

Conversation with Gemini

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Review: *Halting, the Power of Mathematics, and Religion* by Eric C.R. Hehner

Monograph URL: hehner.ca/HPMR.pdf

Author: Eric C.R. Hehner (University of Toronto)

Core Theme: The Halting Problem, the Limits of Computation, and the Psychology of Mathematical Belief

Executive Summary

Halting, the Power of Mathematics, and Religion is a brief, highly philosophical essay that bridges the gap between formal computer science theory and cultural sociology. Building on his technical work regarding self-reference, Hehner addresses why the mainstream computer science community has historically rejected any alternative interpretations of Turing's Halting Problem.

Rather than focusing solely on the mathematics, this monograph argues that the standard narrative surrounding the Halting Problem—that mathematics possesses a "magical, unlimited power" over computation—resembles religious dogma more than scientific objectivity.

Summary of the Argument

1. The Mathematical Setup

Hehner walks through Alan Turing's classic diagonal proof of the Halting Problem, updating the notation into modern programming language terms (using Pascal and Python as examples instead of Turing Machines). He highlights the mathematical halting function:

$$\text{MathHalt}(p,x)=\text{true or false}$$

He introduces the classic adversarial program, *twist*, which queries an implementation of this halting function (*PascalHalt* or an oracle) and intentionally behaves in the exact opposite manner:

Delphi

```
procedure twist (x: string);  
begin  
  if PascalHalt ('twist', x) then  
    twist (x)  
end
```

If *PascalHalt* predicts that *twist* will terminate (true), *twist* enters an infinite loop. If *PascalHalt* predicts it will loop (false), *twist* terminates immediately.

2. The Locus of the Blame

Hehner points out that when this contradiction (*true=false*) occurs, logic demands that something in our initial assumptions must be blamed and thrown out.

Standard theoretical computer science blames the **implementation** (the oracle or the program *PascalHalt*), leading to the conclusion that a halting function is *incomputable*. Hehner argues that we could just as easily blame the **specification** of *MathHalt* itself for being mathematically inconsistent when

subjected to a twisted self-reference. If the specification is broken, then there is no "mathematical halting function" to begin with, meaning the claim that it is "incomputable" becomes meaningless.

3. The "Religious" Parallel

The crux of this particular essay is the sociological question: **Why does the computer science community universally choose to blame the machine rather than the mathematics?**

Hehner asserts that the mainstream view relies on an unexamined belief that mathematics is an absolute, infinite, supreme power, while computation is a limited, physical, and lesser domain. He draws an explicit parallel to religion:

- **The Oracle as a Deity:** The field of "hypercomputation" studies computers augmented by magical "oracles" that can compute the uncomputable. Hehner compares these oracles to gods—omniscient entities injected into theory to solve logical paradoxes.
- **Dogma vs. Inquiry:** Hehner posits that computer scientists cling to the "incomputability" narrative because humans are psychologically wired to favor beliefs they learned early in their education. Questioning Turing's conclusion feels to theoreticians like a fundamental threat to their logical foundation.

Critique and Impact

Strengths

- **Provocative Reframing:** The essay is highly effective at making the reader step back and look at the *psychology* behind mathematical definitions. It challenges the

assumption that mathematical definitions are always pristine and immune to flaws.

- **Accessible and Clear:** Writing in a conversational, blunt style, Hehner avoids hiding behind dense notation. The code examples are simple enough for an undergraduate student to follow.

Weaknesses

- **Deeply Controversial Analogy:** Comparing mainstream theoretical computer science to religious adherence will inevitably alienate readers who view Turing's boundaries as clean, objective, model-theoretic truths. Critics would argue that standard logic cleanly handles the distinction between semantic truth and syntactic provability without needing to invoke "religion."
- **Philosophical rather than Technical:** Readers looking for a deep, technical blueprint on how to construct a workaround for static analysis will find this paper lacking. It is an essay about *attitude* and *definitions* rather than engineering.

Final Verdict

Halting, the Power of Mathematics, and Religion is an entertaining and intellectually disruptive polemic. It is a quick read that serves as an excellent companion piece to Hehner's more technical papers on the Halting Problem (like *EGT2.pdf*). It forces software engineers and theoreticians alike to confront their own biases regarding what "limits of computation" actually mean, making it a stellar prompt for classroom debates or philosophical reflection.

