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ABSTRACT

This paper discusses the role of digital technology within the cognitive revolution of the perception of images. It analyzes the traditional values placed on images as a source of cognition. These values are discussed in terms of the ethical and social issues raised by the use of digital image manipulation in so far as the digital era is falsely being associated with the misuse of visual information and unethical handling of images. The phenomenon of "cognitive revolution" is explained as a direct consequence to the challenges posed by this misconception. The analysis reveals the need for a re-evaluation of the truth value placed on images and the importance of a higher level of visual literacy in order to better identify image manipulation. Considering that the technical possibilities for image alteration have drawn public interest only when individual consumers gained access to electronic imaging technologies, this study stresses the need for an increased awareness of the subjectivity of images so that the popular concept of "seeing is believing" can be redefined. (Author)

"Digital Imaging And The Cognitive Revolution: A Media Challenge"

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Abstract

This paper discusses the role of digital technology within the cognitive revolution of the perception of images. It analyzes the traditional values placed on images as a source of cognition. These values are discussed in terms of the ethical and social issues raised by the use of digital image manipulation in so far as the digital era is falsely being associated with the misuse of visual information and unethical handling of images. The phenomenon of "cognitive revolution" is explained as a direct consequence to the challenges posed by this misconception. The analysis reveals the need for a re-evaluation of the truth value placed on images and the importance of a higher level of visual literacy in order to better identify image manipulation. Considering that the technical possibilities for image alteration have drawn public interest only when individual consumers gained access to electronic imaging technologies, this study stresses the need for an increased awareness of the subjectivity of images so that the popular concept of "seeing is believing" can be redefined.

Ever since Gutenberg invented the moveable type, major technological developments have been met with both enthusiasm for the opening horizons and fear for presumed damaging effects. Technological innovations call for thorough analyses of their pros and cons in order to develop ethical standards that regulate their use. At the dawn of the twenty-first century, digital technologies are some of the most exciting, yet alarming novelties. Technicians and scholars alike eagerly observe these technologies as they shape the "digital age." This paper discusses the role of digital technology within the cognitive revolution of the perception of images. It analyzes the traditional values placed on images as a source of cognition. These values are discussed in terms of the ethical and social issues raised by the use of digital image manipulation in new media. The phenomenon of a "cognitive revolution" is explained as a direct consequence to the challenges posed by the introduction of new technologies to the field of imaging. Finally, the implications of digital imaging technologies on electronic media are reviewed in terms of the media's roles and responsibilities towards society.

Technology and Social Change

Historically, the introduction of new technologies into civilization has had far reaching implications on a variety of levels. Bone, stone, and bronze tools gave prehistoric groups superiority over others who had not yet discovered the value of these materials. When in medieval times the invention of artillery made city walls unnecessary-since guns sent their projectiles over them,-a new sense of freedom emerged, and the concept of protection was culturally redefined in terms other than city walls. Later, some people first thought of the car as nothing more than a horse carriage with an engine and the radio as just a wireless telegraph. Others resisted these inventions fearing the end of personal communication and letter writing with the introduction of the telephone. The invention of the telephone led civilization into uncharted territory: vertical urban expansion in the form of skyscrapers became sociologically possible only after people on different floors were able to communicate by phone. The Sears tower in Chicago-arguably the tallest building in the world-is said to contain over 4500 miles in telephone cabling, roughly enough to connect the cities of Chicago and Los Angeles.

These changes brought about by new technologies and the ensuing need to redefine cultural values have created social tension in the past as much as computer mediated communication creates tension now. Whereas digital technology has had an important influence on many different communication and media processes, the impact of digitization in the field of imaging is of great relevancy due to its social impact. The introduction of electronic imaging media has raised issues that call for a revision of society's conceptualization of visual information and of prevailing views on the representation of reality since modern imaging technologies-such as photography-were first introduced. When the Lumiere brothers projected their movie "The Arrival of a Train" in late 19th century Paris, spectators jumped from their seats and ran away because they thought the train would roll over them when it suddenly grew bigger on the screen. Later, people not only got used to the presumed realism of photographic images, but accepted it to the point of considering a photograph legitimate evidence in courtrooms (Mitchell, 1992). In many other instances images have provided a means for social

change based on photographic representation. During the Vietnam war, when Huynh Cong captured a naked girl covered with napalm running for her life, the photo exposed the ugly side of the war to many Americans. Amateur video footage revealed the Tiananmen and Rodney King tragedies, arguably inducing changes in the ways the world perceived and dealt with China, and in the way Americans looked at race relations and law enforcement.

