Design of many-valued logical circuits

Milan Petrík *

Center for Machine Perception, Department of Cybernetics
Faculty of Electrical Engineering, Czech Technical University
Technická 2, 166 27 Prague 6, Czech Republic
petrikm@cmp.felk.cvut.cz

Abstract

In this paper we generalise the problem of design of logical circuits to the finitely-many-valued logic. We divide the problem into two parts.

The first part is the design of combinational logical circuits. It consists of expressing any logical function by a finite set of operations in a normal form. We present a tool of many-valued Svoboda maps (called also Veitch or Marquand maps) which can be used to find optimized normal forms. Our approach is based on functionally complete sets of operations given by Lukasiewicz connectives extended by rational constants, standard connectives extended by rational constants, Kronecker delta and Lukasievicz equivalence. Other possibilities, functionally complete sets of operations given by many-valued Sheffer operation or many-valued Pierce operation will be discussed.

The second part presents a many-valued memory circuit based on a generalisation of the R-S circuit known from the two-valued logic. This approach is based on the operation of negated standard conjunction.

References


* Work supported by the Czech Ministry of Education under Research Programme MSM 212300013 “Decision Making and Control in Manufacturing”, grant 201/02/1540 of the Grant Agency of the Czech Republic, and CEEPUS net SK-042.

1 See [9, 4, 8].
2 Rational Pavelka Logic, see [11, 7].


[12] PERFILIEVA, I.: Normal Forms in BL-Algebra and their Contribution to Universal Approximation of Functions