Conflict Analysis

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ABSTRACT: Conflict analysis and resolution play an important role in business, governmental, political and lawsuits disputes, labor-management negotiations, military operations and others. Many papers have been published on conflict analysis and resolution (see e.g., Dorclan, 1969, Hart, 1974, Pawlak, 1984, and Roberts, 1976).
Various mathematical models have been proposed as a basis for conflict theory. They include, differential equations, probability, abstract algebra, graph theory and others. The lecture will concern with a mathematical model proposed by the author (see Pawlak, 1984, 1993a, 1997), and pursued by many authors (see e.g., ¯akowski, 1984a, 1984b, 1985, 1986, 1987, 1988, 1990, 1993, Van Xuat, 1984, Kanczewski, 1985, Wiweger, 1986, W¹sowski, 1987, Nabia³ek, 1988, Deja, 1996). The proposed model has its origin from rough set theory (Pawlak, 1991) and can be seen as a kind of relational approach to conflict analysis.
Starting points of the proposed theory are three binary relations, conflict, alliance and neutrality. A formal definition of these relations is given, some their properties are investigated and illustrated by the Middle East conflict.
The proposed approach can be used both, as a basis for conflict theory as well as a tool for computer simulation of case studies.

In any conflict various parties (agents, objects) are invoved in a dispute over some issues, which can be used to define relationships between the parties.

The approach is based on three binary relations R^+, R^0 and R^- called *alliance*, *neutrality* and *conflict* relation respectively.

We assume that these relations have the following properties:

(i) $R^+(x,x)$,

(ii) $R^+(x,y)$ implies $R(y,x)$,

(iii) $R^+(x,y)$ and $R^+(y,z)$ implies $R^+(x,z)$,

(iv) non $R^-(x,x)$,

(v) $R^-(x,y)$ implies $R^-(y,x)$,

(vi) $R^-(x,y)$ and $R^-(y,z)$ implies $R^+(x,z)$,

(vii) $R^-(x,y)$ and $R^+(y,z)$ implies $R^-(x,z)$,

(viii) non $R^0(x,x)$,

(ix) $R^0(x,y) = R^0(y,x)$

Obviously R^+ is an *equivalence* relation. Each equivalence classe of alliance relation is a *coalition*. Let us note that the condition (iii) can be expressed as "friend of my friend is my friend".

Conditions (vi) and (vii) refers to well know sayings "enemy of may enemy is my friend" and "friend of my enemy is my enemy".

Let us observe that in the conflict and neutrality relations there are no coalitions. All the three relations are pairwise disjoint, i.e., every pair of objects belong to exactly one of the above defined relations i.e., is in conflict, is allied or is neutral.

In order to illustrate our considerations of the Middle East conflict, will be used.

(The example does not necessarily reflect present-day situation in this region but is used here only as an illustration of the basic ideas considered in this paper).

In this conflict there are six parties

1 - Israel,

2 - Egypt,
3 - Palestinians,
4 - Jordan,
5 - Syria,
6 - Saudi Arabia,

which are disputing about several issues. In this example we will consider only the following ones:

a - autonomous Palestinian state on the West Bank and Gaza,
b - Israeli military outpost along the Jordan River,
c - Israeli retains East Jerusalem,
d - Israeli military outposts on the Golan Heights,
e - Arab countries grant citizenship to Palestinians who choose to remain within their borders.

The relationship of each agent to a specific issue can be clearly depicted as shown in Table 1.
In the table the attitude (view, approach) of parties of the Middle East region to the above issues is presented as follows: -1 means, that an agent is against, 1 - favorable and 0 neutral toward the issue. For the sake of simplicity we will write - and + instead of -1 and 1 respectively.

U	*a*	*b*	*c*	*d*	*e*
1	-	+	+	+	+
2	+	0	-	-	-
3	+	-	-	-	0
4	0	-	-	0	-
5	+	-	-	-	-
6	0	+	-	0	+

Each row of the table characterizes uniquely each party, by its approach to the disputed issues.
The table can be used to define relations between parties: if two parties have the same (different) views on a specific issue, they are allied (in conflict); if at least one is neutral - the parties are neutral.
It can be easily checked that thus defined relations safisty the properties (i) …(ix).
The conflict, neutrality and alliance relations are the starting points of conflict theory and are employed to form basic concepts of this theory.
Conflict analysis concerns mainly in investigation of conflict structure, in order to give some guidance to conflict resolution. In particular we are interested in coalitions formation, discovering critical elements in conflicts, etc.
In the lecture some ideas related to these equations will be given and illustrate by examples.
The proposed method of conflict analysis seems to be well suited as a basis for conflict theory. It offers a simple mathematical formalism and can be easily used for computer simulation of conflict situations. The model enables also natural interpretation of obtained results.

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