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CONTROL INFORMATION THEORY: THE MISSING LINK IN NORBERT WIENER'S CYBERNETICS

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Norbert Wiener's cybernetic paradigm represents one of the seminal ideas of the 20th century. It has provided a general framework for analyzing communications and control processes in purposeful systems, from genomes to empires. Especially notable are the many important applications in control engineering. Nevertheless, its full potential has yet to be realized. For instance, cybernetics is relatively little used as an analytical tool in the social sciences. One reason, it is argued here, is that Wiener's framework lacks a crucial element -- a functional definition of information. The functional (content and meaning) role of information in cybernetic processes cannot be directly measured with Claude Shannon's statistical approach, which Wiener also adopted. Although so-called Shannon information has made many valuable contributions and has many important uses, it is blind to the functional properties of information. Here a radically different approach to information theory is described. After briefly critiquing the literature in information theory, a new kind of cybernetic information will be proposed which we call "control information." Control information is not a "thing" but an attribute of the relationships between things. It is defined as: **the capacity (know how) to control the acquisition, disposition and utilization of matter/energy in purposive (cybernetic) processes**. We will briefly elucidate the concept, and we will propose a formalization in terms of a common unit of measurement, namely the quantity of "available energy" that can be controlled by a given unit of information in a given context. However, other metrics are also feasible, from money to allocations of human labor. Some illustrations will be provided and we will also briefly discuss some of the implications.