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Copy
Jussi Parikka

The process of copying is a key cultural technique of modernity. The mechanization of *imitatio* awed even the hailed Renaissance artist Leon Battista Alberti at the dawn of the Gutenberg era: "Dato and I were strolling in the Supreme Pontiff's gardens at the Vatican and we got talking about literature as we so often do, and we found ourselves greatly admiring the German inventor who today can take up to three original works of an author and, by means of movable type characters, can within 100 days turn out more than 200 copies. In a single contact of his press he can reproduce a copy of an entire page of a large manuscript."[1] In Alberti's time, the spiritual concept of *imitatio* (Latin) or mimesis (remediated from the philosophy of Ancient Greece) became the cornerstone of art theory, which lasted for hundreds of years, but also turned at the same time into a material process of copying: especially the texts of the ancients.

From the printing press that replaced the meticulous work of monks copying texts to the technique of mass production of photographs and other technical media objects, "copy" has become a central command routine of modernity. Modern media can be understood as products of a culture of the copy as Walter Benjamin has analyzed in relation to film. Paraphrasing Benjamin, mechanical reproduction is an internal condition for mass distribution. In contrast to literature and painting, film production is about mechanical reproduction, which Benjamin claims "virtually causes mass distribution."[2] This coupling of copying and mass distribution is not, however, restricted to the media technology of cinema, but also characterizes networked and programmable media such as computers. I will return to this point at the end of the text.

Nineteenth-century enthusiasm for the copy was tied to the possibility of producing low-cost photographs and films, and the commercial prospects of such a process. Similarly the mass production and distribution of printed material was inherently connected to material principles of production, notably the rotation press, and other factors such as the cheapening of paper. Even the Gutenberg printing machine is fundamentally a copy machine, ingenious in its use of standardized modular parts for individualized signs. During the nineteenth century the first copy machines entered offices due to the rising need for archiving and distributing documents. Such machines slowly replaced the work done by scribes, or copy clerks, such as Bob Cratchit in Charles Dickens's *A Christmas Carol* from 1843 or the dysfunctional copy-man in Herman Melville's *Bartleby the Scrivener* from 1853 (who would "rather not" do his work).[3]

To guarantee obedience and efficiency, the copy routine was technologically automated and also integrated as part of computing systems fairly early on. The early punch card machines used standardized copy processes in the form of special reproducing punch-machines (i.e., the IBM 514) to copy the cards used as templates for further data processing purposes. Some reproduction machines apparently also incorporated special control programs. The data fields of the specific cards to be copied were fed to a control panel, and were then duplicated onto blank cards.[4] In other words, the instructions for making copies were in themselves part of the mass-production of copies: recursive algorithms are at the heart of modernity. With digital computers, the mechanical process is substituted for the informationalization of modular entities and creation of abstract mathematical patterns that are the focus of copying and reproduction.[5] This in itself has eased the copying of cultural products and consequently led to new techniques of copy protection and consumer surveillance.

In digital software culture "copy" is used in two different ways (1) in the context of file-management and as a new phase of cultural reproduction and (2) as part of copy/paste—a cultural technique and aesthetic principle. The two lineages constantly overlap in the modern history of media technologies, where copying, the verb, designates a shift in the cultural techniques of reproduction from humans to machines, and copy, as a noun, presents itself as the key mode of becoming-object of digital culture—as easily reproducible and distributed packages of cultural memory.

With the early computers that used core memory, copy routines were a source of maintenance as well as amusement. The cleaning programs used copying routines to move themselves from one memory location to the next one. This was to fill the memory space with a known value, allowing it to be programmed with a new application.[6] As Ken Thompson recollects, the FORTRAN language was employed for the competitive fun of a "three-legged race of the programming community": to write the shortest program that "when compiled and executed, will produce as output an exact copy of its source."[7] Several kinds of "rabbit" and "bacteria" programs were used to clog up systems with multiple copies of the original program code. The general idea was to make the program spread to as many user accounts as possible on the IBM 360 system. This "constipated" the system. The rabbit program could input itself back into the jobstream over and over again.[8] Such self-referential procedures connect with recursive algorithms, which are part of every major programming language. Recursion can be understood as a subroutine that calls (or invokes) itself. The very basic memory functions of a computer involve copying in the sense of data being continuously copied between memory registers (from cache memory to core storage, for example.) Such operations can be termed "copying" but can equally justifiably be given names such as "read" and "write" or "load" and "store register" operations.[9]

With the move from the mechanical programming of computers to informational patterns, the copy command became integrated as an organic part of file management and programming languages in the 1960s.[10] The UNIX system, developed at Bell Labs, was one of the pioneers with its "CP" command. The CP command was a very basic file management tool, similar to, for instance, the use of the "copy" command in the later DOS environment.