Cognition Through Images

Whereas Webster's Collegiate Dictionary (1994) defines cognition as the act or process of knowing, including both awareness and judgment, Arnheim (1969) uses "cognitive" to refer to "all mental operations involved in the receiving, storing and processing of information: the sensory perception, memory, thinking, learning" (p. 13). Sensory perception, however, is the crucial point of debate when it comes to the role of images in our cognitive process. The act of perceiving has been proven to be very different for each person. Conscious perception is influenced by a variety of conditions regardless of physical abilities. People have different codes by which to perceive and even deny or ignore perception. Some influences on perception are bound to culture, previous training, species, habits, and so on. Not everything that is rational for one individual is rational for another. Regarding visual perception, research has shown that some animals do not perceive the difference between a circle and a square; some persons are not capable of distinguishing between a pentagon and a circle; children have trouble with the identification of certain colors which have a clear character of their own for adults; some cultures do not put green and blue under separate perceptual headings, etc. (Granrud, 1992; Kay & Kempton, 1984; Levie, 1987).

Contrary to this line of research, other scholars of visual communication have pointed out that the basic skills for viewing and understanding images are shared by us all. Messaris (1997) writes: "One can just as well argue that common visual habits are acquired through learning because of the fundamental commonalties affecting all people on this earth regardless of their specific cultural backgrounds" (p. 171). Such a position, although valid, ignores the conventions and stereotypes human beings adopt through socialization.

Nevertheless, there is little doubt about the impact of visual information for the simple fact of its abundance. Gombrich (1996) calls ours a "visual age" in which we are "bombarded with pictures from morning till night" (p.42), which is confirmed by Baker (1961, p. 10), who estimated that 80% of all impressions are received through the eyes. In addition, Seward Barry (1997) affirms that vision is the most sophisticated of our senses, and that the eyes are "our main source of information about the world, sending more data more quickly to the nervous system than any other sense" (p. 15).

Most primitive cultures considered the eye a symbolic representation of a person's world (Bilbeny, 1997), a notion that indirectly carried over into modern society. According to some authors, in today's Western society, we also regard sight as our main access to the "external world" (Dondis, 1973; Jenks, 1995; Seward Barry, 1997). In fact, images are taking the helm in many aspects of our everyday life and individual construction of reality is-more or less involuntarily-based on what we see. Slater (1995b)

claims that "ironically, if modernity is based on restricting 'believing' to 'seeing,' on the idea that seeing is the only valid basis for believing, then it must constantly generate visual spectacles which inspire belief" (p. 223). However, the main paradigm coming forth from this assertion is that within the realm of digital imaging hence, image manipulation, beliefs cannot be constructed on the basis of what we see. Yet undeniably, our society's cognitive processes are strongly built on visual perception; thus images are more than ever an active participant in the cultural revolution that digital technologies are calling for. As far as the media are concerned, images used to be perceived as secondary to verbal language in their communicative function. More than two decades ago, Dondis (1972, pp. 6-7) explained:

In the modern media [...] the visual dominates; the verbal augments. [...] Our language-dominated culture has moved perceptibly toward the iconic. Most of what we know and learn, what we buy and believe, what we recognize and desire, is determined by the domination of the human psyche by the photograph. And it will be more so in the future.

The increased reliance on images as a source of information has not only become evident in the media, but it is clearly the case in many other aspects of every day life as well. Through the availability of electronic media in the form of computers, scanners, digital cameras, etc. to the individual consumer, a large number of people have gained easy access to digital imaging. Through this access, not only commercial or work-related digital culture has become increasingly image-based, but many leisure activities as well. Slater (1995a) reports: "Essentially, new image technologies in everyday life overwhelmingly take the form of 'home entertainment': commodities which are conceived, designed and marketed in relation to private family leisure. [...] Many home entertainment activities and technologies-new and old-are crucially image-based" (p. 130).

The Cognitive Revolution

According to Shaffer (1995), the personal computer industry generates close to $100 billion in sales each year and is expanding continuously. Negroponte (1995), in fact, calls the growth rate of the computer market exponential. The more there are, the more they become popular-arguably "necessary"-thus more are being bought. Negroponte states that 35% of American families and 50% of American teenagers have a personal computer at home; 30 million people are estimated to be on the Internet; and 65% of new computers sold worldwide in 1994 were for the home. The rapid increment in the use of computers is directly related to the digitization of communication technologies and the acceleration of data dissemination with a direct influence on images and our perceived value of them.

