



Graph Algebra and Formally Defined Programs in Z

Using Haskell to Reason and Verify Programs

Leonard Kleinrock

01.jan.2022

Formal Methods International Congress



Graph Algebra Representation of Formally Defined Programs in Z

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Lists

1 Berlin

2 Hannover

3 Freiburg im Breisgau

4 Heidelberg

5 Hamburg

1 Leipzig

2 Dresden

3 München

4 Köln

5 Königsberg und Praga

Is Algebraic Graph Knowledge Possible?

Research has been conducted in order to evaluate the possibility of reaching meaningful knowledge from Algebraic Graph transformations.

- Model Cheking and theorem proving are viable paths.

When the neet to make strong assertions becomes inevitable:

- This is the first way: outstanding assertion !
- Even greater impact comes from: **hilight text** !

* **Note** : This is a very long footnote line intended to test the layout of two.

H1

H2

H3

H4

H5

H6

- This is a fragment o normal text written here in order to exemplify the use of several featrues in CSS.
- This is a fragment o normal text written here in order to exemplify the use of several featrues in CSS.
 - This is one **feature**
 - This is another subjeti.

Lists

1. One
2. Two
3. Three
 - i. abc
 - ii. def
4. End of list

```
primes = filterPrime [2..]
  where filterPrime (p:xs) =
        p : filterPrime [x | x <- xs, x `mod` p /= 0]

seqLength :: Num b => Sequence a -> b
seqAppend :: Sequence a -> Sequence a -> Sequence a

seqLength Nil = 0
seqLength (Cons _ xs) = 1 + seqLength xs

seqAppend Nil ys = ys
seqAppend (Cons x xs) ys = Cons x (seqAppend xs ys)
```

Code: Haskell code fragment.

Tables

Column A	Column B	Column C	Column D
A1	B1	C1	D1
A2	B2	C2	D2
A3	B3	C3	D3

Table: Exemple of use of tables.

LaTeX Equations

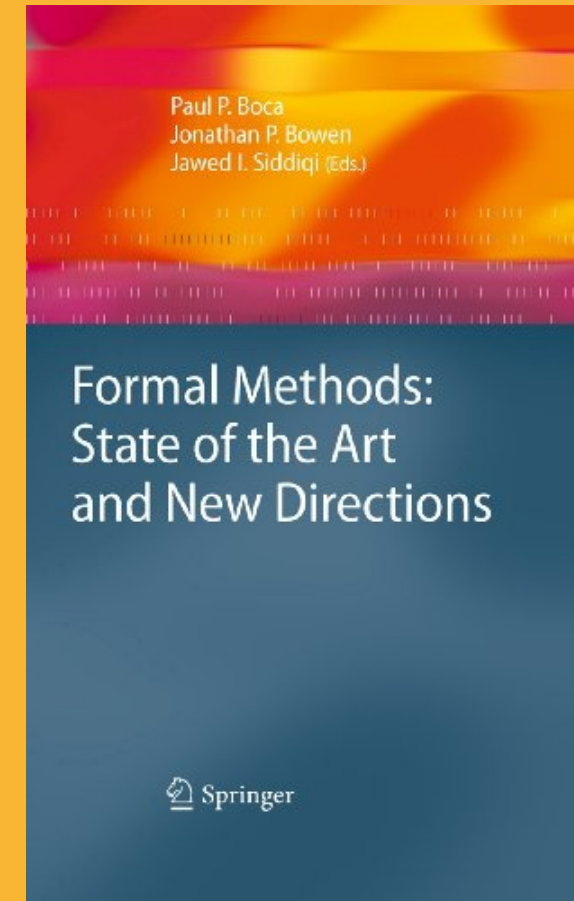
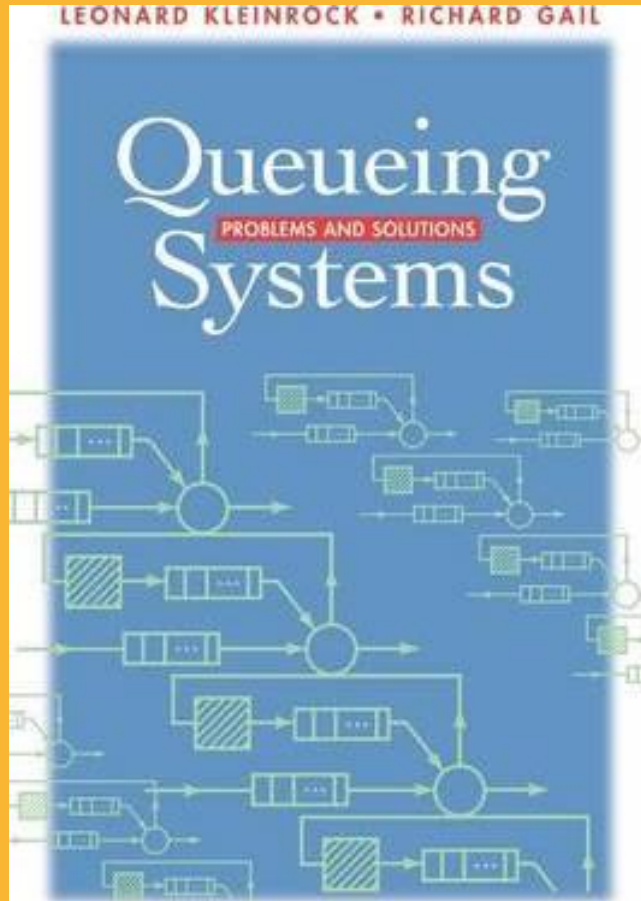
$$\frac{1}{c^2} \frac{\partial^2 \psi}{\partial t^2} = \nabla^2 \circ \psi$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

