Category Learning in Second Life: A New Way of Looking at Things

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Introduction

There is substantial evidence in the cognitive science research literature for effects of category learning on perceptual judgments related to stimuli of various kinds (e.g., Goldstone, 1994; Livingston & Andrews, 2005). During categorization, objects classified together may come to be treated as more alike (compression) and/or objects classified differently may come to treated as more distinctive (expansion). However, these effects can only be conclusively demonstrated using unfamiliar category structures, in order to have a baseline to compare to judgments following category learning. Interestingly, the remarkable effect that recent technological developments have had on classification systems indicates that the mechanisms underlying these basic categorization processes are highly adaptive, producing novel classification systems in accordance with their dynamic environments (Glushko, Maglio, Matlock, & Barsalou, 2007).

The study presented here involved the recreation of a typical category learning experiment within the online, interactive, 3-D environment known as Second Life, which offers great methodological tools, including an editable physics engine and a powerful scripting language, for creating novel perceptual stimuli in a dynamic and manipulable setting (see Figure 1). Acting as a replication, this initial study seeks to produce the above mentioned phenomena of compression and/or expansion in a novel context by utilizing the unique capabilities of Second Life, and in doing so, establishing a basis for its use in further research. Our hope is that this unique functionality may introduce a more dynamic and realistic experimental setting for studying categorization processes.

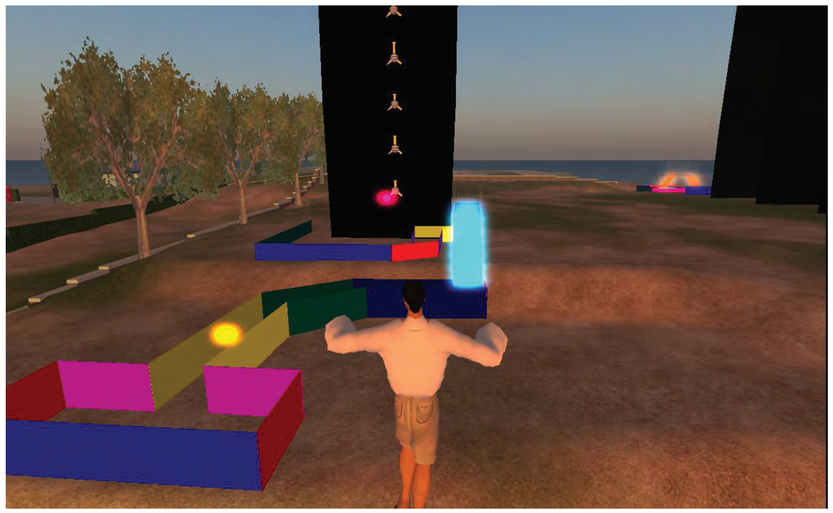

Figure 1. Experimental Setting and Avatar.

Methods

The stimuli (inspired by those of Cooke, Jakel, Wallraven, & Bulthoff, 2007) were each constructed from five separate “object primitives,” which were edited and linked together using the “build” tool in Second Life. Each object consisted of three protrusions, one of which had two parts, that were attached to a central sphere. The stimuli varied on two perceptual dimensions: the width of the stripes on the central sphere and the length of the upper (red) protrusion. All other physical and spatial characteristics were kept constant (see Figure 2). In total, there were 32 different stimuli. Objects 1-16 were given the category label “Gex” and possessed both the widest stripes and the longest top protrusions, while objects 17-32 were giventhe category label “Zof” and possessed both the narrowest stripes and the shortest protrusions (see Figure 2).

Participants were assigned to one of two conditions (control or classification). Participants were represented by an androgynous avatar (see Figure 1). Before either of the tasks began, participants in both conditions were taken through orientation simulations, enabling them to navigate their avatars within Second Life. All stimuli were presented in front of a black background to keep viewing conditions constant.

