A function is a map from a domain to a range. Mathematics has traditionally focused on the properties of functions. As representations of functions, algorithms have additional properties — time and space — that are irrelevant to the study of functions. Recent work in mathematics, such as automata and complexity theory, is helping us understand these properties. Programs are representations of algorithms that carry still more properties: ease of construction and modification. Studying these properties involves the formalization of software engineering.

We need a mathematics of software engineering. Because software is still new, mathematics has not yet gotten around to the formal study of program properties not found in algorithms and functions. The frame technique is an empirical example of a construction system that makes precise some fuzzy issues about ease of construction and modification. Frame hierarchies embody the notion of context stratification. They also provide a consistent way to reconcile inconsistent information structures: generic frames that must be blended but not at the expense of their reusability or the efficiency of the resulting program.

Can a calculus of frames be developed? How about correctness-preserving transformations? Can canonical or normal forms be found that minimize redundancy while maximizing reusability (the dual of relational database normal forms)?

Frame-based software engineering clearly works well. The bonus is that it provides grist for some interesting mills in both mathematics and computer science.

References

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