The Contribution of Carl Adam Petri to our understanding of 'Computing'

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What is Modelling ?

Widespread view:

REALITY -------- partial function ----→ MODEL

but we prefer :

SHARED
INFORMAL ====== translation ====== FORMAL
MODEL MODEL

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C. A. Petri (2005)

SHARED

INFORMAL ====== translation ====== FORMAL

MODEL MODEL

contains:

Experiences

Conventions

PLANS

Preferences

Beliefs, Illusions ?

Paradoxes ?

In constant friendly battle

requires:

Deductive power

Share-ability

Definiteness for

Verification or

Disproof

Simple Basis

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C. A. Petri (2005)

Modelling

Modelling is a translation from a shared informal mental image to a formal mental image

- Deductive power
- Share-ability
- Verification or Disproof-definiteness

Resonances

- XXth Century Philosophy of Science
  - Bridgman's Operationalism
  - Popper's Neo-empiricism
  - Feyerabend methodological Anarchism
  - and the whole debate that is still going on.

A different position

- Petri is not interested in philosophy of science, in the concept of truth, or in relativizing it
- Petri wants to modify ‘the way we model’ not interpret ‘models, as they are currently done’ in a relativized way.

Petri's Forgotten Topics

- Our Community has paid, up to now, little attention to these aspects of Petri's work
- Few people, out of our community, made efforts to understand it
- A small contribution to overcome these shortfalls.

Interpreting Petri's slides

- Knowledge is a social construct
- Social knowledge is experiential, conventional, subject to social traditions, individual preferences, or, even, to beliefs and illusory truths.
- Sharing knowledge is limited!

A new view on modelling

- Modelling is the way for becoming able to share knowledge without sharing experiences, conventions, social traditions, individual preferences, beliefs and illusory truths.

- Sharing as re-producing!

The role of scientific knowledge

- Is not telling us the ‘true’ truth
- Neither to tell us the ‘best possible’ truth

- Rather, to make social knowledge share-able, reproducible, falsifiable

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Two examples

- Basic mathematical concepts of Petri's combinatorial models
- Communication disciplines

Standard mathematics

- Our scientific theories are based on equivalence relations, i.e. on relations being reflexive, symmetric and transitive.
- Equivalence is the intersection of two partial orders:

  $a = b$ iff $a \leq b$ and $b \geq a$

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equivalence

- We consider equivalent two indistinguishable observations that tell us that the observed phenomena are indistinguishable

- ‘Equivalent’ can stand for ‘equipollent’, ‘congruent’, ‘equal’, …

Relativizing ‘equivalence’

- Philosophy of science proposes ways of relativizing the truth of equivalence, but does not attack equivalence itself.

- Its role seems to give us a ways of considering scientific truth as approximate.

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The observer

- But human observations cannot capture the very nature of the phenomenon they observe.
- If two observations are indistinguishable, we cannot infer that the observed phenomena are equal.

Concurrency relation

- Concurrency relation is reflexive and symmetric but not transitive
- Partial order, on its part, is reflexive and transitive, but not symmetric
- a *co* b and b *co* c =/=> a *co* c

Indistinguishability

- Indistinguishability is, like concurrency, reflexive and symmetric but not transitive.
- Petri's combinatorial models don't need to be relativized.

Net Theory

- Is a theory for modelling without assuming a strong idea of truth
- Combinatorial and topological properties, interesting model properties, different levels of net models

Communication Disciplines

- A new way to model communication
- Beyond Shannon & Weaver's 'Communication Theory'

Shannon and Weaver's viewpoint

- We are high in the sky, looking at earth
- We see people making and receiving phone calls
- We can see successes and failures, messages flowing, we can measure what happens (noise, duration, …), …

Petri's viewpoint

- But we cannot understand the complexity of communication networks, and how we use them.
- We need to move from the sky down to the earth, assuming the viewpoint of a person immersed in the communication network.

Within a communication network

- People, juridical entities, roles,
- objects, instances,
- rights, constraints,
- channels, devices,
- Routers, protocols
- …

Communication Disciplines

- Synchronization
- Addressing
- Copying
- Composition
- Authorization
- Delegation
- Identification
- Naming
- Cancelling
- Modelling
- Valuation
- Reorganization

Disciplines

- Discipline as a set of rules regulating phenomena
- Discipline as the body of knowledge characterizing a phenomenon

Communication behavior

Synchronization

Identification

Addressing

Naming

Objects Flowing

Copying

Cancelling

Composition

Roles in the network

Authorization

Delegation

Managing the network

Modelling

Valuation

Reorganization

Thank you for the attention!

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