

The Limit of Turing Theory of the Halting Problem and Gödel Incompleteness Theorems

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1. The Background

Turing halting problem (usually just called as halting problem, which this article would serve to prove improper) and Gödel incompleteness theorems have become lofty elements of nowadays world culture so that we could frequently see their citations in both serious scholastic theses and popular writings in all areas of social life. They have been, along with some other similar theories, the symbols of the enlightenment concerning our self-awareness about the intrinsic defects in our historically-assumed perfect logical system.

However, although those theories are undoubtedly great contributions to humanity, their actual roles in real life practices of either logical thinking or computer-related tasks are far less influential than their reputations stand for. A semantic subtlety behind this global phenomenon is the resemblance between the concept of “the whole set of all” and “all of the whole set”. While both the Turing theory about the halting problem and the Gödel theorems only apply to the whole set, they have been widely and confusingly presented as a general truth that would apply to all members of the relevant set. This article would analyze the reason behind the global misconception about the roles of Turing halting problem and Gödel theorems as well as a whole family of the relevant theories in human civilization.

2. Turing Halting Problem

As a famous computability problem, Turing’s halting problem could be described in different ways, and one simple way in plain English goes like this¹:

The halting problem is the problem of determining, from a description of an arbitrary computer program and an input, whether the program will finish running, or continue to run forever. Alan Turing proved in 1936 that a general algorithm to solve the halting problem for all possible program-input pairs cannot exist.

Despite that the Turing halting problem has been given a great weight by academics not only for the foundation of computer science but also for philosophy in general, and despite that whether a program can finish running normally or be halted infinitively is the one of most common concerns for any professional who would write computer programs and run them on computers, people don’t really use or need the Turing theory of the halting problem for daily practices with computer software and hardware or any other practices in any area except for the teaching and theoretical discussions of the theory itself or other theories with similar nature.

We could sense the weight of the Turing halting problem theory in our civilization through the volume of text that has been devoted to the introduction, demonstration, further proof, and application of the theory in various theoretical fashions, as well as in popular culture including

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Turing's Cathedral George Dyson, 2012-12-11 A Wall Street Journal Best Business Book of 2012 A Kirkus Reviews Best Book of 2012 In this revealing account of how the digital universe exploded in the aftermath of World War II George Dyson illuminates the nature of digital computers the lives of those who brought them into existence and how code took over the world In the 1940s and 50s a small group of men and women led by John von Neumann gathered in Princeton New Jersey to begin building one of the first computers to realize Alan Turing s vision of a Universal Machine The codes unleashed within this embryonic 5 kilobyte universe less memory than is allocated to displaying a single icon on a computer screen today broke the distinction between numbers that mean things and numbers that do things and our universe would never be the same Turing s Cathedral is the story of how the most constructive and most destructive of twentieth century inventions the digital computer and the hydrogen bomb emerged at the same time

Kurt Gödel and the Foundations of Mathematics Matthias Baaz, Christos H. Papadimitriou, Hilary W. Putnam, Dana S. Scott, Charles L. Harper, Jr, 2011-06-06 This volume commemorates the life work and foundational views of Kurt G del 1906 78 most famous for his hallmark works on the completeness of first order logic the incompleteness of number theory and the consistency with the other widely accepted axioms of set theory of the axiom of choice and of the generalized continuum hypothesis It explores current research advances and ideas for future directions not only in the foundations of mathematics

and logic but also in the fields of computer science artificial intelligence physics cosmology philosophy theology and the history of science The discussion is supplemented by personal reflections from several scholars who knew G del personally providing some interesting insights into his life By putting his ideas and life s work into the context of current thinking and perceptions this book will extend the impact of G del s fundamental work in mathematics logic philosophy and other disciplines for future generations of researchers

Limits Of Mathematical Modeling In The Social Sciences, The: The Significance Of Godel's Incompleteness Phenomenon Francisco Antonio Doria,2017-05-30 Current mathematical models are notoriously unreliable in describing the time evolution of unexpected social phenomena from financial crashes to revolution Can such events be forecast Can we compute probabilities about them Can we model them This book investigates and attempts to answer these questions through G del s two incompleteness theorems and in doing so demonstrates how influential G del is in modern logical and mathematical thinking Many mathematical models are applied to economics and social theory while G del s theorems are able to predict their limitations for more accurate analysis and understanding of national and international events This unique discussion is written for graduate level mathematicians applying their research to the social sciences including economics social studies and philosophy and also for formal logicians and philosophers of science

Gödel, Tarski and the Lure of Natural Language Juliette Kennedy,2020-12-17 Introduces an original approach to foundations of mathematics departing from G del and Tarski and spanning many different areas of logic

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Table of Contents Thinking About Godel And Turing Thinking About Godel And Turing

1. Understanding the eBook Thinking About Godel And Turing Thinking About Godel And Turing
 - The Rise of Digital Reading Thinking About Godel And Turing Thinking About Godel And Turing
 - Advantages of eBooks Over Traditional Books
2. Identifying Thinking About Godel And Turing Thinking About Godel And Turing
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Thinking About Godel And Turing Thinking About Godel And Turing
 - User-Friendly Interface
4. Exploring eBook Recommendations from Thinking About Godel And Turing Thinking About Godel And Turing
 - Personalized Recommendations
 - Thinking About Godel And Turing Thinking About Godel And Turing User Reviews and Ratings
 - Thinking About Godel And Turing Thinking About Godel And Turing and Bestseller Lists

5. Accessing Thinking About Godel And Turing Thinking About Godel And Turing Free and Paid eBooks
 - Thinking About Godel And Turing Thinking About Godel And Turing Public Domain eBooks
 - Thinking About Godel And Turing Thinking About Godel And Turing eBook Subscription Services
 - Thinking About Godel And Turing Thinking About Godel And Turing Budget-Friendly Options
6. Navigating Thinking About Godel And Turing Thinking About Godel And Turing eBook Formats
 - ePub, PDF, MOBI, and More
 - Thinking About Godel And Turing Thinking About Godel And Turing Compatibility with Devices
 - Thinking About Godel And Turing Thinking About Godel And Turing Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Thinking About Godel And Turing Thinking About Godel And Turing
 - Highlighting and Note-Taking Thinking About Godel And Turing Thinking About Godel And Turing
 - Interactive Elements Thinking About Godel And Turing Thinking About Godel And Turing
8. Staying Engaged with Thinking About Godel And Turing Thinking About Godel And Turing
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Thinking About Godel And Turing Thinking About Godel And Turing
9. Balancing eBooks and Physical Books Thinking About Godel And Turing Thinking About Godel And Turing
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Thinking About Godel And Turing Thinking About Godel And Turing
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Thinking About Godel And Turing Thinking About Godel And Turing
 - Setting Reading Goals Thinking About Godel And Turing Thinking About Godel And Turing
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Thinking About Godel And Turing Thinking About Godel And Turing
 - Fact-Checking eBook Content of Thinking About Godel And Turing Thinking About Godel And Turing
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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