Seminar of I. Vekua Institute of Applied Mathematics REPORTS, Vol. 30, 2004

ABOUT THE ONE QUESTION OF IMPLAMANTATION OF THE LOGIC OF SENTENCES

Saatashvili G.

The Teacher of the Tskhinvali State University

Received: 17.12.2003; revised: 15.02.2004

Abstract

The following obligatory and enough conditions of sorting the logics of the sentences are found in the work:

Theorem 1. For disjunctive normal form F to be identically true, it is necessary and sufficient that the conjuncts of formula F were distributed in formula G_d.

Theorem 2. To make the F conjunctive normal form identically false, it's necessary and sufficient that the disjuncts of F formula were distributed in formula G_k.

Key words and phrases: steady state, micropolar, non-viscous, Fourier transform.

AMS subject classification: 510.633.

Let there be F and P given for the disjunctive normal form. Say, conjuncts of the F formula are distributed in P formula, when each conjunct of the formula P contains at least one conjunct of formula F .

Say, we have F and P disjunctive normal form. We say, disjuncts of formula F are distributed in formula P, when each disconjunct of the formula P contains at least one disconjunct of formula F .

Say, we have a perfect F disjunctive normal form with just $A_1, A_2, ..., A_n$ various atoms. $S_k \equiv \{X : X = (B_1 \wedge B_2 \wedge ... \wedge B_n)$, where Bi is A or $\neg Ai (i = 1, 2...n)\}$. Let's mark the disjunctive normal form, conjuncts of which are standing for the elements of S_k, with G_d .

Say, we have a perfect F conjunctive normal form with just $A_1, A_2, ..., A_n$ various atoms. $S_k \equiv \{X : X = (B_1 \wedge B_2 \wedge ... \wedge B_n)$, where B_i is A or $\neg A_i (i = 1, 2, ..., n)\}$. Let's mark the conjunctive normal form, disjuncts of which are standing for the elements of S_k, with G_d.

Theorem 1. *For disjunctive normal form F to be identically true, it is necessary and sufficient that the conjuncts of formula F were distributed in formula G_d.*

Sufficiency: It's obvious.

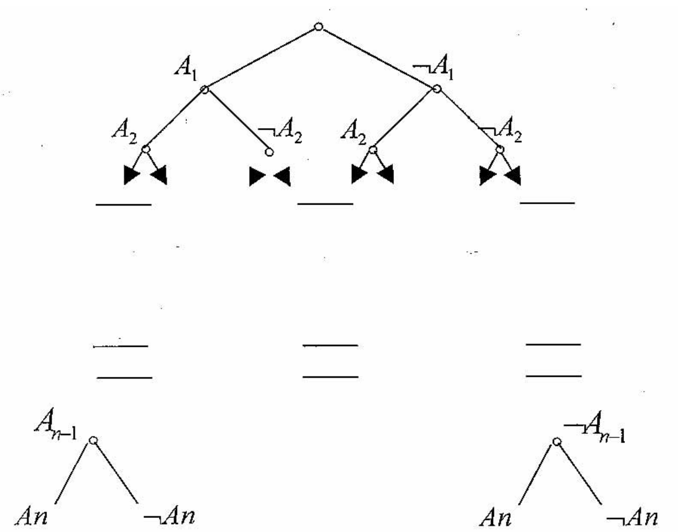
Necessity: Let us assume the contrary, i.e. formula F is true, and its conjuncts are not distributed in formula G_d. So there is some conjunct $(B_1 \wedge B_2 \wedge ... \wedge B_n)$ in G_d which does not include any conjunct from F. In the conjuncts of formula F where each of B_i can be found, at least one letter that does not belong to $\{B_1, B_2, ..., B_n\}$ set, or else such a conjunct would found in $(B_1 \wedge B_2 \wedge ... \wedge B_n)$ conjunct. It is clear, that the letter which does not belong to the set $\{B_1, B_2, ..., B_n\}$, is a contrary letter of some B_j. Thus in any conjunct where one may come across B_j we will definitely find some contrary letter of $\{B_1, B_2, ..., B_n\}$ letters. Let's take the interpretation where $\{B_1, B_2, ..., B_n\}$ are true. According to the above said, any of the conjuncts, where the each of B_i can be found, are identically false. In the conjuncts of F where none of the $\{B_1, B_2, ..., B_n\}$ sets are coming in, we will find only their contrary letters that in this particular interpretation are absolutely false. Consequently, these conjuncts are false too. Thus we've found the interpretation for F, where it is false. And this is the contradiction.

