APPLICATIONS OF NONSTANDARD MODELS IN REVERSE MATHEMATICS

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ABSTRACT. This is a tutorial on reverse mathematics with emphasis on applications of nonstandard models. The tutorial consists of three parts. The first part is on the basics of reverse mathematics. As the talk is aiming for non-experts, motivations and basic definitions of reverse mathematics will be introduced. The second part is about fragments of Peano arithmetic and their models, which are necessarily nonstandard. I will also prove some recursion theoretic theorems to demonstrate some difference between standard and nonstandard models; for example, without sufficient induction, it is possible that every incomplete r.e. set is low. Finally, I will talk about two theorems in reverse mathematics, whose proofs involve nonstandard models; one says that stable version of Ramsey's Theorem for Pairs does not imply the general version, done by Chong, Slaman and Yang; the other says that Ramsey's Theorem for Pairs is Π_3^0-conservative over $I\Sigma_1^0$, done by Patey and Yokoyama. The last part will be sketch as both proofs are very complicated.

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