Design of A System-Level Testability Allocation Model Using Fuzzy Set Theory

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In order to implement testability in field maintenance of a modern complex system effectively and efficiently, it is necessary to integrate the overall system from the inception of its design process by adopting the top-down approach. As a way of developing a practical testability allocation considering scarcity and imprecise nature of system information, and multi-objectives, an integrated fuzzy multi-objective testability allocation model was proposed in this paper. Its effectiveness of the proposed model has been verified using three testability allocation examples. Compared with other approaches such as Augmented Lagrange Multiplier or Linear Programming, the proposed model showed very useful in handling multi-objectives and incomplete/fuzzy information which were often encountered in the early stages of the system design. By specifying the constraints as fuzzy membership functions over all the possible values, the number of attempts of sensitivity analysis could be reduced considerably. Since the model provided an approach to design an optimal system instead of optimizing a given system, the system designer can explore broader range of alternatives for the better solution than with the cases of single objective models after the problem was formulated.