$$\nabla^2 \mathbf{E} = \mu\epsilon \frac{\partial^2 \mathbf{E}}{\partial t^2}$$

$$c = \sqrt{\frac{1}{\mu\epsilon}}$$

Images in Two Columns



Images in Two Columns

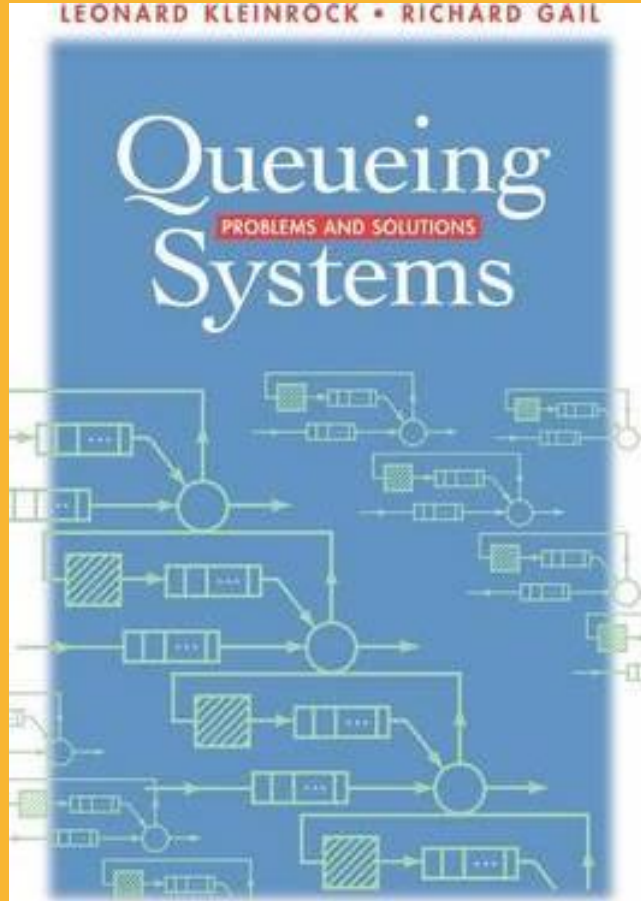


Figure: Kleinrock, Gail (1979).

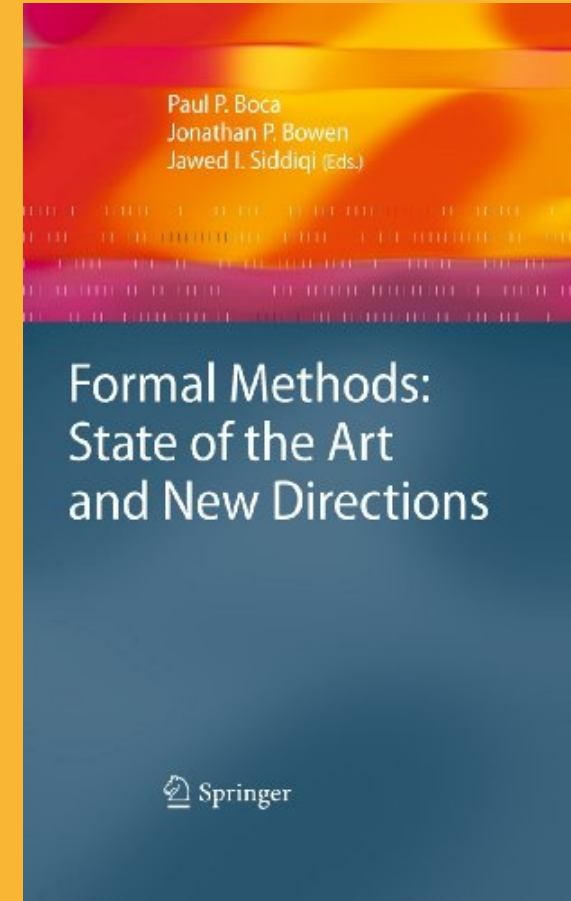


Figure: Springer Verlag (1979).

