

Abstract for Meeting of January 24, 1973
Computer-Communications Conference:

"Sociological Spin-Off From Computer-
Communications Systems Engineering."

by

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The material presented in this paper has a long and slow sequence of development. When I was a junior high school student, I was puzzled by the phenomena of the most advanced countries in regard to the development of the arts, literature, and science changing at some point in their development to a sudden return to barbarism. I tried to determine, if this could be correlated with the rise and fall of ancient Greece and Rome. The social scientists of that time could not provide satisfactory answers to my questions. In high school I concluded that the development and application of science was central to this question, but that the social scientists were too far removed from the scene of application of new technology to be able to observe the critical events in such developments.

I concluded that electrical engineering would be the right profession to be in to be able to observe the impact and by-products of new technology. Therefore, I changed my college plans from college of letters and science to college of engineering. A second reason was that I wanted to remain close to areas of science and mathematics where rigorous testing of hypotheses is the tradition.

While studying electrical engineering in college, I found it difficult to get the knowledge of sociology that I needed. However I found a way outside the formal organization of the university. By attending discussions and forums at the University YMCA and the Student YWCA, I got to hear current reports on developments in most of the social sciences. I obtained information on the critical problems of our civilization from meetings at Hillel Foundation, Newman Club, and the Unitarian Church.

When I studied graduate courses in mathematics, I developed a special technique of study. After each lecture in mathematics, I would go for a hike in the hills to meditate about the material covered in the math lecture. I would think about the material from three viewpoints, namely (1) abstract mathematical concepts, (2) representation of engineering structures, and (3) representation of elements of biological or sociological systems. My background of sociological information plus this triple approach to mathematics led to a process which I call "technological meditation" many years later, when I became involved in computer-communication systems.

This process of "technological meditation" has led to five major spin-offs while working on computer-communication systems. These concepts are not claimed as new, but are potentially more simple to implement in connection with real social systems than other derivations of similar principles. These spin-offs are:

- (1) Sociological equivalent of the uncertainty principle(physics);
- (2) Sociological equivalent of completeness theorems(mathematics);
- (3) Negative feedback systems in political and social systems equivalent to negative feedback amplifiers(electronics);
- (4) Concept of image compression in political ideology from electrical communication channel capacity and data compression (information theory);
- (5) Concept of maximizing communication entropy in social systems deriv from maximizing the entropy of a set of messages on a telegraph system(information theory).

A brief statement of the five principles will be given, followed by a comparison of the fifth one with another derivation of the same principle. This concept of maximizing the communication entropy of a social system will be compared with R. B. Lindsay's concept of the "Thermodynamic Imperative." It will be pointed out how the two concepts are approximately the same, but that the version derived by "technological meditation" while working on computer-communication systems is easier to test by sample calculations for elementary social systems.

Then two examples of the use of this concept will be given. The first is an analysis of a hypothetical public opinion survey simulated for conditions in Nazi Germany in 1942. The second is a comparison of six hypothetical countries, in which the calculation of the communication entropy is used to rate where the six countries should be placed on an evolutionary scale as a measure of how advanced they are in terms of the evolution of human civilization.

Further details of these developments are being published in the magazine, COMMUNICATION THEORY in the CAUSE of MAN, P.O. Box 5095, San Jose, California 95150, issued approximately bimonthly, \$5.00 per year.

Technological Meditation: A process of subconscious correlation of concepts in the technology with which an engineer is working with characteristics of the sociological system in which the engineer is working. This process is facilitated by long years of preparation in the form of formal training in engineering technology, plus informal learning of concepts in the social sciences, plus the cultivation of special techniques of learning basic mathematical theorems.

Refs: COMMUNICATION THEORY in the CAUSE of MAN (abbreviated CTCM), v. I, n. 1-2, pp. 19-21, Jun-Jul 1970.
CTCM, v. I, n. 12, p. 6, Jun 1971.

Sociological Uncertainty Principle: Where X is the path distance in sociological evolution of social system, normally a spiral path, where X is traced by the point of vector R, where the base point of the vector R moves as a function of Time, and the radius of the vector R increases with the complexity of the social system, and the angle θ of the vector R is a function of Time and the distribution of psychological stresses in the social system, then the accuracy of measurement of the status of the social system is limited by the constant $S \sim dX \times dM_x$. Here M_x is the social momentum in the direction of the path of social evolution, X. S is a yet undetermined constant of social systems, similar to Planck's constant in physical systems. If an observer tries to make more precise observations, either he is ejected from the system, and loses his usefulness as a sociological observer, or the system is disturbed from the path it was on. This puts the sociological observer in a position of severe social responsibility to try to avoid damaging his own usefulness and to avoid damaging the stability of functioning social system without adequate knowledge of the potential consequences.

