

entry: **information and communication technologies\***

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*Bit transmission technologies are not communication technologies!* I argue that most so-called Information and Communication Technologies (ICTs) are neither information nor communication technologies. They are, instead, simply *bit transmission technologies* that need to be critically decompiled and rebuilt if they are ever to have any potential as communication technologies. The so-called "theory of communication" authored by Claude Shannon and Warren Weaver in 1949 is the root cause of this widespread misunderstanding of transmission-as-communication. As one example, I examine the technical underpinning of so-called "automatic translation" technologies to illustrate this critical flaw in almost all contemporary "communication" technologies. I am especially concerned with the way existing ICTs dumb down the content of conversation, exclude communicational context and participation, and sterilize the spaces of online interaction by employing simplistic means to condense and map information and communication exchanges.

In 1949 Claude Shannon and Warren Weaver published their mathematical theory of communication (Shanon and Weaver, 1949). This theory, and subsequent work, has made it possible to understand information and communication technologies (ICTs) as technologies that transmit bits over fixed capacity channels. But isn't there a difference between transmission and communication? Transmission is successful between two people if the receiver can recreate -- perhaps repeat -- the sender's message. In contrast, communication is successful between two people if some form of shared understanding is achieved. Thus, the email message in my inbox written in a language unknown to me constitutes a successful transmission, but an unsuccessful communication. So -- obviously -- yes, there is a difference between transmission and communication. This difference between transmission and communication explains why -- even as ICTs become more numerous in number and kind -- communication seems to be on the wane. In short, communication technologies -- as they are currently designed - - do not help us communicate with one another.

Even though we can exchange bits with one another via the Internet, we do not necessarily communicate with one another. The ubiquity of online "flame wars" in public discussion forums illustrates the truth of this. In fact, it may very well be the case that the main result of providing universal access to the Internet would be to make it certain that groups fundamentally at odds with one another would butt heads frequently. In the words of the philosopher Jean-Francois Lyotard, online exchanges can illustrate a *differend*, a difference so vast between participants that it can never be bridged (Lyotard, 1988).

How can technologies be designed to facilitate the calm and caring exchange of questions and answers that result in mutual understanding? In the future, ICTs should be designed to facilitate conversational interaction rather than, as they often do now, simply function as conduits to transmit the bits of virtual shouting matches or ad campaigns.

*"The term 'dialectic' originates from the Greek expression for the art of conversation"* (Edwards, 1967). It is worth remembering that a variety of aesthetic practices from art and design have been dependent upon an understanding of conversation or, more particularly, an understanding of *dialectics*. The conviction that

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the commonsense and stereotypes of mainstream media can be challenged through design of new media has been the foundation for many philosophical and artistic-design projects produced to find new material forms for some contemporary theory of dialectics. At least since Socrates' time, artists, designers, and philosophers have been inventing new dialectical processes to unravel the forms of each new medium and each new commonsense (Havelock, 1963). New theories of dialectics were developed by Plato, Aristotle, Immanuel Kant, Georg Wilhelm Freidrich Hegel, Karl Marx, Theodor Adorno, and others. Artists and designers have elaborated these dialectical processes for new and existing media. For example, a variety of artistic processes were developed in the early-twentieth century that can be seen as media-specific instantiations of Marx's theory of dialectics (Marx, 1983). Among these processes might be mentioned Sergei Eisenstein's then-new techniques of editing and film *montage* (Eisenstein, 1949). Eisenstein's frequent collaborator, the Russian Formalist Viktor Shklovsky (Jameson, 1972, p. 61), described a set of devices used in poetry for making the unconscious conscious by making the familiar strange. (Erlich, 1965). Shklovsky's notion of "making strange," *ostranenie*, with poetry is comparable to Bertolt Brecht's theory of the "estrangement-effect," *Verfremdung*, in epic theater (Jameson, 1972, p. 58; Brecht, 1964). Analogous phenomena and devices – called *faktura* -- were researched by the Russian Constructivists for media as diverse as architecture, painting, sculpture, and collage (Lodder, 1983; Buchloh, 1984).

Each of the artistic design practices mentioned differs according to the medium in which it was practiced and according to the theory of dialectics – or conversation – that it incorporated or made into material form. Obviously, as soon as conversation assumes a new material form, the aesthetics of a "dialectic" practice must also renew itself. The question is, therefore, what is the new aesthetics for online discussions, a form of conversation that often involves many more people in far more complicated social and semantic dynamics than earlier forms of conversation and dialectic envisioned?

The constant flame wars of the Internet illustrate how transmission technologies can easily support polemic exchange. We know, from previous theories and practices of dialectics, that polemics are at least a necessary ingredient for free speech. For example, Hegelian dialectics is often schematized as a repeated iteration through thesis/antithesis/synthesis, where one can understand thesis and antithesis as opposing or contradictory statements. However, what is missing -- or possibly impossible -- is the recipe that can combine or synthesize the diverse contributions of online exchange. More commonly successful online conversations are not a result of a recipe, but rather are a result of sage and insightful moderation performed by an articulate and caring person or group of people (cf., Rheingold, 1993).