The emerging trends and demands of network computing underlined the centrality of the copy command. Instead of mere solitary number crunchers, computers became networked and communicatory devices where resource sharing was one of the key visions driving the design of, among other things, the ARPANET.[11] During the same time as the early computer operating systems for wider popular use were developed, meme theory, originally conceived by Richard Dawkins in the mid-1970s, depicted the whole of culture as based on the copy routine. Memes as replicators are by definition abstract copy machines "whose activity can be recognized across a range of material instantiations."[12] Informatics is coupled with meme copying; media technological evolution

can be seen as moving toward more precise copy procedures, as Susan Blackmore suggested. Copying the product (mechanical reproduction technologies of modernity) evolves into copying the instructions for manufacturing (computer programs as such recipes of production).[13] In other words, not only copying copies, but more fundamentally copying copying itself. What makes meme theory interesting is not whether or not it is ultimately an accurate description of the basic processes of the world, but that it expresses well this "cult of the copy" of the digital era while it abstracts "copying" from its material contexts into a universal principle.

During the 1990s, copy routines gained ground with the Internet being the key platform for copying and distributing audiovisual cultural products. Of course, such techniques were already present in early fax machines. Since the latter half of the nineteenth century, these routines allowed for the transmission of ones "own handwriting" over distances. Soon images also followed. (Technically, mid-nineteenth-century phototelegraphy already allowed the encoding of data into patterns and the transmission of this copy via telegraph lines.) Hence, facsimile, factum simile, should be seen as "a copy of anything made, either so as to be deceptive or so to give every part and detail of the original; an exact copy likeness."[14] Of course, no copy is an exact reproduction of the original but an approximation that satisfies, for example, the expectations of the consumer. To guarantee such consumer satisfaction, especially since the 1970s, with the help of engineers at Philips and Sony, digital optical archiving techniques have presented us with a material memetic technology of cultural reproduction that happens via a simple command routine: copy.

The material processes of copy routines have often been neglected in cultural analysis, but the juridical issue of copyright has had its fair share of attention. Yet the issues are intimately tied, both being part of the same key thematics of modernization that spring from the fact that automated machines can reproduce culture (a major change of the mode of cultural reproduction when compared to, e.g., the nineteenth-century emphasis on civilization). Copy routines that originated with medieval monks are integrated in special copy/ripper programs with easy point-click routines and CSS interpretation possibilities. Hermeneutic questions of meaning are put aside and attention is paid to the minuscule routines of reproduction: "Thus, it was only after the fall of the Roman Empire that writing fell as an obligation on monks, nuns, and finally male students. Of all forms of manual labor, mechanical copying, just as in present day computers, most closely corresponded to Saint Benedict's dictum: *ora et labora*. Even if the writer, simply because his tongue knew only some vernacular dialect, had no understanding of the Latin or even Greek words he was supposed to preserve, his handicap augmented the monastery library."[15]

The difference between such earlier forms of preserving and reproducing cultural memory and contemporary digital archiving techniques has to be emphasized. Contemporary forms of copy are intimately tied to the consumer market and the commercial milieu of the digital culture (especially the internet), whereas the work done by monks was part of the theological networks where God, in theory, played the key mediator (and the final guarantor of mimesis) instead of, for example, Sony BMG or Microsoft. Theological issues defined the importance of what was copied and preserved, whereas nowadays the right to copy and to reproduce culture is to a large extent owned by global media companies. This illustrates how copying is an issue of politics in the sense that by control of copying (especially with technical and juridical power) cultural production is also hierarchized and controlled.

