How Media Became New

On August 19, 1839, the Palace of the Institute in Paris was completely full with curious Parisians who came to hear the formal description of the new reproduction process invented by Louis Daguerre. Daguerre, already well-known for his Diorama, called the new process daguerreotype. According to a contemporary, "a few days later, opticians' shops were crowded with amateurs panting for daguerreotype apparatus, and everywhere cameras were trained on buildings. Everyone wanted to record the view from his window, and he was lucky who at first trial got a silhouette of roof tops against the sky."[10] The media frenzy has begun. Within five months more than thirty different descriptions of the techniques were published all around the world: Barcelona, Edinburg, Halle, Naples, Philadelphia, Saint Petersburg, Stockholm. At first, daguerreotypes of architecture and landscapes dominated the public's imagination; two years later, after various technical improvements to the process, portrait galleries were opened everywhere — and everybody rushed in to have their picture taken by a new media machine.[11]

In 1833 Charles Babbage started the design for a device he called the Analytical Engine. The Engine contained most of the key features of the modern digital computer. The punch cards were used to enter both data and instructions. This information was stored in the Engine's memory. A processing unit, which Babbage referred to as a "mill," performed operations on the data and wrote the results to memory; final results were to be printed out on a printer. The Engine was designed to be capable of doing any mathematical operation; not only would it follow the program fed into it by cards, but it would also decide which instructions to execute next, based upon intermediate results. However, in contrast to the daguerreotype, not even a single copy of the Engine was completed. So while the invention of this modern media tool for the reproduction of reality impacted society right away, the impact of the computer was yet to be measured.

Interestingly, Babbage borrowed the idea of using punch cards to store information from an earlier programmed machine. Around 1800, J.M. Jacquard invented a loom which was automatically controlled by punched paper cards. The loom was used to weave intricate figurative images, including Jacquard's portrait. This specialized graphics computer, so to speak, inspired Babbage in his work on the Analytical Engine, a general computer for numerical calculations. As Ada Augusta, Babbage's supporter and the first computer programmer, put it, "the Analytical Engine weaves algebraical patterns just as the Jacquard loom weaves flowers and leaves."[12] Thus, a programmed machine was already synthesizing images even before it was put to process numbers. The connection between the Jacquard loom and the Analytical Engine is not something historians of

Skenováno pro studijní účely

computers make much of, since for them computer image synthesis represents just one application of the modern digital computer among thousands of others; but for a historian of new media it is full of significance.

We should not be surprised that both trajectories — the development of modern media, and the development of computers — begin around the same time. Both media machines and computing machines were absolutely necessary for the functioning of modern mass societies. The ability to disseminate the same texts, images and sounds to millions of citizens thus assuring that they will have the same ideological beliefs was as essential as the ability to keep track of their birth records, employment records, medical records, and police records. Photography, film, the offset printing press, radio and television made the former possible while computers made possible the latter. Mass media and data processing are the complimentary technologies of a modern mass society; they appear together and develop side by side, making this society possible.

For a long time the two trajectories run in parallel without ever crossing paths. Throughout the nineteenth and the early twentieth century, numerous mechanical and electrical tabulators and calculators were developed; they were gradually getting faster and their use was became more wide spread. In parallel, we witness the rise of modern media which allows the storage of images, image sequences, sounds and text in different material forms: a photographic plate, film stock, a gramophone record, etc.

Let us continue tracing this joint history. In the 1890s modern media took another step forward as still photographs were put in motion. In January of 1893, the first movie studio — Edison's "Black Maria" — started producing twenty seconds shorts which were shown in special Kinetoscope parlors. Two years later the Lumière brothers showed their new Cinématographie camera/projection hybrid first to a scientific audience, and, later, in December of 1895, to the paying public. Within a year, the audiences in Johannesburg, Bombay, Rio de Janeiro, Melbourne, Mexico City, and Osaka were subjected to the new media machine, and they found it irresistible.[13] Gradually the scenes grew longer, the staging of reality before the camera and the subsequent editing of its samples became more intricate, and the copies multiplied. They would be sent to Chicago and Calcutta, to London and St. Petersburg, to Tokyo and Berlin and thousands and thousands of smaller places. Film images would soothe movie audiences, who were too eager to escape the reality outside, the reality which no longer could be adequately handled by their own sampling and data processing systems (i.e., their brains). Periodic trips into the dark relaxation chambers of movie theaters became a routine survival technique for the subjects of modern society.

