Nondeterministic Polynomial-Time Computations and Models of Arithmetic

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Abstract

We will discuss Attila Mate's 1981 paper *Nondeterministic Polynomial-Time Computations and Models of Arithmetic*. The idea in this paper is to use a semantic approach to P vs. NP, instead of the syntactic methods used so far, like Solavay's relativizing to certain oracles, which have been unsuccessful.

We see that the existence of certain partial extensions of non-standard models of arithmetic implies that $NP \neq co - NP$, and thus, $P \neq NP$.

The existence of such extensions is linked to the bound for the existential quantifier in the DMPR theorem, which says that every $\phi(\overline{x})$ in $\mathcal{L}_{PA}$ is equivalent in PA to $\exists \bar{t} P(\bar{t}, x) = 0$ where P is a polynomial with integer coefficients.