

Welkin
An Information Language

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Preface

To be written...

Chapter 1

Introduction

Starting Outline:

- Describe the ways philosophers and mathematicians have approached organizing the world around them.
 - Look at Cantor, Dedekind, Frege, Russell, Goedel, and up to the present.
 - Look at modern philosophers
- Reflect on two major shortcomings of these approaches: having little metaphysical explanation about *how* things can be combined, and a lack of generality for several concepts
 - No explanation for what *is* a set fundamentally, or, more importantly, how two entities can be combined into one.
 - * Include formal and informal definitions
 - * Recognize the prior *tool* used to start math in the first place (again, the ability to combine objects or ideas)
 - * Explain that, while category theory may make these constructions more precise, it *still relies on predetermined tools*. These tools are physiological in nature, but they are *ultimately meta-physical*.
 - Lack of generality for: structures, the real numbers, logic (particularly paraconsistent logics). Specifically, mention:
 - * Cryptomorphisms and Voldemort's Theorem. This is not part of official literature, but has been given in an extensive document. It serves an important philosophical point (which will be reexamined in Chapter 2)
 - * Mention the number of models for the reals, and how it still has not been decided what the official model is. Mention constructive concerns (overarching with generality). (Cite Lesnik's paper as a step in the right direction, but critique the lack of generality)

- * Mention the role of bifurcation, and that there is opportunity to expand upon it more (into a generalized fuzzy logic)
- Explain the essential goals of Welkin, built upon CFLT
- Describe target audience
 - This document is geared towards philosophially or mathematically inclined persons. The official version is in English, but, in time, translations will be added.
 - In a different document (separate from this repo), there will be a more accessible version as a part of my program on “humanistic logic”.

Chapter 2

Background

Possible beginning quote (at least for Western philosophers). “The Fold: Leibniz and the Baroque”

the two instances . . . have no windows, . . . for Leibniz, [this! is because the monad’s being-for the world is subject to a condition of closure, all compossible monads including a single and same world. For Whitehead, on the contrary, a condition of opening causes all prehension to be already the prehension of another prehension. . . . Prehension is naturally open, open to the world, without having to pass through a window.

2.1 Western and Eastern Thought

- Contrast the distinct philosophies pervasive in Western and Eastern philosophy. Some key points to emphasize:
 - Mechanistic vs spiritual leaning
 - Classical logic vs Different Logics (particularly involving contradictions)
 - Brief mention in other philosophies (possibly ethics or other non-epistemology related fields?)
 -

2.2 Sets: Georg Cantor and Others

- Cover most of Cantor’s writings, including “Beiträge zur Begründung der transfiniten Mengenlehre”.
 - Touch upon other thinkers that built upon Cantor, including Frege, Dedekind, etc. Dedekind particularly has a section on systems that

he later uses to define naturals (and is extremely relevant to Cantor's definition).

- Cover the core issues behind Cantor's original definition, including psychological components. Use modern critiques in current literature. (See references in: "New Essays On Peirce's Mathematical Philosophy")
- Poin
- Explain the overreaching implications of set theory, as well as its materialistic issues. Briefly explore the possible resolutions to this (e.g., type theory), and demonstrate that they do not sufficiently resolve the materialistic roots.
- Explore the issue of defining an object, claiming a more general theory is possible. Argue that Cantor and others have used foci
- Touch upon the formalist response to set theory, and rebuttal against the claim that formalism alone can be used for mathematical thought.
- Helpful: look at the references in the metamath book

2.3 The Role of Foci

- Explore the issue of defining an object, claiming a more general theory is possible. Argue that Cantor and others have used foci (in a specialized form, collections)
- Justify the existence of different paradoxes the applicability of non-classical logics (particularly paraconsistent logic)
- Explain the shortcomings of foci alone in explaining both new phenomena and generality

2.4 Early Attempts at Continua: Cantor, Dedekind, and Others

- Revisit Cantor, particularly with Cantor's Theorem. Explore the different models of the real numbers.
- Referencing foci, explain how these models do not completely generalize the reals. Even mention how category theory does not resolve this either (in both a mathematical and philosophical sense).
- Analyze Zeno's paradoxes and Aristotle's original definition of a continuum. Explain set-theoretic continua do not constitute full fledged continua (and are missing key metaphysical properties)

2.5 Continua: Charles Peirce

- Discuss Peirce's role in mathematics, logic, and ontology.
- Briefly mention Pragmatism and Peirce's search for its proof.
- Explain what Peirce thought about Cantor's theory, and introduce his concept of multitudes
 - Elaborate on his initial readings of Cantor's theorem and definition of sets
 - Explore Peirce's shortcomings in his definition of collection
 - Mention some of his misconceptions, e.g., his presumption that the Continuum Hypothesis must hold
- Informally justify the mathematical value of Peirce's writings, arguing that more concrete axioms need to be developed from his ideas. In particular, explain why Peirce was closer than Cantor to getting to a definition of a bona fide continuum.

2.6 Folds: Deleuze

Possible quote to include about Deleuze, "The Fold: Leibniz and the Baroque", page 81 (maybe this is better suited for the introduction?)

