

Fuzzy Objects – **A New Direction in Research***

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Abstract

We introduce in this paper a new and revolutionary concept: *fuzzy objects* – *FOBs*. It turns out that FOBs can generalize much of the ongoing research in computer science, ranging from its theoretical to applied aspects. It is even apparent that research areas outside of traditional computer science can be formulated within the FOB framework. Our research on FOBs is just starting and the paper is of exploratory nature and rather sketchy. We just outline the main ideas and do not engage in any rigorous treatment which we hope to provide in forthcoming papers.

1 Definition

We say that an *object* (in a very general sense) is *fuzzy* if its behavior is non-deterministic. For example, within the programming framework, we might take the traditional view that an object is a structured value accompanied by its methods. The exact behavior of a fuzzy object under a method invocation will be non-deterministic. This idea leads naturally to a *fuzzy object oriented* programming paradigm (*FOOP*) which obviously generalizes the well known *object oriented* programming paradigm. We shall say more about this particular application in Section 3.

2 Possible applications

It is quite clear to us that much of the existing computer science can be reformulated in terms of FOBs. We mention some of the possible examples below. The list is obviously very far from being exhaustive.

- Monte Carlo methods;
- fault-tolerant computing;

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- network protocols;
- distributed systems;
- genetic algorithms;
- fuzzy intelligence;
- fuzzy neural nets.

3 Linguistic support

Applications to such diverse areas of computer science will require a strong linguistic support. We are engaged in the design of a new programming language to be called C+- (to be pronounced ‘*cee, more or less*’). The language will be (probably) upward compatible with C++. The final mechanisms for non-determinism have not been decided yet, however several of them are under consideration. Possibly more than one will be included in the final design, so as to increase the expressive power of the language.

Some of the non-deterministic mechanisms we are studying are:

- non-deterministic **switch** statement;
- non-deterministic inheritance scheme;
- non-deterministic method choice;
- non-deterministic exception handlers.

We assume that besides providing linguistic support for other applications, the design of C+- will spur a new line of research within the programming language community. We foresee the design or extension of other languages; clearly, Modula-FOB is a strong candidate.

4 Theoretical aspects

We expect that our ideas will stimulate lots of new theoretical research. *Fuzzy semantics*, strongly related to *fuzzy logic*, will become an important subject of studies supporting the area of programming languages. The definition of fuzzy objects includes in a natural way notions of *non-deterministic automata* (of several kinds) and many others.

5 Conclusions

We provided just an outline of some basic ideas about *fuzzy objects*. There is no doubt that these ideas will have a strong and unifying effect on research in computer science. As a matter of fact, its influence need not be constrained. Fuzzy objects can be identified in any scientific or cultural domain. We can think of fuzzy mechanical parts, fuzzy electronic components, and so on.