

In Search of Silver Bullet

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Abstract

Frederick P. Brooks' recent insightful exposition on werewolves and the essence of software engineering [1] triggered painful memories of my own experience with werewolves such as program development environments for NASA, telecommunications software at Collins research labs, and rapid prototyping systems for the Strategic Defense Initiative.

We have tried and are still trying many approaches to solving the generic problem of finding reliable, efficient, timely and cost-contained solutions for our automation problems.

Our goal is still to create the means for cost-contained production of efficient, reliable, timely, maintainable, and portable automations. We are attacking this generic problem from many angles.

We are extending our horizon of programming technology in directions of functional programming, automatic programming, graphical/visual programming, object-oriented programming, and logic programming. We are extending our development environments in directions of knowledge-based support, graphics, integrated data-flow, and low-level operating system interfacing. We are providing powerful and expensive environments to the developers in the form of workstations. We are providing all sorts of tool sets. We are preaching management techniques. So far there is no clear cut single winner.

It appears that missed-budget and scheduling

problems of 1960's and early 1970's in constructing software have been, at least partially, solved. But the lack of a continuum from specification to design and to implementation is making the knowledge of a particular phase inaccessible at later phases of development. This inaccessibility of design and specification information is becoming a source of problems in developing and maintaining large scale software systems.

A fundamental challenge is to identify the ways of synergistic integration of technological knowledge accumulated in the fields of AI, SE, DBMS, and graphics. In working towards this goal, we should maintain a realistic perspective and not raise unrealistic expectations.

It is desirable to have a high level description system which takes advantage of AI, SE, DBMS, and graphics technologies for interactive and rapid development of functional prototypes. To be able to provide such a system, we have to solve fundamental problems related to knowledge representation and semantics. At the heart of such a system, there will be an executable VHL design languages which can be used in interactive, incremental and hierarchical specification of large scale systems.

This system should provide capabilities for prototyping of functional behavior and interfaces. In addition, a simulation/ stimulation environment in which this kind of rapid prototyping system will reside should provide performance and reliability testing capabilities.

[1] Brooks, F.P., No Silver Bullet: Essence and Accidents of Software Engineering, *Computer*, Vol. 20, No. 4, 10-19, April 1987.