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Circular Proofs

Self-referential objects such as natural numbers, infinite words, languages accepted by abstract machines, finite and infinite trees and so on, live in the world of μ-bicomplete categories, where they arise from the following operations: finite products and coproducts, initial algebras (induction) and final coalgebras (coinduction). Circular proofs were introduced by Santocanale in order to provide a logical syntax for defining morphisms between such objects. We have indeed shown full completeness of circular proofs with respect to free μ-bicomplete categories. The main practical advantage of having such a syntax is that it provides a general evaluation algorithm, via a cut-elimination procedure. We can then see circular proofs as a new kind of abstract machine, for which we will explore some computability-related questions.