

Fuzzy Arden Syntax: A fuzzy programming language for medicine.

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OBJECTIVE: The programming language Arden Syntax has been optimised for use in clinical decision support systems. We describe an extension of this language named Fuzzy Arden Syntax, whose original version was introduced in S. Tiffe's dissertation on "Fuzzy Arden Syntax: Representation and Interpretation of Vague Medical Knowledge by Fuzzified Arden Syntax" (Vienna University of Technology, 2003). The primary aim is to provide an easy means of processing vague or uncertain data, which frequently appears in medicine. **METHODS:** For both propositional and number data types, fuzzy equivalents have been added to Arden Syntax. The Boolean data type was generalised to represent any truth degree between the two extremes 0 (falsity) and 1 (truth); fuzzy data types were introduced to represent fuzzy sets. The operations on truth values and real numbers were generalised accordingly. As the conditions to decide whether a certain programme unit is executed or not may be indeterminate, a Fuzzy Arden Syntax programme may split. The data in the different branches may be optionally aggregated subsequently. **RESULTS:** Fuzzy Arden Syntax offers the possibility to formulate conveniently Medical Logic Modules (MLMs) based on the principle of a continuously graded applicability of statements. Furthermore, ad hoc decisions about sharp value boundaries can be avoided. As an illustrative example shows, an MLM making use of the features of Fuzzy Arden Syntax is not significantly more complex than its Arden Syntax equivalent; in the ideal case, a programme handling crisp data remains practically unchanged when compared to its fuzzified version. In the latter case, the output data, which can be a set of weighted alternatives, typically depends continuously from the input data. **CONCLUSION:** In typical applications an Arden Syntax MLM can produce a different output after only slight changes of the input; discontinuities are in fact unavoidable when the input varies continuously but the output is taken from a discrete set of possibilities. This inconvenience can, however, be attenuated by means of certain mechanisms on which the programme flow under Fuzzy Arden Syntax is based. To write a programme making use of these possibilities is not significantly more difficult than to write a programme according to the usual practice. Copyright © 2010 Elsevier B.V. All rights reserved.

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