ψ lang: Whitepaper

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Abstract

Mathematics and Computer Science are deeply intertwined; some universities even offer CS *as* a math course. However,

1 Motivations

Computer Science is arguably one of the most interesting fields of **math**, so why is there such a big disconnect between the math one learns in university and high school CS and the programming language of choice?

Take the example of a simple sum function in math:

$$f(a,b) = \sum_{b}^{a} b, \{ a, b \} \in \mathbb{N}$$

This is an example of Sigma notation, a much-used concept in many parts of math. Taking a look at the equivalent expression in Python,

```
def sum_loop (top_bound, start):
    accumulator = 0
    for i in range(start, top_bound+1):
        accumulator += i
        i+=1
    return accumulator
```

One might see that the two have absolutely nothing in common.

This may not seem like a problem; the programmer just needs to learn programmatical intuition. However, this can pose a challenge for a *mathematician* to learn programming, because of the existing mathematical intuition that needs to be replaced.

Enter: Phi.

Φ is commonly known as the Golden Ratio, is the very symbol of mathematical perfection, and so is the namesake of this language called Φ.

In essence, I want to make Phi because of the disconnect between CS and programming.

It will be built from the ground-up using lambda calculus, allow for absolutely no ambiguity, and employ mathematical techniques that will be familiar to anyone.

2 Design

2.1 Syntax

2.2 Relations to Mathematics

2.2.1 Lambda Calculus

2.3 Tokenization