

- ▶ MAI GEHRKE, *Stone duality and recognizability*.

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Recognizability is an important concept in computer science. It was originally introduced for finite words but has since been successfully extended to many other structures. Generally speaking, a set (called a language in this context) is recognizable if it is the preimage under an appropriate type of transformation of a subset of a *finite* structure. Where it applies, recognizability is a powerful tool for separating logical and/or computational complexity classes. It figures centrally in many decidability results, e.g. in automata theory. The main tools may be summed up as the Eilenberg-Reiterman theory. Stone duality on the other hand, is the fundamental mechanism connecting algebraic specification and spatial or geometric semantics – whether in mathematics, in logic, or in computer science. In logic it is useful in relating syntactic and semantic conceptions of logics. For propositional logics, access to relational semantics is typically useful in proving decidability results and tends to be computationally advantageous.

In joint work with Jean-Eric Pin and Serge Grigorieff, we have realized that there is an intrinsic connection between these two areas as minimal recognizers are dual spaces of certain enriched Boolean algebras or lattices generated by the objects to be recognized. This allows the formulation of Eilenberg-Reiterman theory to be generalized in two ways. Firstly, among the languages that can be treated, we may treat any collection closed under union and intersection (this is a very weak requirement; in terms of logical complexity classes, for example, this means any class closed under disjunction and conjunction). Secondly, we may in principle treat *any* sort of language – as long as we are willing to weaken the notion of recognizability from finiteness to compactness. In this general setting, recognition is no longer by finite algebras but by compact topological algebras or even compact topo-relational structures.

In this talk I will attempt to give an idea of the basic features and concepts both from the theory of recognizability and from duality theory for lattices with additional algebraic structure. Finally, I will try to explain the content of our results connecting the two illustrated by a few examples.