The 1890s was the crucial decade, not only for the development of media, but also for computing. If individuals' brains were overwhelmed by the amounts of information they had to process, the same was true of corporations and of government. In 1887, the U.S. Census office was still interpreting the figures from

Skenováno pro studijní účely

the 1880 census. For the next 1890 census, the Census Office adopted electric tabulating machines designed by Herman Hollerith. The data collected for every person was punched into cards; 46, 804 enumerators completed forms for a total population of 62,979,766. The Hollerith tabulator opened the door for the adoption of calculating machines by business; during the next decade electric tabulators became standard equipment in insurance companies, public utilities companies, railroads and accounting departments. In 1911, Hollerith's Tabulating Machine company was merged with three other companies to form the Computing-Tabulating-Recording Company; in 1914 Thomas J. Watson was chosen as its head. Ten years later its business tripled and Watson renamed the company the International Business Machines Corporation, or IBM.[14]

We are now in the new century. The year is 1936. This year the British mathematician Alan Turing wrote a seminal paper entitled "On Computable Numbers." In it he provided a theoretical description of a general-purpose computer later named after its inventor the Universal Turing Machine. Even though it was only capable of four operations, the machine could perform any calculation which can be done by a human and could also imitate any other computing machine. The machine operated by reading and writing numbers on an endless tape. At every step the tape would be advanced to retrieve the next command, to read the data or to write the result. Its diagram looks suspiciously like a film projector. Is this a coincidence?

If we believe the word cinematograph, which means "writing movement," the essence of cinema is recording and storing visible data in a material form. A film camera records data on film; a film projector reads it off. This cinematic apparatus is similar to a computer in one key respect: a computer's program and data also have to be stored in some medium. This is why the Universal Turing Machine looks like a film projector. It is a kind of film camera and film projector at once: reading instructions and data stored on endless tape and writing them in other locations on this tape. In fact, the development of a suitable storage medium and a method for coding data represent important parts of both cinema and computer pre-histories. As we know, the inventors of cinema eventually settled on using discrete images recorded on a strip of celluloid; the inventors of a computer — which needed much greater speed of access as well as the ability to quickly read and write data — came to store it electronically in a binary code.

In the same year, 1936, the two trajectories came even closer together. Starting this year, and continuing into the Second World War, German engineer Konrad Zuse had been building a computer in the living room of his parents' apartment in Berlin. Zuse's computer was the first working digital computer. One of his innovations was program control by punched tape. The tape Zuse used was actually discarded 35 mm movie film.[15]

One of these surviving pieces of this film shows binary code punched over the original frames of an interior shot. A typical movie scene — two people in a

Skenováno pro studijní účely

room involved in some action — becomes a support for a set of computer commands. Whatever meaning and emotion was contained in this movie scene has been wiped out by its new function as a data carrier. The pretense of modern media to create simulation of sensible reality is similarly canceled; media is reduced to its original condition as information carrier, nothing else, nothing more. In a technological remake of the Oedipal complex, a son murders his father. The iconic code of cinema is discarded in favor of the more efficient binary one. Cinema becomes a slave to the computer.

But this is not yet the end of the story. Our story has a new twist — a happy one. Zuse's film, with its strange superimposition of the binary code over the iconic code anticipates the convergence which gets underway half a century later. The two separate historical trajectories finally meet. Media and computer — Daguerre's daguerreotype and Babbage's Analytical Engine, the Lumière Cinématographie and Hollerith's tabulator — merge into one. All existing media are translated into numerical data accessible for the computers. The result: graphics, moving images, sounds, shapes, spaces and text become computable, i.e. simply another set of computer data. In short, media becomes new media.

This meeting changes both the identity of media and of the computer itself. No longer just a calculator, a control mechanism or a communication device, a computer becomes a media processor. Before the computer could read a row of numbers outputting a statistical result or a gun trajectory. Now it can read pixel values, blurring the image, adjusting its contrast or checking whether it contains an outline of an object. Building upon these lower-level operations, it can also perform more ambitious ones: searching image databases for images similar in composition or content to an input image; detecting shot changes in a movie; or synthesizing the movie shot itself, complete with setting and the actors. In a historical loop, a computer returned to its origins. No longer just an Analytical Engine, suitable only to crunch numbers, the computer became Jacqurd's loom — a media synthesizer and manipulator.

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