The high fidelities of consumer production connect to the other key area of copy within computer programming: the copy/paste routine that is part and parcel of graphic user interfaces (GUI). Aptly, the Xerox Company, now a kind of cultural symbol of the modern culture of copy, and especially its Palo Alto research center (PARC), are responsible for the original ideas of graphic user interfaces and point-click user control using the mouse. The Gypsy graphical interface system from 1974/1975 was probably the first to incorporate the cut and paste command as part of its repertoire (although Douglas Engelbart and the "Augmentation Research Center" had introduced the idea in 1968). The command was designed as a remediation of the paper-and-scissors era, keeping nonprofessionals especially in mind. The interface was designed for efficient office work, where adjustments could be done on screen while always having a clean copy in store for backup. The idea at PARC was to create an office workstation that would seem as invisible to the lay user as possible. This was effected by providing a set of generic commands.[16]

The Xerox Star (1981) was hailed as the software system of the future, designed as a personal workspace for networks. The Star office system incorporated key commands (Move, Copy, Open, Delete, Show Properties, and Same [Copy Properties]) as routines applicable "to nearly all the objects on the system: text, graphics, file folders and file drawers, records files, printers, in and out baskets, etc."[17] Being generic, such commands were not tied to specific objects. In addition, the commands were accessible using special function keys on Star's keyboard. Star's design transferred, then, responsibilities from the user to the machine. The user no longer had to remember commands, but could find them either in special function keys or in menus.[18] The desktop became for the first time the individualized Gutenberg machine, or the hard-working and pious medieval monk that followed the simple commands universalized as generic.

The very familiar point-click copy-paste routine originates from those systems, and is now integrated into everyday consumer culture. This, as Lev Manovich suggests, is perhaps how Fredric Jameson's ideas of postmodernization should be understood: Copy production as the dominant mode of cultural production culminated in the digital production techniques of GUI operating systems that originated in 1980s. Manovich notes that "[E]ndless recycling and quoting of past media content, artistic styles and forms became the new 'international style' and the new cultural logic of modern society. Rather than assembling more media recordings of reality, culture is now busy reworking, recombining, and analyzing already accumulated media material."[19] In addition, recycling is also incorporated as part of the actual work routines of programming in the sense of reusing already existing bits and pieces of code, and pasting them into novel collages (so-called copy and paste programming). Since the 1960s, copying has been elevated into an art practice but it is more likely to be articulated in monotonous office work context or as pirate activity.[20]

In general, "CTRL + C" functions as one of the key algorithmic order-words piloting the practices of digital culture. This returns focus on the key economic-political point: who owns and controls the archives from which content is quoted and remediated? The question does not only concern the software producers who are in a key position to define the computer environment but also the large media conglomerates, which have increasingly purchased rights to the audiovisual archives

of cultural memory. Purchasing such rights means also purchasing the right to copying (as a source of production) and the right to the copy as an object of commercial distribution. The archive functions as the key node in the cultural politics of digital culture. One alarming trend is how such key nodes are being defined in commercial interests, such as in the 1996 Copy Protection Technical Working Group, in which technical manufacturers (Panasonic, Thomson, Philips), content producers (Warners Bros, Sony Pictures), Digital Rights Management (Macrovision, Secure Media), telecommunications (Viacom, Echostar Communications) and the computer industry (Intel, IBM, Microsoft) are represented.[21] The issue under consideration is not only about content that is archived in private corporate collections but about how copying is subject to technical, commercial, and political restrictions.

"Postmodernization" should be understood as a media technological condition. Aesthetic and consumer principles have been intimately intermingled with the engineering and programming routines of modern operating systems that are part of the genealogy of modern technical media. For Friedrich Kittler, the Turing machine as the foundation of digital culture acts as a digital version of the medieval student, "a copying machine at almost no cost, but a perfect one." Similarly for Kittler, "The internet is a point-to-point transmission system copying almost infallibly not from men to men, but, quite to the contrary, from machine to machine."[22] Hence we move from the error-prone techniques of monks to the celluloid-based cut and paste of film, and on to the copy machines of contemporary culture, in which digitally archived routines replace and remediate the analog equivalents of prior discourse networks. With computers, copying becomes an algorithm and a mode of discrete-state processing. Digital copying is much more facile (if not totally error-free) than mechanical copying, and copies are more easily produced as mass-distribution global consumer products. In digital products the tracking and control of the objects of copying is easier, and there is the added capability to tag the copies as copyright of the producer or the distributor. The novelty of the digital copy system is in the capability to create such copy management systems or digital rights management (DRM) techniques, which act as microcontrollers of user behavior: Data is endowed with an inherent control system, which tracks the paths of software (for example, restricting the amount of media players a digitally packed audiovision product can be played on).