As the exchange and manipulation of images in the digital era have become increasingly accessible, we have experienced a perceived lack of control over image manipulation, alteration, and copyrights. We have started to be alarmed as we discovered the disintegration of long held beliefs about photography being an objective representation of reality. On the one hand, virtually limitless options of digital imaging technologies have

originated numerous scandals in print, while on the other, they also amaze us every day on television with the most spectacular graphics. We are growing accustomed to digital imaging readily accepting a television commercial showing a surfer gliding on a concrete wave in the midst of Manhattan. It is the surreal visual rendering of the metaphor of "surfing" (the net) in an urban setting of advanced communication technologies. Neither do we shake our head when in another ad a car takes off flying into an aerial gas station, gets serviced instantly, and lands safely in a traffic-filled street.

In other instances, however, image alteration is less acceptable. In 1982, National Geographic digitally moved one of the great pyramids of Egypt so it would fit better on its February 1982 cover. That is, reality was altered for purely aesthetic reasons. Also, in 1994, New York Newsday produced a cover showing the ice-skaters Tonya Harding and Nancy Kerrigan-at the time involved in a scandalous quarrel-together on the rink the day before their scheduled Olympic match. Although the magazine acknowledged in a little note that the cover photo was a composite, many readers were fooled. The same year, during the O. J. Simpson trial, the June 27 cover of both Time and Newsweek featured a mug shot of the accused. Emphasizing the already tense issue of race in this trial, Time magazine rendered the cover as a photo-illustration by Matt Mahurin, who had digitally darkened Simpson's face. The presence of two distinctly connotative versions of the same picture on the cover of the country's most popular weeklies raise concerns about the ethical implications of digital imaging.

Image Manipulation And Photographic Realism

Despite the fact that photograph manipulation is as old as photography itself, this medium has frequently been attached to the "blind" assumption that it is a purely objective representation of reality (Arnheim, 1974; Snyder & Allen, 1975). News photography-as opposed to artistic photography-is defined by truth, accuracy, and integrity (Sherer, 1994). In this respect, Roland Barthes (1996) explains that the content of the photographic image is by definition, the scene itself, the literal reality. Although Barthes acknowledges a process of reduction (in proportion, perspective, color) taking place between reality and the photographic image, he emphasizes that at no time this reduction is a transformation. Barthes calls the image a perfect analogon of reality, claiming that "it is exactly this analogical perfection which, to common sense, defines the photograph" (p. 135). Nevertheless, Barthes explains that although photographs are objective-thus purely denotative-representations of reality, they may be connoted. The very fact that a news photograph is chosen, worked on, composed, and treated according to professional, aesthetic and ideological norms, and further placed in context with other signs, establishes a code by which a photograph will be perceived. Barthes calls this process the photographic paradox, which is the coexistence of two messages: the one without a code (the photographic analogue), and the other with a code (the treatment or the rhetoric of the photograph).

Another perspective arguing that photographs are truthful representations of reality is the no longer sustainable assumption that the photographer personally witnesses the scene. The veracity of photographs was formerly backed by the necessary physical presence of a human being taking the picture. Nowadays however, cameras do not need to

be operated in situ. Oftentimes, photographic lenses are directed into physical spaces impossible to penetrate by humans. Current medical imaging technologies, for example, photograph remote surfaces of a body's interior depicting a tumor perhaps like a nebula, or a cancer like a star. In fact, as far as medical imaging is concerned, the issue is still whether and to what effect photography achieves visionary status (Kember, 1995). On the other hand, medicine also relies on other kinds of images, such as magnetic resonance scans. In fact, Mitchell (as cited in Bush, 1995) emphasizes that magnetic resonance scans are generated under a completely different set of conventions and are not photographic at all. Yet, they are used as evidence, and life or death decisions are often based on such images. In this case, in order to approach the issue of truth or falsity, it is necessary to know the conventions under which these images operate. Medical imaging, as well as satellite photography, thermographics, an other imaging techniques prove that a photographically recorded scene is not necessarily a purely denotative representation of reality as seen by the human eye.

The debate about the photographic image's privileged status as a trustworthy analogue representation of reality is now re-surfacing in relationship to digital imaging. New technology is being associated with the loss of trust in visual media mainly because more people have access to digital imaging techniques. In the 19th century, photography was a craft-based practice that required high levels of technical skill and considerable investment of time and money. Only few people engaged in it until, in the 1880s, Eastman transformed photography into a consumable leisure activity (Slater, 1995a). The introduction of prepared and pre-loaded roll film, and the technological simplification of the camera settings motivated a mass consumption of photography. The process was further eased by making film developing and printing services available. From there on, taking pictures has become an important part of a great number of social activities. In fact, Slater (1995a) argues that photography plays a strategic role in bringing together family, leisure, and consumerism into a private world which is a major site for the articulation of identity.

