

CHAPTER III.

PROBLEMS IN COMMUNICATION

In this chapter on communication we find many information theoretic problems. Perhaps this is as it should be, since information theory yields some of the extreme points of the theory of communication. Extreme cases tend often to be theoretical and therefore to lend themselves to crisp problem formulation.

Two of the problems have been partially solved. Wyner's problem on the spectra of bounded functions has led to the contribution by Boyd and Hajela in the solution section. Also, Abbas El Gamal's problem on reliable communication of highly distributed information has led to a solution by Gallager, "Computing Parity in a Broadcast Network," appearing in Chapter VI.

Contents

3.1	Some Basic Mathematical Problems of Multiuser Shannon Theory, by <i>I. Csiszár</i>	29
3.2	The Information Theory of Perfect Hashing, by <i>János Körner</i>	32
3.3	The Concept of Single-Letterization in Information Theory, by <i>János Körner</i>	35
3.4	Is the Maximum Entropy Principle Operationally Justifiable? by <i>I. Csiszár</i>	37
3.5	Eight Problems in Information Theory, by <i>R. Ahlswede</i>	39
3.6	Optimum Signal Set for a Poisson Type Optical Channel, by <i>A.D. Wyner</i>	43
3.7	Spectra of Bounded Functions, by <i>A.D. Wyner</i>	46
3.8	A Stochastic Decision Problem, by <i>H.S. Witsenhausen</i>	49
3.9	Unsolved Problems Related to the Covering Radius of Codes, by <i>N.J.A. Sloane</i>	51

3.10	A Complexity Problem, by <i>R. Ahlswede</i>	57
3.11	Codes as Orbits, by <i>R. Ahlswede</i>	59
3.12	Reliable Communication of Highly Distributed Information, by <i>Abbas El Gamal</i>	60
3.13	Instability in a Communication Network, by <i>F.P. Kelly</i>	63
3.14	Conjecture: Feedback Doesn't Help Much, by <i>Thomas M. Cover</i>	70
3.15	The Capacity of the Relay Channel, by <i>Thomas M. Cover</i>	72
3.16	Simplex Conjecture, by <i>Thomas M. Cover</i>	74
3.17	Essential Average Mutual Information, by <i>Yaser S. Abu-Mostafa</i>	75
3.18	Pointwise Universality of the Normal Form, by <i>Yaser S. Abu-Mostafa</i>	77
3.19	On Classification with Partial Statistics and Universal Data Compression, by <i>Jacob Ziv</i>	84
3.20	Are Bayes Rules Consistent in Information? by <i>Andrew R. Barron</i>	85
3.21	On Finding Maximally Separated Signals for Digital Communications, by <i>D.J. Hajela and Michael L. Honig</i> ...	92
3.22	Frequency Assignment in Cellular Radio, by <i>Edward C. Posner</i>	100