

Topological Structures Induced by General Fuzzy Automata Based on Lattice-ordered Monoid

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Received: 2019/02/11

Accepted: 2019/11/23

Extended Abstract

Paper pages (177-190)

Introduction

The fundamental role of algebraic properties in the development of the basics of computer science has led researchers to study the concepts of fuzzy automaton separatedness, connectedness, and reversibility on a large scale. The concept of L-valued automata theory based on quantum logic is introduced in Ying. The quantum logic can be understood as a logic whose truth value set is an orthomodular lattice, and an element of orthomodular lattice is assigned to each transition of an automaton. In Qiu, it has been shown that the concepts of L-valued source and L-valued successor operators, associated with L-valued automata, induced L-valued topologies on the state-set of an L-valued automaton. The relationship between L-valued topologies depends on the distributivity of the associated lattice. In another study, Tiwari and his coworkers introduced the LM -valued automata theory from algebraic and topological point of view, where L is a residuated lattice and M is a completely distributive lattice. Such automaton may be assumed to be more general than that existing in literature in the sense that for M as one element lattice and $L = [0, 1]$. Moreover, the basis of some ordered algebras (e.g. BL-algebra, MV algebra, and BCK-algebra) is derived from the residuated lattice. Therefore, when we consider the residuated lattice as an ordered algebra, it bears a strong structural similarity to $[0,1]$. Hence, working with that is considered as both a generalization of the concept of fuzzy set and a connection between algebraic-logic and fuzzy automaton. In this paper, the general fuzzy automaton is investigated from an algebraic and topological point of view and the algebraic properties of this automaton is studied on the basis of Lattice-ordered monoid. On the other hand, the general fuzzy automaton is examined using the concepts of operators.

Materials and Methods

For the purpose of this study, considering the definition of general fuzzy automaton, we define the L^B -valued general fuzzy automaton in which B is lattice-ordered monoid consisting of propositions about general fuzzy automaton. Further, we define the L^B -valued interior and Kuratowski clouser operators on the set of these automaton modes and then we introduce the topological structures resulting from the related operators. A noteworthy point in this study is to search for algebraic and topological concepts for general fuzzy automata based on lattice-ordered monoid which rely on dependent monoid structures. Finally, some of the connectedness and separatedness properties of the general L^B -value fuzzy automaton are examined in this study while the proposed concepts are illustrated in details through examples.

Results and Discussion

This study focuses on the results obtained from L^B -valued general fuzzy automaton, the topological structures resulting from certain operators as L^B -valued interior and Kuratowski clouser operators on the set of automaton modes (Sections 3-1, 3-2 and 3-3). The results are demonstrated in details through definitions and propositions.

It has been found that the operators discussed in this study help us in the algebraic study of general fuzzy automata and provide us the necessary basis for the application of topological concepts.

Conclusion

In this study, we studied and investigated general fuzzy automaton on the basis of Lattice-ordered monoid. Moreover, the concepts of fuzzy automaton separatedness and connectedness have been investigated and the general fuzzy automaton has been examined using the concepts of operators.

Keywords: General fuzzy automata, Monoid, Operator, Connected, Seperated

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