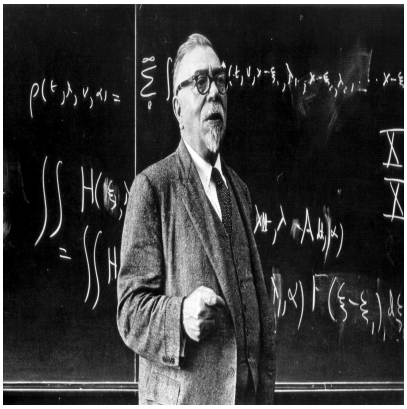

Cybernetics: The science of steering systems

Description

The etymology of cybernetics

In ancient Greek the word for ‘steer’ is ‘kybernan’ which in turn forms the root of the term ‘cybernetics’ coined 1948 by U.S. mathematician Norbert Wiener. The construction is perhaps based on 1830s French cybernétique ‘the art of governing’. In an academic context cybernetics is the theory or study of communication and control. In general, cybernetics is a transdisciplinary approach for exploring regulatory systems—their structures, constraints, and possibilities.

The Latin term ‘gubernare’ (to direct, rule, guide, steer, govern) has the same etymological root. The word ‘governor’ and ‘goverment’ are both related.”

Norbert Wiener
Wiener is considered the originator of cybernetics, a formalization of the notion of feedback, with implications for engineering, systems control, computer science, biology, neuroscience, philosophy, and the organization of society.

Norbert Wiener is credited as being one of the first to theorize that all intelligent behavior was the result of feedback mechanisms, that could possibly be simulated by machines and was an important early step towards the development of modern AI.

Norbert Wiener – The Application of Physics to Medicine (1953)

Further References

Miles, S. B., & Wiener, N.. (2006). The Human Use of Human Beings: Cybernetics and Society. Land Economics

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DOI URL
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“This is one of the fundamental documents of our time, a period characterized by the concepts of ‘information’ and ‘communica tions’. norbert wiener, a child prodigy and a great mathematician, coined the term ‘cybernetics’ to characterize a very general science of ‘control and communication in the animal and machine’. it brought together concepts from engineering, the study of the nervous system and statistical mechanics (e.g. entropy). from these he developed concepts that have become pervasive through science (especially biology and computing) and common parlance: ‘in formation’, ‘message’, ‘feedback’ and ‘control’. he wrote, ‘the thought of every age is reflected in its technique . . . if the seventeenth and early eighteenth centuries are the age of clocks, and the later eighteenth and nineteenth centuries constitute the age of steam engines, the present time is the age of communication and control.’ in this volume norbert wiener spells out his theories for the general reader and reflects on the social issues raised by the dramatically increasing role of science and technology in the new age – the age in which we are now deeply and problematically embroiled. his cautionary remarks are as relevant now as they were when the book first appeared in the 1950s.”

Heylighen, F., & Joslyn, C.. (2004). Cybernetics and Second-Order Cybernetics. In Encyclopedia of Physical Science and Technology

Plain numerical DOI: 10.1016/b0-12-227410-5/00161-7
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“Nd in the 19th century with ampre, who both saw it as the science of effective government. the concept was revived and elaborated by the mathematician norbert wiener in his seminal 1948 book, whose title defined it as ‘cybernetics, or the study of control and communication in the animal and the machine’. inspired by wartime and pre-war results in mechanical control systems such as servomechanisms and artillery targeting systems, and the contemporaneous development of a mathematical theory of communication (or 3 information) by claude shannon, wiener set out to develop a general theory of organizational and control relations in systems. information theory, control theory and control systems engineering have since developed into independent disciplines. what distinguishes cybernetics is its emphasis on control and communication not only in engineered, artificial systems, but also in evolved, natural systems such as organisms and societies, which set their

own goals, rather than being c”
Wiener, N.. (1956). The theory of prediction. In Modern mathematics for the engineer, editor E.F. Beckenbach

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“?11 in ‘modern mathematics for the engineer,’ first series, edited by ef beckenbach, mcgraw-hill book company, inc., new york, 1956. …”
Rosenblueth, A., & Wiener, N.. (2002). The Role of Models in Science. Philosophy of Science

