

Lower Bounds for Swapping Arthur and Merlin

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We prove a lower bound for swapping the order of Arthur and Merlin in two-round Merlin-Arthur games using black-box techniques. Namely, we show that any AM-game requires time $\Omega(t^2)$ to black-box simulate MA-games running in time t . Thus, the known simulations of MA by AM with quadratic overhead, dating back to Babai's original paper on Arthur-Merlin games, are tight within this setting.