects and avatars it encounters on the way, log this information, and send it to us. Currently it uses email to send us the information, but SL allows other forms of communication with external software, such as HTTP or XML-RPC[4].

4 Collecting Data: Virtual Age

One capability of our SL bot is to wander around and collect data; we demonstrate this by collecting information about the virtual age of avatars in SL; i.e., the time passed since the users behind the avatar joined SL. Our assumption is that this virtual age in SL is an important social factor. People who joined earlier probably know more about the environment, have collected more virtual property (nice-looking avatars, jewelery, etc.), and we thus assume there is a positive correlation between SL age and social status in SL.

We instructed our bot to record the age of all the avatars it detects. First, we see that there are many more new citizens than old citizens. To find out the

[4] http://rpgstats.com/wiki/index.php?title=XMLRPC

exact rate we released our bot on a specific day (April 17th, 2007). We sampled 5 different SL areas, selected arbitrarily[5].

The avatar collected the age of 118 avatars, and we plot the age of the avatars detected relative to this date; as we can see from Figure 1, the number of "newbies" versus old citizens increases exponentially. The oldest avatar encountered was "born" on September 28th, 2004, but most of the ones encountered were born in the last few months.

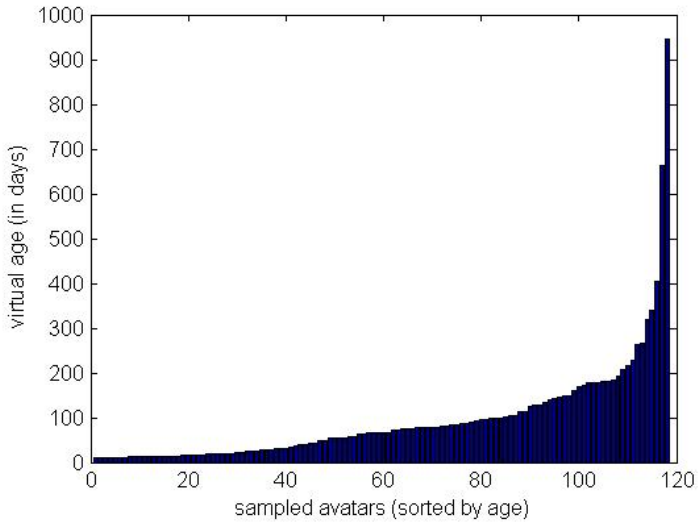

Fig. 1. A summary of the virtual age of avatars encountered on April 17th, sorted by age.

Figure 2 provides another view: the distribution of ages by months. Such information may be useful for various purposes. For example, if joined with additional data about joining rates, we could analyze the patterns of SL users in terms of revisiting SL; how many of them revisit and for how long do they keep revisiting? The bot can, for example, be used for targeted advertising campaigns: it can locate areas in SL that have a particular demographics of users, in terms of their age or other features (such as payment history, which is also provided by LSL).

5 Discussion and Future Work

Bots collecting information, and even carrying out experiments, raise methodological issues. For example, we need to find ways to ensure that we are sampling

[5] We are still seeking a method that will ensure that we are sampling SL correctly.

SL properly. We need to find ways to know who are the users behind the avatars we are interacting with: are they currently socializing, or are they working? in the future we might need to make sure they are not bots themselves...

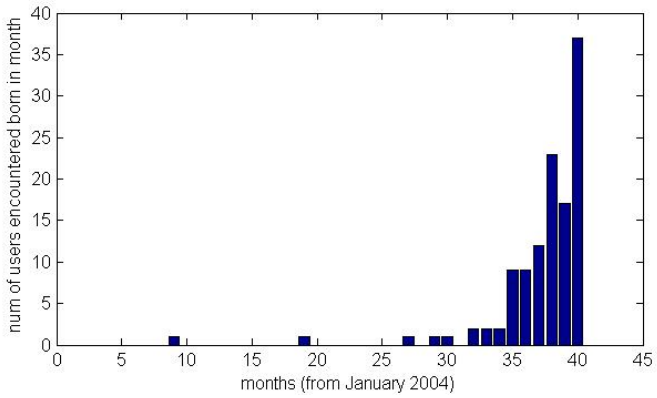

Fig. 2. A view of the distribution of virtual age, by months, from the 118 avatars sampled.

Such research may also raise ethical, and even legal considerations. Carrying experiments with human subjects generally requires following ethical guidelines and experiments require formal approval from an official committee. For example, informed consent is always required from a subject before participating in an experiment. As long as the study is purely observational there is no problem. In our case [1] the manipulation of the subjects is clearly insignificant. If there were direct information being asked about the subjects, then it may be necessary to get institutional ethics approval, and also to make it clear to the subjects that this is a study, and they have the right to refuse, as in any real-life experiment. There is still a a difference from real-life experiments, since everyone is anonymous. However, some people put enormous resources into maintaining online personas, and would rightly object to using that persona's name in records. Another concern will need to be addressed if the bots would be able to carry out more meaningful social interactions, since this would involve deception. In some virtual environments users are happy to accommodate bots in the condition that they declare themselves to be bots.

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