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“The intention and the result of a scientific inquiry is to obtain an understanding and a control of some part of the universe. this statement implies a dualistic attitude on the part of scientists. indeed, science does and should proceed from this dualistic basis. but even though the scientist behaves dualistically, his dualism is operational and does not necessarily imply strict dualistic metaphysics.”
Rosenblueth, A., Wiener, N., & Bigelow, J.. (2002). Behavior, Purpose and Teleology. Philosophy of Science

Plain numerical DOI: 10.1086/286788
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“This essay has two goals. the first is to de- fine the behavioristic study of natural events and to classify behavior. the second is to stress the importance of the concept of pur- pose.”
Adams, F.. (2003). The Informational Turn in Philosophy. Minds and Machines

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“This paper traces the application of information theory to philosophical problems ofmind andmeaning from the earliest days of the creation of the mathematical theory of communication. the use of information theory to understand purposive behavior, learning, pattern recognition, and more marked the beginning of the naturalization of mind and meaning. from the inception of information theory, wiener, turing, and others began trying to show how to make a mind from informational and computational materials. over the last 50 years, many philosophers saw different aspects of the naturalization of the mind, though few saw at once all of the pieces of the puzzle that we now know.

starting with norbert wiener himself, philosophers and information theorists used concepts from information theory to understand cognition. this paper provides a window on the historical sequence of contributions made to the overall project of naturalizing the mind by philosophers from shannon,wiener, and mackay, to dennett, sayre, dretske, fodor, and perry, among others. at some time between 1928 and 1948, american engineers and mathematicians began to talk about 'theory of information' and 'information theory,' understanding by these terms approx- imately and vaguely a theory for which hartley's 'amount of information' is a basic concept. i have been unable to find out when and by whom these names were first used. hartley himself does not use them nor does he employ the term 'theory of transmission of information,' from which the two other shorter terms presumably were derived. it seems that norbert wiener and claude shannon were using them in the mid-forties. (yehoshua"
Wiener, N.. (2011). Cybernetics, or control and communication in the animal and the machine (2nd ed.). Cybernetics, or control and communication in the animal and the machine (2nd ed.).

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"This paper examines the empirical question of whether systematic equity risk of us firms as measured by beta from the capital asset pricing model reflects the risk of their pension plans. there are a number of reasons to suspect that it might not. chief among them is the opaque set of accounting rules used to report pension assets, liabilities, and expenses. pension plan assets and liabilities are off-balance sheet and are often viewed as segregated from the rest of the firm, with its own trustees. pension accounting rules are complicated. furthermore, the role of the pension benefit guaranty corporation clouds the real relation between pension plan risk and firm equity risk. the empirical findings in this paper are consistent with the hypothesis that equity risk does reflect the risk of the firm's pension plan despite arcane accounting rules for pensions. this finding is consistent with informational efficiency of the capital markets. it also has implications for corporate finance practice in the determination of the cost of capital for capital budgeting. standard procedure uses de-leveraged equity return betas to infer the cost of capital for operating assets. but the de-leveraged betas are not adjusted for the risk of the pension assets and liabilities. failure to make this adjustment typically biases upward estimates of the discount rate for capital budgeting. the magnitude of the bias is shown here to be large for a number of well-known us companies. this bias can result in positive net present value projects being rejected."
Wiener, N.. (1960). Some moral and technical consequences of automation. Science

Plain numerical DOI: 10.1126/science.131.3410.1355
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"Some 13 years ago, a book of mine was published by the name of cybernetics. in it i discussed the problems of control and communication in the living organism and the machine. i made a considerable number of predictions about the development of controlled machines and about the corresponding techniques of automatization, which i foresaw as having important consequences affecting the society of the future. now, 13 years later, it seems appropriate to take stock of the present position with respect

to both cybernetic technique and the social consequences of this technique. before commencing on the detail of these matters, i should like to mention a certain attitude of the man in the street toward cybernetics and automatization. this attitude”

Category

1. General

Tags

1. Cybernetics
2. information processing
3. Norbert Wiener
4. Perceptual input
5. Psychophysics
6. Social control
7. Social engeneering
8. Systems engeneering
9. Trivium

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