In addition, copying is intimately entwined with communication as a central mode of action of network culture. Such sociotechnological innovations as nineteenth-century magnetic recording, the modem (1958), the c-cassette (1962), the CD-disc (1965), the Ethernet local network (1973), and Napster (1999) and subsequent file-sharing networks can be read from the viewpoint of the social order words, "copy" and "distribution." The act of copying includes in a virtual sphere the idea of the copy being shared and distributed. What happens in copying is first the identification or framing of the object to be copied, followed by the reproduction of a similar object whose mode of existance is predicated upon its being distributed. There is no point in making copies without distributing them. Copying is not merely reproducing the same as discrete objects, but coding cultural products into discrete data and communicating such coded copies across networks: seeding and culturing. Similar to how Benjamin saw mechanical reproduction and distribution as inherent to the media technology of cinema, copy routines and distribution channels are intimate parts of the digital network paradigm: connecting people, but also copying machines.

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1   Quoted in David Kahn, *The Codebreakers: The Story of Secret Writing*, 125.

2   Walter Benjamin, *Illuminations: Essays and Reflections*, 244 fn. 7.

3   See the online Early Office Museum pages for copying machines, available at http:// www.officemuseum.com/copy_machines.htm.

4   See the Waalsdorp museum online page at http://www.museumwaalsdorp.nl/computer/en/punchcards.html. Thanks also to Jaakko Suominen for his notes.

5   As Hillel Schwartz notes in his thought-provoking *The Culture of the Copy*, two modes, or philosophies, of copying were early rivals: copying discretely bit by bit, or analogically copying an entirety, as with chemical copying. Hence the cultural origins of computerized scanning and the calculation of, for example, images, and the copying of these images in the form of bits spans further in time than actual digital machines. See Hillel Schwartz, *The Culture of the Copy: Striking Likenesses, Unreasonable Facsimiles*, 223.

6   Robert Slade, "History of Computer Viruses," 1992, available at http://www.cknow .com/articles/6/1/Robert-Slade&%2339%3Bs-Computer-Virus-History.

7   Ken Thompson, "Reflections of Trusting Trust," *Communications of the ACM*, vol. 27, issue 8 (August 1984), 761.

8   Bill Kennedy, "Two Old Viruses," *The Risks Digest*, Vol. 6, Issue 53 (March 1988), available at http://catless.ncl.ac.uk/risks. Another similar observation is dated to 1973, which shows that several programmers thought about the same ideas. See "Old Viruses," *The Risks Digest*, vol. 6, issue 54 (April 1988), available at http://catless.ncl .ac.uk/risks. Another example are the "bacteria" programs that have been listed as one of the oldest forms of programmed threats. A bacterium is another name used for rabbit programs. It does not explicitly damage any files, its only purpose is to reproduce exponentially, but can thus take up all the processor capacity, memory, or disk space. See Thomas R. Peltier, "The Virus Threat," *Computer Fraud & Security Bulletin*, June 1993, p. 15.

9   Thank you to Professor Timo Järvi for pointing this out to me.

10   See B. I. Blum, "Free-Text Inputs to Utility Routines," *Communications of the ACM*, vol. 9, issue 7 (July 1966), 525–526.

11   See Janet Abbate, *Inventing the Internet*, 96–106.

12   Matthew Fuller, *Media Ecologies: Materialist Energies in Art and Technoculture*, 111.

13   Susan Blackmore, *The Meme Machine*, 214.

14   See the "Facsimile & SSTV History," available at http://www.hffax.de/html/ hauptteil_faxhistory.htm.

15   Friedrich Kittler, "Universities: Wet, Hard, Soft, and Harder," *Critical Inquiry*, vol. 31, issue 1 (Autumn 2004), 245.

16   Michael Hiltzik, Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age, 209–210.

17   Butler W. Lampson, "Hints for Computer System Design," *Proceedings of the Ninth ACM Symposium on Operating Systems Principles* (1983), 39.

18   See Jeff Johnson and Teresa L. Roberts, "The Xerox Star: A Retrospective," *IEEE Computer* (September 1989), 11–29.

19   Lev Manovich, *The Language of New Media*, 131.

20   Schwartz, *The Culture of the Copy*, 238–239.

21   See Volker Grassmuck, "Das Ende der Universalmaschine," in *Zukünfte des Computers*, ed. Claus Pias, 251.

22   Kittler, "Universities," 252.