

Due: beginning of class, Tuesday, March 6

Overview

This lab will give you an opportunity to explore your abilities as a Cognitive Scientist in a manner similar to your first lab. You will formulate and test hypotheses about the functioning of two new “Black Box” programs. In addition, you will explore the plausibility of the Prototype and Exemplar models of concepts.

The two programs you will consider implement concept acquisition for the prototype and exemplar models of concept representation. Their objective is to acquire the concept “dog” in a simple world made up of dogs, cats, and (occasionally) bunnies. Instructions for downloading and starting the programs are given below.

Note that the programs start out knowing nothing about dogs (or cats or bunnies). You will begin interacting with each program by selecting an initial example of a dog. (You will choose the example from a menu of choices labelled **Initial Example**.) Once you’ve selected an initial example, you will notice a message in the program window that displays “Teacher Says It’s a dog.” (You’re the teacher!)

Once the program has an initial example of a dog, you can begin to test its understanding by giving it examples of dogs and non-dogs, which you can select from the menus labelled **Positive Examples** and **Negative Examples**, respectively. For each choice you make, the window will display “Black Box Says ...” telling you what Black Box thought the example was. Over time, you will see each program’s concept of “dog” changing.

If you want to start a new “training session”, you needn’t restart the program. Simply select a new example from the **Initial Example** menu.

Dogs, cats, and bunnies

We will provide you with pictures of the example dogs, cats, and bunnies, that serve as input to programs as they acquire the “dog” concept. The program does not take these images as input, however. We have represented each pictured animal by a schema that includes the following attributes:

- Hair type – for example, long-haired, short-haired, medium
- Primary color – brown, black, white, orange, etc.
- Secondary color (if any)
- Spots – whether there are spots or not
- Stripes – whether there are stripes or not
- Size – small, medium, large, very large, etc.

- Number of legs – *not* the number of legs visible in the picture – the number of legs we assume the creature has
- Tail type
- Whiskers – whether it has them
- Ear type – pointy, floppy, round, etc.

You can assume that each example schema describes what we know of the animal, not only what's obviously visible in the corresponding picture. The pictures are there only for you, not for the program. (We assume that you'll find the pictures more helpful than text listings of attributes and values.)

What you need to do / turn in

As in the first lab, for each Black Box you should keep (and then type up) a journal of your “experiments/investigations.” It should consist of three columns: the first should indicate the example input to the program (i.e., “Positive Example 2”); the second should give the program's response; and the third should include your observations, hypotheses and plans for further testing.

The diary for each Black Box should not exceed 1 page (12-point Times font, one-inch margins.) On a third page, discuss your best guess as to which Black Box is based on a prototype model and which is based on an exemplar model. Was it difficult to tease out which is which? Based upon your experience and the readings for the course, discuss briefly the plausibility of the prototype and exemplar models for representing concepts. Is there a significant difference? Do you support one more than the other? Is there another model that you feel is better?

Your entire writeup (diary plus analysis) should not exceed three pages (again, 12-point Times font, one-inch margins. No tiny single spacing please.)

Instructions for downloading and running the programs:

The two programs you are to explore – called BlackBox and BlackBox2 – are implemented in the Java programming language. In theory, they should run on any platform (i.e., Mac or PC) as long as you have Java. What follows are directions for downloading and running the programs in TCL 216 or 217.

Once you've logged in, start up Safari. You can download the programs from

<http://www.cs.williams.edu/~andrea/cogs222/Assignments/Lab4>

There are three files to download:

- Lab4.jar
- Dogs.pdf
- NotDogs.pdf

The first will enable you to run the two programs. The latter two contain pictures of the examples of dogs and non-dogs that the system can consider.

Now you're ready to run the two programs. You will need to start up a terminal window. Double-click on the **Macintosh HD** icon; then double-click **Applications**; then **Utilities**; and finally **Terminal**.

In the terminal window, type

```
cd Desktop
```

and hit <Return>, assuming that the file Lab4.jar is on the Desktop.

To run BlackBox, type

```
java -cp Lab4.jar BlackBox
```

and hit <Return>.

To run BlackBox2, type

```
java -cp Lab4.jar BlackBox2
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