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This result leads to the construction of the simultaneous confidence bands. The properties of the suggested method are illustrated in a simulation study.

The second part of the thesis deals with an extension to the twodimensional autoregressive model. The joint asymptotic normality of all the matrix parameter estimator, including the innovation variance matrix, is proved. The asymptotic behaviour of the spectral density estimator inverse is further studied. The simultaneous bands for the coherence function are set up using the expression

$$\mathcal{K}^2(\omega) = g_1' h(\omega) / g_2' h(\omega),$$

where $h(\omega) = (e^{-2pi\omega}, \ldots, e^{2pi\omega})'$. It has been found that the width of these confidence bands depends on the quantity

$$c_\alpha = \Phi^{-1}(\frac{1}{2}\alpha^{1/16p} + \frac{1}{2}).$$

TWO NEW PROOF TECHNIQUES FOR INVESTIGATING THE COMPUTATIONAL POWER OF TWO-WAY COMPUTING DEVICES

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Two new proof techniques for investigating the computational power of two–way computing devices are developed and presented in the thesis. One of them is a completely new technique and the second one is a generalization of the "cut and paste" technique originally used in [8].

Using the first technique we prove that two–way deterministic pushdown automata are more powerful than two–way deterministic counter automata. This method is also used by M.Chrobak in [6] for showing that two–way nondeterministic counter automata are more powerful than two–way deterministic counter automata. These two results settle two open problems posed in [4]. Our first technique is applied by Z.Galil in [3], too, for improving a result of [5].

We define a language L and prove, by virtue of the second proof technique, that any machine that recognizes L must satisfy $\text{TIME}^2(n) \cdot \text{Space}(n) \geq cn^3$. Our machine model allows k to read only input heads, where k is fixed, and the movement is like those of a multihead two–way finite automata. This result partially solves an open problem posed in [1,2]. Partially, since the heads are not allowed to jump. An immediate corollary of this result is that every multihead two–way finite automaton that recognizes L must have a time bound $T(n) \geq c(n^3/\log n)^{1/2}$. This result substantially improves a result of [7]. Our second proof technique is the first nondiagonalization method used for establishing the nontrivial time–space lower bound for Turing machines with two read heads on input tape [2].

REFERENCES

[1] Borodin A.B., Cook S.A., *A time–space tradeoff for sorting on a general sequential model of computation*, Proc.12th ACM STOC, Los Angeles, Calif. (1980), 294–301.