CPSC 490 Proposal

Josh Clark

February 7, 2019

1 Introduction

"The Impact of Identifier Style on Effort and Comprehension" is a paper describing a family of studies by Dave Binkley, et al., which aimed to discover the impact of identifier style in programs on human understanding. One of these studies, the so-called "Cloud Study" works towards answering the question: does identifier style impact readability? My goal is to replicate this experiment – namely the Applet-cloud experiment, one of two sub-experiments in the Cloud Study – with tuples as the subject of inquiry instead of identifiers.

2 Summary of Experiment

2.1 Overview

Binkley, et al.’s Applet-cloud experiment tested participants on their ability to read two different styles of identifiers, underscore and camel case. Participants were presented with a target identifier among a group of distractor identifiers. All of the phrases, both target and distractor, were presented in randomly-moving cloud shapes, which give the experiment its name. Participants were shown a series of eight screens like this, with identifiers varying in length, style, and origin (code or non-code). Among other measurements, correctness and efficiency of participants were recorded.

2.2 Experimental Design

2.2.1 Phrase Length

Phrases (identifiers or targets) varied in length – not only in number of characters but in number of word components. Since a one-word identifier would not be different in camel case or in underscore style, one-word identifiers were not used. Identifiers consisted of only two- or three-word long phrases.
2.2.2 Phrase Origin

To make the experiment layperson-friendly, identifier phrases came both from open-source programs scraped from the internet and from standard English. Examples include "full pathname" and "drive fast."

2.2.3 Distractors

Distractors are phrases that are similar to, but not identical to, the target phrase. A target phrase of "full pathname" might be accompanied by a distractor phrase like "fill pathname." The distractors were created so that analysis of incorrect answers would yield information about any systematic failure in participant performance. Distractors were versions of the target phrase where modifications were made at the beginning, in the middle, or at the end of the phrase.

2.2.4 Procedure

Participants were shown a screen with the target identifier, and were given as long as they liked to study it. After pressing a button, participants were shown a screen of four cloud images, each containing one of the distractors or the target identifier. The clouds were placed in random positions and moved in random directions at random speeds. The participant was tasked with clicking the identifier they were shown on the previous screen. For each question, the initial position, direction, and speed were fixed (after random determination) so that each participant saw the same screen for the entirety of the question.

2.2.5 Ordering and Groupings of Phrases

There are eight possible combinations of phrases of length either 2 or 3, style either underscore or camel case, and origin either code or non-code. The experiment organized these eight possible questions into two groups, each with a 2-underscore, a 2-camel, a 3-underscore, and a 3-camel phrase (the code and non-code were distributed evenly among phrases of each length). This grouping was done to avoid bias and learning effects throughout the experiment.

2.2.6 Distribution of Experiment

The experiment was created in a custom Java applet, and distributed over the internet to provide ease of access for participants. Use of a custom Java applet disables the use of the "back" button in web browsers, which guarantees flow control.

2.3 Variables

The experiment measured the following variables:

- Correctness: Whether or not the participant selected the correct answer
• Find Time: How long it took the participant to select an answer

• Style
  – Camel Case: E.g., "fullPathame"
  – Underscore: E.g., "full_pathname"

• Questions
  – Length of identifier: 2 or 3 words
  – Phrase origin: Code or non-code

• Participant Performance
  – Reading Time: Time spent studying target identifier
  – Time on Demographics: Time spent filling out participant performance

• Demographic Information
  – Training: Number of years of computer science training the participant had
  – Experience: 1 if the participant has more than 2 years work experience as a programmer; 0 otherwise

2.4 Experimental Hypotheses
The experiment tested the following hypotheses:

1. Performance is unaffected by the style of the identifier
2. Efficiency is unaffected by the style of the identifier
3. The effect of style on correctness is independent of training
4. The effect of style on find time is independent of training

2.5 Discussion/Results
The analysis of the data collected revealed the following about the experiment’s hypotheses:

1. Performance was affected by the style of the identifier. Camel case increased correctness.
2. Efficiency was affected by the style of the identifier. Camel case phrases took longer to identify.
3. The effect of style on correctness was not determined to be dependent on training. This hypothesis was not rejected.
4. The effect of style on find time lessens due to training.

I will conduct a similar experiment, testing similar hypotheses, with the modifications described below.

3 Modifications

I’d like to discover the effect of different indexing methods on the readability and comprehension of tuples. There are several methods of indexing tuples. Suppose we have a tuple that looks like \( t = (\text{position}, \text{direction}) \), where \text{position} is also a tuple that looks like \((\text{row}, \text{column})\). The expanded tuple looks like: \(((\text{row}, \text{column}), \text{direction})\). Here are some ways we could index the tuple to get the value of \text{column}:

- \( t\).getPosition().getColumn() \\
- \( t[0][1] \)
- \( \text{get}(1)\text{(get}(0)\text{(t)}) \)

4 Deliverables

Here is a list of the things I will accomplish and the dates by which I will accomplish them:

- Friday, February 15: Formal statement of experimental design, variables, hypotheses, and analysis that will be conducted
- Friday, March 15: Custom applet up and running
- Friday, March 29: Data collected
- Friday, April 12: Analysis of data
- Friday, April 26: Final paper