Computer science is an experimental science

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Juris Hartmanis considers that computer science is radically different from sciences like, say, physics. He claims that Thomas Kuhn's notion of scientific revolution is not applicable to computer science because no experiments can be developed to put into question basic computing theory. Furthermore, he claims that "One of the defining characteristics of computer science is the immense difference in scale of the phenomena" it deals with.

Kuhn's notion of scientific revolution is that periods of "normal science" are followed by "periods of crisis", in which the basic paradigms are radically put into question and replaced, thereby allowing for a new period of growth.

Hartmanis claims that this process is not taking place in computer science. If such is the case, then software engineering should not be considered as a part of computer science. The first class of *every* software engineering course refers to the *software crisis*, a term invented in the late sixties! The basic problem is that, for the moment, there are no known ways of building large reliable pieces of software without great risk that the projects will fail. Advances in complexity theory may well be elegant, but they offer no understanding of, say, the possible complex interactions of nodes in a network.

In fact, the actual experimentation in computer science is the current programming of large pieces of software, using the various methodologies, formalisms and tools that have been developed over the last thirty years. And experimentation is the correct word, because we often have no idea what these tools, etc. will offer until they are actually used.

The fundamental contribution that Isaac Newton made with the discovery of the Law of Gravitational Attraction is the understanding that gravity acts in the same manner on Earth and in the sky. In time, the current software crisis might be solved, if so it will be because several phenomena that appeared to be disparate have been unified into a coherent whole.

As for the wide variety of scales that are manipulated by computer scientists, I fail to see how this is in any way special to computer science. Plasma physicists work with scales ranging from 10 cm for laboratory plasmas to 5 million light-years for intergalactic space. I do not know of many computer scientists that work with 23 orders of magnitude!

When an experimental scientist prepares an experiment, he or she carefully defines what must be done, and then carefully sets out to do that. That's exactly what builders of software systems do. We *are* in fact experimental scientists.

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