Image and text

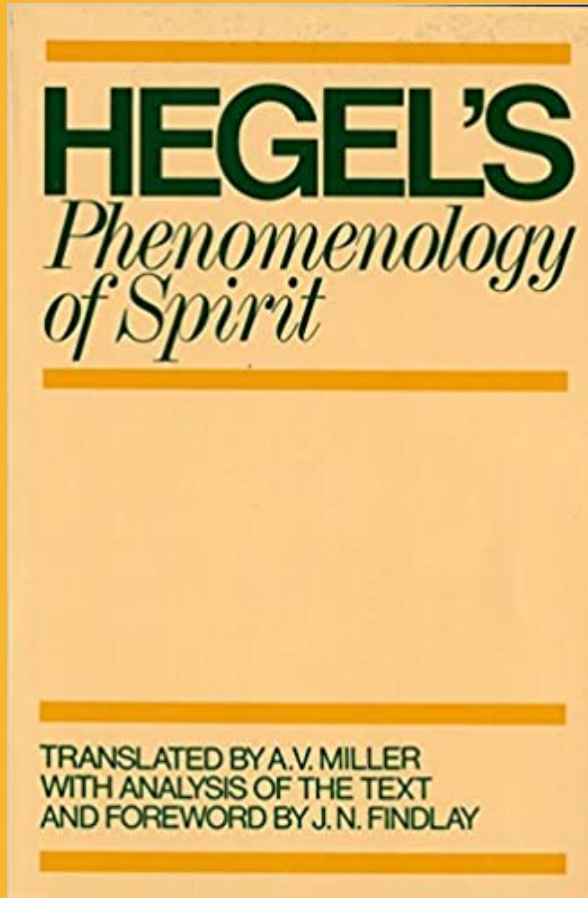


Figure: Oxford edition (1979).

Hegel's Phenomenology

The book was originally entitled "Phänomenologie des Geistes" by its author, G.W.F. Hegel.

- Published in 1807, marked a significant development in German idealism after Kant.
- In this book Hegel develops his concepts of dialectic.

Price at Amazon: \$ 17.83

"There is an **increasing** demand of current information systems to incorporate the use of a higher degree of formalism in the development process. **Formal Methods** consist of a set of tools and techniques based on mathematical model and formal logic that are used to **specify and verify** requirements and designs for hardware and software systems."

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- **Mona Batra** -

Transition Slide

References

1. PLATO. **Plato Republic**. Tradução: C. D. C. Reeve. Indianapolis, IN, USA: Hackett Publishing Company, 2004.
2. PLATO. **Plato Republic**. Tradução: C. D. C. Reeve. Indianapolis, IN, USA: Hackett Publishing Company, 2004.
3. ARISTOTELES. **Nikomachische Ethik**. Berlin: Akademie Verlag, 2010. (Klassiker Auslegen).v. 2
4. KANT, Immanuel. **Kritik der Praktischen Vernunft**. Berlin: Akademie Verlag, 2002. (Klassiker Auslegen).v. 26
5. HEGEL, Georg Friederich Wilhelm. **Hegel's Phenomenology of Spirit**. Tradução: A. V. Miller. New York: Oxford University Press, 2004.



References

1. PLATO. **Plato Republic**. Tradução: C. D. C. Reeve. Indianapolis, IN, USA: Hackett Publishing Company, 2004.
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3. KANT, Immanuel. **Kritik der Praktischen Vernunft**. Berlin: Akademie Verlag, 2002. (Klassiker Auslegen).v. 26
4. HEGEL, Georg Friederich Wilhelm. **Hegel's Phenomenology of Spirit**. Tradução: A. V. Miller. New York: Oxford University Press, 2004.
5. HUSSERL, Edmund. **The Crisis of European Sciences and Transcendental Phenomenology**. Evanston, USA: Northwestern University Press, 1970.
6. CASSIRER, Ernst. **The Myth of the State**. New Haven, USA: Yale University Press, 1946.
7. HEIDEGGER, Martin. **Sein und Zeit**. 11. ed. Tübingen: Max Niemeyer Verlag, 1967.
8. GADAMER, Hans-Georg. **Wahrheit und Methode**. Berlin: Akademie Verlag, 2007. v. 30.

