

Communication Complexity

Jeff M. Phillips

Let there be two computers, Alice and Bob. Alice and Bob are both given a string of n bits. Together they want to compute some boolean function $F : \{0, 1\}^n \times \{0, 1\}^n \rightarrow \{0, 1\}$. Both Alice and Bob have unlimited computing power and complete knowledge of the function F , but they want to send as few number of bits as possible to each other. The communication complexity [3] $C(F)$ of a function F , is defined as the minimum number of bits possible to determine the value of the function F .

I will prove some simple facts about the hardness of certain functions. I will also describe some slight modifications to this model which have more practical implications [2, 1]. These results are fundamental to almost all lower bounds for space/time streaming algorithms.

References

- [1] Noga Alon, Yossi Matias, and Mario Szegedy. The space complexity of approximating the frequency moments. *Journal of Computer and System Sciences*, 1999.
- [2] L. Babai, P. Frankl, and J. Simon. Complexity classes in communication complexity theory. *FOCS*, 1986.
- [3] Andrew Chi-Chih Yao. Some complexity questions related to distributed computing. *STOC*, 1979.