

On Inverse Analytic Methods and Monotonous Growth of Knowledge

Miloš Kosterec
Comenius University in Bratislava

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Problem in short

- Does the use of analytic method presuppose that the content of knowledge have to be enriched?

Scientific Method

- A scientific method is simply a method used in science to solve some problem of actual cognitive interest.
- A problem is usually a question that does not have an explicit answer within the initial knowledge state.
- The problem is usually solved by a change in knowledge state.

Knowledge state

- Every state of knowledge should have a universe of objects which the knowledge is about.
- This knowledge is grasped by particular conceptual tools.
- The state of knowledge is represented by a sum of propositions with an ascribed epistemic value.
- Explicit knowledge state has implicit logical closure.

Instructional Model of Method (IMM)

- A method is modeled as an ordered set of instructions for actions that aim to solve a problem.
- Instruction urge an agent to change the knowledge state.
- A method is taken to change the knowledge state of an agent by changing at least one of the parts of his knowledge state (i.e., the universe of objects, the conceptual system or propositional knowledge).

IMM – methods as relations

- During our research of supposed analytic methods we discovered an inherent underdetermination of these methods.
- In their ideal form, these methods often contain a point at which choice is required.
- Thus it is not sound to consider methods as functions over knowledge states but rather as relations over the set.

Ontology in IMM

- The initial state for using the method includes those parts of knowledge base which are in need of change as its *ontology*.
- By IMM the ontology *after* using a method *always* contains the ontology *before* using the method as its subpart.
- The only changes modeled by the formal version of IMM were based on enriching the knowledge state of the agent

Analytic method

- Analytic method should not lead to any new empirical information, but rather should help in decoding, finding or making explicit some information that had already been present implicitly in the state of knowledge.
- An agent following the analytic method cannot find any information which is not entailed by the state of his initial knowledge.
- I defined a method as analytic if the instructions it contains do not make the agent cross the logical closure of his initial knowledge.

Gauss Elimination

- Solving a set of linear equations is a quite common problem.
- A necessary condition for a single solution to exist is that the number of linearly independent equations is equal to the number of variables.

$$\begin{aligned}1x + 2y &= 6 \\2x + 4y &= 12\end{aligned}$$

$$\begin{aligned}1x + 2y &= 6 \\4x - 1y &= 6\end{aligned}$$

Gauss Elimination – Ontology in IM

- Initial set of objects in ontology – set of equations A .
- Final set of objects in ontology – set of linearly independent equations B .
- B is a subset of A , not *vice versa*.

Monotonous growth of ontology?

- Based on example of Gauss Elimination, the monotonicity condition on ontologies should be dropped from the instructional model of method.
- Analyticity of method does not presuppose growth of explicit knowledge.

Monotonous growth and Analytic Method

- The sheer amount of methods which have some kind of reduction as a goal can be considered as a relevant empirical fact for this line of reasoning.
- We can use analytic methods to reduce the amount of explicit but unnecessary information which is within the knowledge state.

Inverse Analytic Method?

If methods are considered as relations on possible knowledge states of agents

and

the monotonicity of growth is no longer viewed as a necessary condition for any relation to be considered an analytic method

we can ask the following question:

Is there an inverse analytic method for each analytic method?

Inverse analytic method – no in general

- The general answer is: No. Although there is a concept of inverse relation to any relation, we cannot assume that an agent who would follow a method and then its inverse would necessarily return back to where they started.
- The reason being that the composition of a relation with its inverse does not lead to an identity relation.

And for core analytic methods?

- Although I cannot deny the existence of inverse analytic methods in general for at least a subpart of the universe of analytic methods, I can deny it for the analytic methods we presented a model of using IMM: defining, explication, conceptual analysis, abstraction and idealization.
- All IMM based models were not bijections.

Conclusion

- The notion of analytic methods does not presuppose monotonous growth of the explicit knowledge.
- There are analytic methods used to reduce unnecessary information.
- Although the existence of inverse methods is not precluded in general, the core analytic methods in social sciences do not have inverse methods.

Thanks for your attention.