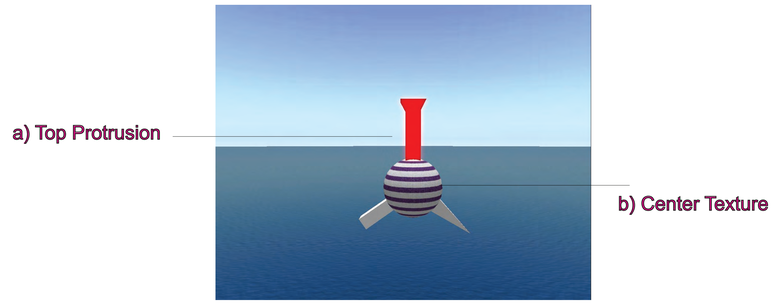

Figure 2: Object 1 (Gex). Varying features shown: (a) the length of the top protrustion and (b) the width of the stripes.

Part 1: Classification Task (Classification Condition Only)

Following the orientation tutorial, members of the classification condition were asked to select a “seat,” which was automated, using the Second Life scripting language, to take participants through random orders of the 32 stimuli, viewing each stimulus for 3 seconds. Immediately after each stimulus was shown, participants were asked to classify it as one of two categories, either Gex or Zof. They received audio feedback concerning the correctness of their response. Participants completed eight separate, randomized orders of the 32 stimuli to ensure that the category structures were adequately learned unless two consecutive orders were completed with no more than one error in each, in which case they were instructed to move on to the next task.

Part 2: Similarity Task (Both Conditions)

In the similarity task, participants were asked to select a similar “seat” and were shown 90 pairs of stimuli (30 Gex-Gex, 30 Zof-Zof, 30 Gex-Zof), basically a random subset of the possible pairs of each type, in a constant random order. Each object in a pair was shown for three seconds. After each pair was viewed, participants were asked to rate it on a similarity scale of 1-9 (1 being least similar and 9 being most similar). Participants were told only that this scale represented overall similarity and were not informed further on how to use the scale.

Preliminary Results and Further Research

Although data collection is ongoing at this point, initial trends clearly resemble those that would indicate category compression and/or expansion. Data collection will continue this semester. If the expected effects occur, in accordance with previous research using traditional methods, we hope to make further use of the many advantages of Second Life for creating complex novel objects and ways of interacting with them, and to examine their effect on judgments and behavior related to categorization and category learning. This may include adjusting the physical forces acting on participants and stimuli (e.g. gravity, normal force, tension, friction), manipulating features of the category learning environment, altering the properties of participant avatars, and/or creating various kinds of stimuli which act and react to participants in novel ways. We also hope to utilize the networking capabilities of Second life to obtain larger and more diversified samples.

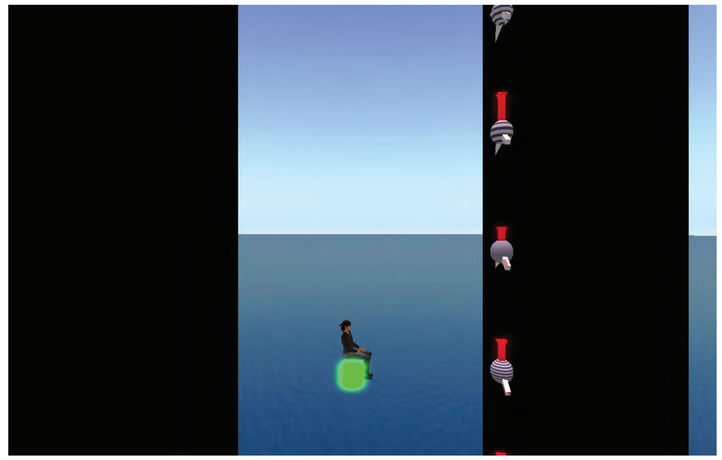

Figure 3. External View of Avatar Participating in Similatiry Task.

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