Similarly the following can be proved:

Theorem 2. *To make the F conjunctive normal form identically false, it's necessary and sufficient that the disjuncts of F formula were distributed in formula G_d.*

For the formula F, which contains n various atoms, we build a tree and name it as disjunctive (conjunctive) tree:

Let's take an initial knot and draw two branches from it so that the ends of these branches are other knots, one of them marked as first atom and the second knot marked as contradiction to the first atom. Each of these knots instigate two branches marked next atom and its contradiction and so up to n. We get:



Apparently, the letters of each conjunct (disjunct) of formula F are the letters placed on some of the branches of the designed tree. And the letters placed on each branch, stand for the letters of some conjunct (disjunct) of F .

To determine the value of a disjunctive (conjunctive) normal form F into which n various atoms are coming, we need to apply the following methods:

1. If each conjunct (disjunct) of the formula F contains a contrary pair the formula is identically false (true), otherwise we go on to the second step.

2. Let's take the initial knot and name it as the open knot.

3. If we used all of the atoms of formule to design the tree, the formula is completable. If not, let's move to the 4^{th} step.

4. Out of each know we draw two branches and their ends create knots, one of them marked as new atom taken from F and the other as condradiction to this atom.

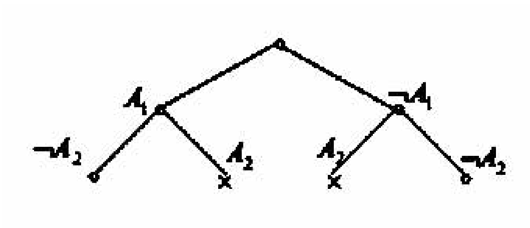
5. Each of the knots with respective branch that contains at least one conjuct (disjunct) we name as closed knot and cease the growth of the tree from this knot.

6. If all the knots are closed, the formula is true (false). If not, we move to the step 3.

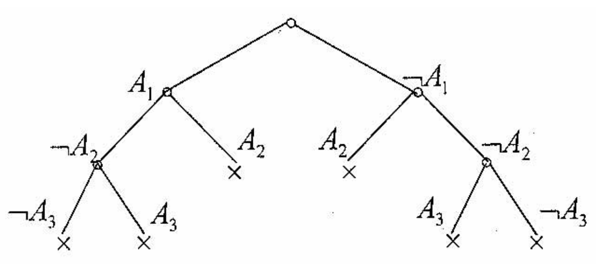
For example:

$$(A_1 \wedge A_2) \vee (A_1 \wedge A_3) \vee (\neg A_1 \wedge A_2) \vee (\neg A_1 \wedge A_3) \vee (\neg A_2 \wedge A_3)$$

Applying the steps as mentioned we come to the following stage in the devepment of tree:



As long as the letters of the $(A_1 \wedge A_2)$ and $(\neg A_1 \wedge A_2)$ conjuncts are subsets of the set of letters placed on the branches where $\{A_1, A_2\}$ and $\{\neg A_1, A_2\}$ are respectively, we name them as closed knots and cease the growth of the tree from these knots. Having the open knots according to the step 6 we continue the process from step 3. After doing so we have:



On each of the remaining four branches of tree the sets of letter $\{A_1, \neg A_2, \neg A_3\}$, $\{A_1, \neg, A_2 \neg A_3\}$, $\{\neg A_1, \neg A_2, A_3\}$, $\{\neg A_1, \neg A_2, \neg A_3\}$ include conjuncts $(A_1, \wedge A_3)$, $(\neg A_2 \wedge \neg A_3)$, $(\neg A_1 \wedge A_3)$ as subsets, therefore each of these knots we can name as closed. Coming out of the step 6 the formula is identically true.

REFERENCES

1. Chin-liang chang Richard Char., Tung Lee Academic press. Symbolic logic and mechanical theorem proving. New York san Fransisko London 1973.
2. Shalva Fkhakadze. Mathematical logic., The Publishement of Tbilisi University 1996 year.