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Notre Dame Journal of Formal Logic
Volume 33, Number 3, Summer 1992

A Certain Conception of the Calculus of Rough Sets*

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Abstract We consider the family of rough sets in the present paper. In this family we define, by means of a minimal upper sample, the operations of rough addition, rough multiplication, and pseudocomplement. We prove that the family of rough sets with the above operations is a complete atomic Stone algebra. We prove that the family of rough sets, determined by the unions of equivalence classes of the relation R with the operations of rough addition, rough multiplication, and complement, is a complete atomic Boolean algebra. If the relation R determines a partition of set U into one-element equivalence classes, then the family of rough sets with the above operations is a Boolean algebra that is isomorphic with a Boolean algebra of subsets of universum U.

1 Introduction The rough set concept was introduced by Pawlak [4], [5]. A certain generalization of his conception was offered by Iwiński [3]. Both formulations were then extended by Janusz and Jacek Pomykała [7]. Janusz Pomykała also proposed another definition of approximation space [6]. This definition was modified by Bryniarski [1], who also proposed a different formulation of rough set theory.

The aim of this paper is to prove some algebraic properties of rough sets and to show that the algebra of classes is a particular case of the algebra of rough sets.

2 Approximation space and approximations of set Let U be a finite nonempty set and let R be an equivalence relation in U. The set U is called the *universum* and the relation R is called the *indiscernibility relation.* We will call the pair $\mathfrak{A} = (U, R)$ the *approximation space.* As U is a finite set, the relation R determines a partition of U into a finite number of equivalence classes. The equiva-

*Some of my results were presented in 1989 at XXXV Conference of History of Logic at the Jagiellonian University, Cracow.

Received February 25, 1991; revised November 8, 1991