For Leibniz... bifurcations and divergencies of series are genuine borders between impossible worlds, such that the monads that exist wholly include the compossible world that moves into existence. For Whitehead (and for many modern philosophers)... bifurcations, divergences, impossibilities, and discord belong to the same motley world that can no longer be included in expressive units, but only made or undone according to prehensive units and variable configurations or changing captures. In a same chaotic world divergent series are endlessly tracing bifurating paths. It is a "chaosmos" of the type found in Joyce, but also in Maurice Leblanc, Borges, or Gomrowicz.

- Describe Deleuze's work in epistemology and relevance throughout modern philosophy.
- Connect Deleuze to some concepts in Eastern thought, particularly tying his idea of folds with origami. Also mention how he challenged Leibniz's metaphysics.
- Explain how Deleuze's concept of a fold resolves Peirce's previous inquiries into collections.

Chapter 3

Continuum Foci Logic and Theory

3.1 Axioms

- Figure out how to write all of the axioms in Lean.
 - Lean is based on the Calculus of Inductive Constructions (see this link for a relative strength of this theory: <https://mathoverflow.net/questions/69229/proof-strength-of-calculus-of-inductive-constructions>)
 - However, we want to generalize this to ANY theory... how could this be done?
 - I am still pondering on a solution. Here is what I am thinking so far: I think we need to recognize how the continuum is secretly hidden in any theory. It is similar to the incompleteness theorems: maybe we can generate a corresponding theorem or property of continua, but we cannot prove it.
 - Then, for a proof of the principle, we go back to CFLT. My hope is that, because CFLT is the complete opposite of purely finitistic systems (combinatorial logic or DFAs), we can prove, once and for all, properties about CFLT, under possible metaphysical assumptions. (Much more background needs to be written before I can discuss this in depth, but for now, I believe I must assume that a continuum exists. That may be the ONLY unproven assumption out of everything else, but beyond that, the axioms are purely structural (and may be unneeded).)

3.2 Fundamental Properties

- Define and prove properties of (generalized) theories

- Semantic Lifting Lemma
- Justify how every possible theory (in the MOST general since) is definable in CFLT
- Prove the consistency, completeness, and uncomputability of CFLT. In particular, show that CFLT can solve *any* possible generalization to the Halting Problem. Heavily connect to Harvey Friedman’s unpublished manuscript on Boolean relation theory and incompleteness: <https://bpb-us-w2.wpmucdn.com/u.osu.edu/dist/1/1952/files/2014/01/0EntireBook061311-wh0yjy.pdf>

3.3 Key Implications

Chapter 4

The Welkin Standard

4.1 The Welkin Language

- Determine a suitable BNF for Welkin, which can be parsed with LALR (or otherwise a more efficient parser)
 - Key goal: make Welkin’s syntax fully decidable and efficient to parse. An important component of CFLT called the Semantics Lifting Lemma (TBD) essentially says we can embed a complex syntax into a semantics. (This proof will hopefully be constructive and work for any random syntax, no matter how crazy it might be). In other words, using an efficient parser does NOT limit how expressive Welkin is.
 - Presuming the result above, there will be two variants: the finite (regex) and full versions.
 - * The finite, or regex, version is purely for regex-definable files.
 - * The full version will be LALR parsed, as it is generally a standard for programming languages. Not only is it efficient (both in speed and memory), but any grammar written in LALR is unambiguous (reference needed!).
 - * Now that the idea of these two versions is solidified, we need some common terms. Most of these should come from graphviz, but also in other note taking formats.
 - The standard format should read just like an ordinary programming language. It may be akin to graphviz, but it should prioritize on the contents of each node and edge, not necessarily how they are rendered. (A better thought would be to put rendering information in a standard *library*, which could then be minimized when browsing through a Welkin file/project.)
 - * For efficiency, the standard should use a minimal character set, such as ASCII. However, it would always be possible to *translate*

Welkin files by creating foci over them (generally, in the form of new Welkin files). The standard will have a corresponding file for *every* human language possible. (And emojis can be handled in a similar way; that will be supported but is still TBD). With that said, the standard may use a more efficient encoding overtime, so it may be imposed on *standard implementations*; that is yet to be decided.

- * Welkin essentially needs the key elements from set theory: conjunction, disjunction, negation, implication, etc. We can use corresponding symbols for these: $\&$, $\|$, \neg , \rightarrow . In *customizable files*, these symbols can be overloaded and added upon.
 - * Key goal: make this FULLY compatible with dot. (In fact, for a prototype, we can work with dot directly, but we should make it helpful for our needs).
- Following CFLT, explain a suitable semantics for Welkin.
 - We need to determine how to implement all of the axioms.
 - We also need to use a suitable proof system (e.g., Hilbert, Gentzen, etc.). Maybe that could be decided in CFLT?

Draft of EBNF:

```

<term> ::= <ident> '=' <expr>
| 'for' <ident> '=' <expr> 'to' <expr> 'do' <statement>
| '{' <stat-list> '}'
| <empty>

```

```

<stat-list> ::= <statement> ';' <stat-list> | <statement>

```

4.2 Core Algorithms

4.3 General Application Behavior

Chapter 5

Expanding Complexity