

Brian Christian

Period 3

### Senior Thesis Proposal

For my senior thesis project, I will be creating an interpreter for a dialect of the Lisp programming language. For context, Lisp is a programming language family, much like spoken language families in that all of the languages in the family bear common traits and share common roots. My interpreter will take code written in a particular dialect of Lisp and execute it in order to run programs. I will use existing guides to determine the syntax, semantics, structure, and other properties of the dialect itself as well as to lay out the stages for constructing the interpreter. Independently, I will figure out how specifically to implement the dialect and interpreter stages as well as create any additions as I see fit.

I will be reading *Clojure for the Brave and True* by Daniel Higginbotham. This book teaches the reader about the Clojure programming language, which is a Lisp dialect. This book will assist me with my senior thesis because I will use Clojure to program the interpreter. In addition, Clojure, as a Lisp dialect, will give me greater understanding of the Lisp language family. I will also read some of *Crafting Interpreters*, by Bob Nystrom, to learn about some of the theory and linguistics behind interpreters, as well as some implementation techniques. I will not read all of it (in fact the book is currently being published serially online as a work in progress, so I *can't* read all of it!) because only some of the chapters will give me the information I'm looking for.

First, I will be writing notes for both of the aforementioned books. I will also document my entire process, recording how I tackled every step and problem I faced. Along with this, I

will record a progress log of the revisions I make each day and major steps and milestones surpassed. My reflection will be the only formal and structured writing piece, where I'll discuss, among other things, the pros and cons of my experience and suggestions for improvement upon it.

I will be researching the Lisp language family, including its origins and foundations, the general design choices behind it, and the iconic features that make a Lisp language a *Lisp* language, as opposed to any other. I will also conduct heavy research on language interpreters, including the relevant linguistics concepts, such as parsing, syntax, and semantics. This will include the similarities and differences between parsing natural languages such as English and parsing programming languages such as a Lisp dialect. I will also research the phases of interpretation and how code is ultimately transformed into a running program.

My presentation will include an explanation of my Lisp dialect, including its feature set. I will demonstrate my interpreter with, at the very least, some basic math expressions and user interaction. I will then explain the phases of the interpreter, including the relevant linguistics, drawing parallels between natural languages (especially English) and programming languages that I hope will assist my audience in understanding the topic. As part of this, I will demonstrate how written code eventually becomes a running program.

This is a worthy project for my senior thesis because I have a vested interest in programming languages and hope to pursue their field in college and my career. This project will give me more insight into my interest and assist me in pursuing such a career in the future. I also believe that the necessity of explaining the complexity of programming languages and interpreters in more familiar terms to an unfamiliar audience will pose a unique, yet intriguing,

challenge. Developing this skill is integral to a career in computer science, especially when engaging in discussions with potential customers or grant awarders. If I can make a person outside the field as intrigued as one inside of it, then I will have succeeded. Going along with this, I think it is important to inform general audiences about what programming languages really are and perhaps reduce some of the confusion or mystery surrounding them.