So, perhaps it is idiotic to look for some set of "recipes" for online conversation? No! A search for "recipes" for good conversation is not misguided for two reasons. First, even if one imagines that the only means to a good online conversation is a wise (human) moderator, it is obviously the case that some moderators are better than others and that moderators work best with a cooperative set of conversants. This is essentially a Romantic vision best articulated in the 18th century by the philosopher Jacques Rousseau. (Rousseau, 1762) In his book *The Social Contract or Principles of Political Thought*, the Rousseau posits that the so-called "General Will" is arrived at only when each citizen reflects on what will produce the good of all. Instead of a technology, Rousseau proposes that a special sort of person -- someone he calls "the Legislator" -- will be the one to voice the objective good sought by the many for society. Rousseau's democratic fantasy is a beautiful vision, but short of a saintly constituency and an omniscient and omnipotent Legislator, there is still a presupposed set of technologies and techniques in this vision to (a) gather and register everyone's opinions; (b) select a

Legislator/moderator/representative-of-the-people; and, (c) synthesize the diverse opinions into a "General Will." In short, this vision does not obviate the need for "recipes," rather it simply presupposes a technology of dialectics or conversation without examining it critically.

Second, due to the misguided theory of communication-as-transmission launched by Shannon and Weaver we now live in an information environment where local and international exchanges have been forced into the mold of transmission. There exists a set of technologies that are claimed to be technologies of information and communication (ICTs) when, in fact, they are nothing of the sort. These so-called ICTs incorporate a set of programmed procedures (i.e., "recipes") for the transmission and storage of bits and bytes and people the world over are attempting to employ these technologies as forms of communication and information exchange. The "recipes" of existing ICTs need to be examined critically both to unmask them as communication technologies and also in order to propose alternatives.

Symptomatic of this genre of ICTs intended to support international communication is so-called "automatic translation" software. In 1949 one of the inventors of the mathematical theory of information and communication, Warren Weaver, wrote and distributed a report to two hundred of his colleagues. The title of Weaver's report was "Translation." Its purpose was to explore the idea that one might design a computer program to translate texts from one language to another. Those familiar with Claude Shannon's and Warren Weaver's mathematical theory of information and communication will not find the following too surprising. But, anyone who has done the work of a translator is likely to find Weaver's understanding of translation fantastical: *"When I look at an article in Russian, I say, 'This is really written in English, but it has been coded in some strange symbols. I will now proceed to decode'."* (Weaver, 1949)

Weaver wrote this shortly after the World War II when the computer was first applied -- with great success -- to the problem of breaking Germany's military communication codes. In short, for Weaver, it was clear that computers were good for the tasks of decryption and so if a problem could be reconceptualized to look like a decryption problem, then it was probably something a computer could do. Despite skepticism voiced by scientific luminaries of the day -- notably Jerome Wiesner, later president of MIT, John F. Kennedy's science advisor, and the co-founder of the MIT Media Laboratory -- Weaver's "Translation" essay was enormously influential and, arguable, still informs computer scientists' approaches to translation. For example, the statistical approach to decoding Weaver outlined in his essay constitutes the core of the most successful work in contemporary machine translation.

After half a century of sustained work on Weaver's translation-as-decoding problem, how much progress has been made? Anyone with a web browser has the means to check. At this URL (<http://www.translate.ru/>) one can input a text in English and receive a translation (and vice versa). I typed in a sentence from a technical text that was used as a canonical example (e.g., Oettinger, 1960) in the early days of machine translation work: *"In recent times Boolean algebra has been successfully employed in the analysis of relay networks of the series-parallel type."* Using the Russian translation that I received from the website, I translated the Russian back into English and received the following: *"In recent time when Boolean algebra it was successfully used in the analysis of networks of the relay of type parallel by a number(line)."* This result can be compared to the output of computer translation programs of forty years ago. Clearly today's machines are better even if they are not very good (cf., Oettinger, 1960). Even so, one might object that the web-based system demonstrated above is not the best automatic translation system with which to demonstrate today's capabilities. But, given

any contemporary system it is always easy to find a text on which the system performs poorly.

Over the years many fixes have been proposed for natural language processing systems and each "fix" has engendered an entire computer science research direction unto itself. For example, much success has been had simply by sticking with slightly more sophisticated statistical models of language and then relying on ever-increasing computer speeds and memory to increase the number of computations performed for every word processed (e.g., Manning and Schutze, 1999; Jurafsky and Martin, 2000). Others have noted that the systems often fail to take into account enough of the pragmatic context of a text or utterance. This has created several large artificial intelligence projects to attempt to encode all of pragmatic knowledge (e.g., "what goes up, must come down," "anything that falls in the water will get wet," "humans need to breath in order to live," etc., etc., etc.; e.g., Lenat and Gupta, 1990). Other work has explicitly limited the pragmatic context so that the machine translator performs well for a given set of domains (e.g., airline reservations), but can do nothing with a text or speech outside those domains (e.g., Seneff, Lau and Polifroni, 1999). Finally, many projects have been launched in order to design and implement a universal "interlingua" into which all other languages can be mapped (e.g., Gruber, 1993).

After half a century of sustained work on Weaver's translation-as-decoding problem, how much progress has been made? When measured against the enormous amount of money that has been spent on computer programs written to "decrypt" novels, newspapers, technical reports and other sorts of texts, has the small amount of progress achieved been worth the budgets -- indeed careers -- expended? Perhaps, fifty years later, it's finally time to admit Weaver's folly: translation is not a task of decryption. In fact, it may be time to critically examine many of the so-called "fixes" of ICTs with the same sort of skepticism Ludwig Wittgenstein applied in his examination of the "problems" of philosophy (Wittgenstein, 1960). Many of the "problems" of computer-network-facilitated "communication" may stem from a badly chosen set of foundational propositions (e.g., translation-as-decryption) and might, therefore, be more properly understood as pseudo problems or just dangerous and silly games.

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