Reduction of Logic to Arithmetic

Ranganath G Kulkarni
E mail: kulkarni137@gmail.com
Address: R G Kulkarni
C/o G V Kulkarni
Jambukeshwar Street
Jamkhandi, INDIA
PIN: 587301

Abstract: It is possible to make decisions mathematically of first order predicate calculus. A new mathematical formula is found for the solution of decision problem. We can reduce a logical algorithm into simple algorithm without logical trees.

I
Introduction:

For n number of inputs, is there any mathematical formula that answers yes or no ?[1][2][3] Now it is possible, a mathematical formula[4] is found that can be used to reduce the logical algorithm into simple algorithm without logical trees. This converts logical operation to arithmetic operation. It is a solution for decision problem of first order predicate calculus or first order logic. Therefore in a computer programming we can replace logical test containing thousands of if-else by single mathematical equation using the proposed formula. We can convert decision algorithm into algebraic manipulation or math equation. This changes the design of algorithm and also programming.

II

Theory:

Consider the function $y = \frac{(|x|+|c|+x)}{(|x|+|c|+c)}\frac{1}{e}$

Where $-\infty < c < \infty$ and $-\infty < y < \infty$

Now, $y_1 = |\frac{y}{\log y}|$ and $y_2 = |\frac{y_1}{\log y_1}|$

For n number of terms $y_n = |\frac{y_{n-1}}{\log y_{n-1}}|$

Taking limit as $n \to \infty$ yields, For x>c then $y_n = e$ and Z=f

For x=c then $y_n = 1/e$ and Z=g, For x<c then $y_n = 0$ and Z=h

This result has no proof, but we can easily verify it.

Where the function Z is given by $Z = \frac{f(y_n - 1/\mathrm{e})\,y_n}{(e - 1/e)e} + \frac{g(y_n - e)y_n}{(1/e - e)(1/\mathrm{e})} + h(y_n - 1/e)(y_n - e)$

Here f, g and h are functions of x. In logical language, this formula is a solution for decision problem[5][6] of first order logic.This formula can be used to replace decision algorithm by simple algorithm without decision trees.

III

Discussion:

Here, by using the function Yn it is possible to express non-closed form expression into closed form expression. It is a solution for decision problem of first order predicate calculus. This formula can be used for reduction of logical algorithm into simple algorithm without logical trees. This reduces logical operation to arithmetic operation. Hence the reduction of logic to arithmetic. By using the proposed formula and optimization techniques we can make elegant programming. It changes the style of designing algorithm and also we can make efficient programming.

IV

Conclusion:

I have found the decision fragment for first order predicate calculus. In a computer programming we can replace logical test by single mathematical equation. Therefore we can make elegant programming.

References:

[1] Turing, A.M. 1936.'On Computable Numbers, with an Application to the Entscheidungsproblem'. Proceedings of the London Mathematical Society , series 2, 42 (1936-37), 230-265.

[2] Church, A. "A Note on the Entscheidungsproblem." J. Symb. Logic 1 , 1936.

[3] Gödel, K. (1931), 'On Formally Undecidable Propositions of Principia Mathematica and Related Systems I', Monatschefte für Mathematik und Physik 38, pp. 173–198

[4] R G Kulkarni, Expression for the Mathematical Constant e, viXra:1109.0054
(see, http://vixra.org/abs/1109.0054)

[5] B.J. Copeland, The Essential Turing, Publisher Clarendon Press, 2004

[6] Mathematical Problems. Lecture delivered before the International Congress of Mathematicians at Paris in 1900, English translation of Hilbert (1900) by Mary W. Newson, Bull. Amer. Math. Soc. 8 (1902), 437–479