

Abstract

We report progress in two closely related lines of research: the semantic study of sequentiality and parallelism, and the development of a theory of intensional semantics. We generalize Kahn and Plotkin's concrete data structures to obtain a cartesian closed category of generalized concrete data structures and continuous functions. The generalized framework continues to support a definition of sequential functions. Using this ccc as an extensional framework, we define an intensional framework — a ccc of generalized concrete data structures and parallel algorithms. This construction is an instance of a more general and more widely applicable category-theoretic approach to intensional semantics, encapsulating a notion of intensional behavior as a computational comonad, and employing the co-Kleisli category as an intensional framework. We discuss the relationship between parallel algorithms and continuous functions, and supply some operational intuition for the parallel algorithms. We show that our parallel algorithms may be seen as a generalization of Berry and Curien's sequential algorithms.