

Non-deterministic Communication Complexity with Few Witnesses

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Abstract

We study non-deterministic communication protocols in which no input has too many witnesses. Define $n_k(f)$ to be the maximum complexity of a non-deterministic protocol for the function f in which each input has at most k witnesses. We present two different lower bounds for $n_k(f)$. Our first result shows that $n_k(f)$ is bounded below by $\Omega(\sqrt{c(f)/k})$ where $c(f)$ is the deterministic complexity. Our second result bounds $n_k(f)$ by $\log(\text{rk}(M_f)/k-1)$ where $\text{rk}(M_f)$ is the rank of the representing matrix of f . As a consequence, it follows that the communication complexity analogue of the Turing-complexity class Few P is equal to the analogue of the class P .