Ref: CTCM, v. I, N. 7-8, p. 16, Jan-Feb 1971.

Equalivent Completeness Theorem for Sociological Systems: It is recognized that it is not possible to formulate a quantitative completeness theorem for the mathematical modeling of biological and social systems. To reduce the probability of serious errors in mathematical simulation of social systems, it is the responsibility of the mathematical programmer to use a qualitative test of completeness in the absence of a quantitative completeness theorem. A qualitative test is proposed in terms of a "checking chart" (two-dimensional

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tabulation of levels of phenomena(physical, chemical, biological, psychological, & social) vs. type of activity(basic science, engineering science, education, & action). It is the responsibility of the mathematical programmer to check for necessary consultants needed for interdisciplinary work in testing the qualitative validity of his model of a social system. A more sophisticated three-dimensional version of the checking chart has also been developed.

Refs: F. B. Wood, "The Social Responsibility of Engineers and Scientists," 1959 Proceedings of the Western Joint Computer Conference, March 1959, pp. 310-313.
CTCM, v. I, n. 9, Mar 1971, pp. 14-16,
Socio-Engineering Problems Report(abbreviated SEPR) No. 402-A, Oct. 30, 1972, "The Equivalence of a Completeness Theorem for Cybernetic Systems."
CTCM, v. II, n. 1, Jul-Aug-Sep 1971, pp. 8-9.

Negative Feedback in Social Systems: A social system in which output information is coupled back into the input in such a way to cancel part of the input in order to maintain the social system at some desired stable level of functioning.

Refs: CTCM, v. I, n. 5-6, Nov-Dec 1970, pp. 8-10.
 (above section reprinted in SEPR No. 401, 7/25/71, for Second Annual Institute of Systems Education, San Jose State College, Sept. 9-10, 1971)

Image Compression in Social Systems: Political ideology consists of a kind of image compression accompanied by a significant amount of information loss, similar to image compression in information theory where the loss of information prevents accurate decompression.

Engineering background ref: P. D. Dodd and F. B. Wood, "Image Information, Classification and Coding," 1966 IEEE International Convention Record, Part 7, pp. 60-71.

Sociological ref: CTCM, v. I, n. 1-2, Jun-Jul 1970, pp. 19-20.

Maximizing Communication Entropy in Social Systems: The equivalent of Shannon's discrete channel model can be used to measure the communication entropy of a social system. The higher the communication entropy (or negentropy) the more democratic the social system is, provided a set of fifteen other parameters can be assumed to remain constant. The equivalent of Shannon's continuous channel model can be used to measure the communication entropy of the major sub-systems of an international social system. The higher the communication entropy the greater the "dynamic justice" in the subsystem, i.e., the closer to optimum balance between stability and diversity is obtained, provided a set of fourteen other parameters of the social system can be assumed to remain constant.

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Refs: Conference paper(preprint only) for First International Congress of Social Psychiatry, London, August 1964, Sectional Program on General Systems Theory and the Multidimensional Character of Social Psychiatry, "A general Systems Theoretic Model for the Estimation of the Negentropy of Sociological Systems through the Application of Two Isomorphic Electrical Communication Networks.

(Main points covered in CTCM, v. II, nos. 1 & 2, 1971)

Discussion in Rhe Evolving Society, edited by Alice Mary Hilton, N.Y.: ICR Press, 225 East 23rd St, N.Y., N.Y. 10021(1966), pp. 227-229.

Letter to the editor, Society for Social Responsibility in Science Newsletter, No. 195, Jan 1969, S.S.R.S., 221 Rock Hill A Bala Cynwyd, PA 19004. Discussion in SSRS Newsletter, No. 203, Oct/Nov/Dec 1969. Rejoinder in CTCM, v. I, n. 3-4, pp. 18-22.

SEPR No. 56-B, "Equilibrium Between Order and Diversity As A Crucial Factor in the Development of Democratic Institutions," a conference preprint of a paper presented at the National Meeting of the American Humanist Association, Asilomar, Calif., April 28, 1966, 13pp.

CTCM, v. I, n. 1-2, pp23-25, 27-28.

CTCM, v. I, n. 3-4, pp. 17-22.

CTCM, v. I, n. 5-6, pp. 5B, 10-12.

CTCM, v. I, n. 7-8, p. 3.

CTCM, v. I, n. 12, p. 7-10.

CTCM, v. II, n. 1, pp. 5-24.

CTCM, v. II, n. 2, pp. 7-22.

(Note: about half of the above items in CTCM have been reprinted in SEPR No. 401)