The results of computer simulations of natural or technical systems have already become subject of political decisions. It is anticipated that they are able to support politicians to act responsibly especially in cases where experience and experimental control is lacking. My dissertation is intended to elaborate recommendations for rational strategies when dealing with computer simulations.

An appropriate assessment of the possibilities and constraints of a new explorative technique is unavoidable. This is of even higher importance when the technique in question has continually been improved thus highlighting its abilities. One example of a typical but problematic expectation towards computer simulations is that they constitute a means to continue the successful history of experimental research without difficulty. This can be understood in two ways. The first way is the view of computer simulations as an unproblematic complement of the experimental possibilities in contrast to, second, as their creative extension. When it comes to the "complement view" of simulations, it is for the most part overlooked by the general public that the processing of models on computers adds modelling steps. This is even more crucial in the face of the improving visualisation techniques pretending "real-life" experiences. Concerning the "extension view" of simulations, it is important to think about the type of knowledge that is claimed. It is not to be expected that all kinds of computer simulations give rise to the same answer to this question, therefore case studies or classification schemes are required. However, an approach to the answer can be given beforehand.

COMPUTER SIMULATIONS AS BASIS FOR POLITICAL DECISIONS

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It can be argued that queries beyond experimental possibilities generally involve a lower-level knowledge regarding certainty. Again, the public opinion may be the other way around. One reason for this contrary perception is the confusion of certainty due to known circumstances and the relevance of such knowledge under different conditions. Once this confusion is clarified, it is easy to show that already existing scientific methods satisfy different knowledge claims, delivering different degrees of certainty. Irrespective of this judgement, the ideal laboratory experiment and passive observations without the option to manipulate hold for the two extremes. The ideal laboratory experiment on the one hand is characterised by controllability and repeatability as well as an increasing precision. The ultimate confidence in experiments rests upon plausible predictions of observations under hypothetical circumstances. The reasonable knowledge claim of mere observation techniques on the other hand instead improves their prediction ability in terms of plausible assumptions which are to be discussed. I shall argue that it is necessary to assess computer simulation enterprises in terms of such classification schemes. It is important to stress the fact that scientific methods and models are not only a weapon against uncertainty but sources of uncertainty itself. In order to give recommendations when dealing with their results the discussion of inherent knowledge claims and assumptions is crucial, especially in consideration of possible errors and their consequences.

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