To what extent do computer programs *depend* on logic?

September 12, 2019

BERTINORO 2019 – PROGRMAme-WORKSHOP: LOGIC

Instead of defending an already well established argument when it comes to the relationship of "logic" and "computer programs", I'd like to raise the question, "To what extent do computer programs *depend* on logic?". At first, this question may read as naive or even silly since logic is undeniably a very important "ingredient" of computer programs (as evident by the choice as topic of our workshop in Bertinoro). However, the question has a metaphysical motivation and aims for a better understanding of the ontological status of computer programs by analyzing the kind and degree of dependence.

In Metaphysics there are different forms of so called *ontological dependence*, often spelled out in modal terms. For instance:

$$x \text{ depends for its existence upon } y =_{df} \text{ Necessarily, } x \text{ exists only if } y \text{ exists.} \tag{1}$$

Illuminating the kind of ontological dependence of entities x upon y (in our case $x =$ "computer programs" and $y =$ "logic") may help one to better understand the ontological status of x, i.e., here, computer programs.

But how does the original question about the dependence of computer programs to logic help us understand the the nature of the former? So far, it turned out to be notoriously difficult to determine the ontological status of computer programs. Many philosophically inclined scholars suggested the so

called *dual-nature view*; on the one hand, computer programs causally interact with the world and "do something", they are physical (in a certain way), on the other hand they are perceived as these abstract-mathematical-object like entities, which don't bear any physical properties.

Take for contrast, regular "material objects" like rocks or tigers – they seem to lack any ontological dependence to "logic". In other words, logic is not an integral ingredient of what constitutes those objects as being rocks or tigers. Mathematical objects on the other hand, appear to be largely contingent on logic (in one form or another). But how is the situation then when it comes to computer programs? Is logic really an over and above necessary ingredient for constituting a computer program? Could there be computer programs without logic and what, subsequently, are the ramifications for the understanding of their ontological status?

Even though the question has a clearly philosophical connotation, it can not only be approached from a philosophical angle, but also from a historical and a practical perspective. For instance, has the relationship (especially "ontological dependence") between logic and computer programs historically always been the same? Can there be (historically) identified different kinds of dependence relations between computer programs and logic? Shedding light on these issues may help us to find an answer to the original question "To what extent do computer programs *depend* on logic?", which in turn would largely benefit our understanding of the metaphysics of programs in general.

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