

# The building of systems that are difficult



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The paper is a summary of the essays of the famous computer scientist David Lorge Pranas. Pranas quitted working with the Panel on Computing In Support of Battle Management. He cited his resignation due to the belief that the software needed by the SDIO would not be trustworthy (Pranas, 1985).

In the essay, the author explains the distinction that separates software engineering from other classes of engineering and unreliability of the software and the unattainable features of the SDI software. He further addresses the inadequacy of the techniques used to make military software. Moreover, he explained the research in the area and insufficient improvements which will impede the construction of an efficient software defense system, and why research in AI will not help in building the military software. He clarifies why automatic programming will not lead to any improvement and that program verification cannot lead to reliable strategic defense system, and why funding for this project would be inefficient.

Products of engineering include the discrete state systems and the analog systems. These systems have various shortcomings such as repetitive structures. The continuous functions of the mathematics used to explain the operation of these systems cannot help in the verification of the systems. The use of sophisticated mathematical expressions also makes the techniques inefficient to solve the differences in the technology. The education level of the programmer also impedes this project, since most programmers cannot deploy the little tools available to software engineers (Pranas, 1985).

The need for a battle management software system and the cited characteristic to improve the efficiency of the software is unattainable. The impossibility arises from the need to develop fire control software after gaining knowledge of the enemy weapons and targets. The system is too large to be built under realistic condition. More difficulty arises with the number of systems required to give such a level of functionality. The design of computer algorithms by thinking through like a computer results in uncertainty.

The uncertainty further leads to building of systems that are difficult to understand. The ability of the computer to process several functions simultaneously requires many sequential programs that confuse learners. The military software currently in place is incorrect, and the methods available in the industry to develop sizeable real-time software systems are inadequate. Software engineering methods are inadequate for large projects, and the programming environment is not flexible enough to eliminate tasks which consume time involved in the production of complex programs. Pranas argues that extensive research in software engineering will not reduce the errors and the fundamental differences in the engineering fields. Artificial intelligence will not help in designing efficient battle management software. The heuristic programs in the AI are designed by trial and error resulting in programs whose behaviors are hard to understand and predict.

Military research foundations fund most of the research involving AI (Beusmans and Wieckert, 1989). Nevertheless, automatic programming has emerged as a promising solution for the SDI software problem. The basic problem of SDI is the lack of information to write specifications rendering

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automatic programming unhelpful. Program verification of the SDI software is impossible because it should work with other parts of the system being obliterated by the adversary. A check may not be possible should the hardware fail. There are no techniques available to prove the correctness of a program in a situation where the hardware has failed when there are errors in input data.

The inadequacy of the SDIO organization further impedes the possibility of this project becoming a reality. The panel lack experts on trajectory computations and recognition of the pattern. The incompetence of the SDIO panel to judge the quality of research on battle-management computing software further makes it an inefficient organization to fund research in this area.