The use of photography as a means to articulate identity stresses its value as an objective representation of reality. Most people do not develop and print their own pictures, but send them to a processing laboratory. The pictures obtained after picking up a developed roll of film is assumed to be an unalterable representation of what was shot. The lack of direct participation in lab procedures allows for a generalized misconception of photography as the unalterable truth. The assumption is therefore based merely on lack of technical awareness and is bound to change as people discover the possibilities offered by a computer with imaging software. Yet, image manipulation is nothing new. It is new only to the leisure photography consumer. Historically, faking photographs to manipulate beliefs is widely traceable. Double exposures, double printing, and composite photographs are discussed already in popular nineteenth-century books on "photographic amusements" and trick photography. Later, Dadaists and Surrealists adopted photographic manipulation and photomontage as a technique, but it was also used by all political factions in Europe and Russia in the decades before the Second World War. In the early 20th century, political propagandists manipulated photographs to their advantage. Stalin, for example, had Trotsky airbrushed out of a picture that showed him next to Lenin delivering a speech to a crowd in 1920 (Mitchell, 1994). In fact, according to Ades

(1976), photomontage is associated particularly with the political Left, because it is ideally suited to the expression of the Marxist dialectic.

Ethical implications

Photographic manipulation has been practiced in several ways ever since the first photographer took up the camera and processed an image. So, what is at stake as we enter the digital era? The increased awareness about opportunities to practice image alteration and to indiscriminately disseminate these images raises a controversial discussion about ethical values. Robins (1991) states that digital imaging has finally freed photographers from the perpetual constraint of having, by definition, to record reality. Undoubtedly, as scanners and digital cameras drop in price and become more readily available, there is no further need for complicated darkroom equipment, chemical procedures, and special light conditions. Thus, more people will be able to edit photographs with only a few computer keystrokes. However, digital technology is associated with unethical behavior although the actual act of manipulating a photograph is as much an ethical issue now, as it has ever been before. Lister (1995) calls this phenomenon a "fundamental cultural break between the photographic and the digital" (p. 11). Lister further explains that we need not regard the photograph as the product of a specific mechanical and chemical technology, but rather as a technological, semiotic, and social hybrid. The issue at stake is not as much the increased possibility of manipulation through digital means, as it is the socio-cultural impact of abusing the traditional-albeit naive-belief in photography's truthfulness by deliberately manipulating an image and using it as an original.

The ethical parameters that a news photograph should go by, as opposed to the liberal interpretation an artistic photograph or an illustration may adopt, are difficult to define. In an interview conducted by Print Magazine (Bush, 1995) Janet Abrams, a visual communication and new media technologies specialist, commented:

There seems to be a distinction-tacit or more explicit-between how permissible it is to adjust a documentary image to accompany a news story compared with one made for illustrative purposes, which means, presumably, that the image has some point of view beyond just representing what ostensibly took place. An illustration is intended to give a flavor of what the feature is about, rather than presenting the scene as if you had been there yourself. (p. 27)

This premise departs from the observation that any photograph is-one way or the other-manipulated, and setting the limit is a matter of individual judgment. The challenge lays in the interpretation of the word "manipulation." Mitchell (1994) suggests that in the age of digital technology our capacity to sort visual facts from falsehoods will increasingly rest on our ability to cross-check visual evidence against established knowledge and beliefs. However, considering the example of National Geographic, it is hardly fair to expect from a reader to be able to judge whether the Egyptian pyramids are indeed as close to each other as presented. Therefore, in order to identify image manipulation, it is necessary to analyze an image carefully for structural incoherence.

Such an analysis presupposes a certain level of visual literacy to compare shadows to objects and potential light sources, regularity of visual texture, perspectival correlation, reflections, etc. For the average reader, however, the capability-or even the willingness-to undertake this kind of visual analysis is not to be taken for granted.

Another criterion that may attest to the authenticity of a photograph is the verification of its provenance. With digital imaging, however, this is increasingly difficult, given the lack of physical materials such as negatives, films, paper prints, and so on. Digital images are transmitted and replicated in a matter of seconds via computer and telephone networks. In such transactions, alteration of the pixel values of an image is technically indiscernible.

The Challenge

As the digital era widens the scope of traditional imaging techniques, introducing new means for image exchange, production and manipulation, we are simultaneously experiencing the liberating effect and the worrying implications of the technology. Many myths long associated with the factual realism of photography are questioned. Mitchell (1994) compares the belief of traditional photography as "causally generated, truthful reports about things in the real world" to the position we face with new media:

The emergence of digital imaging has irrevocably subverted these certainties, forcing us all to adopt a far more wary and vigilant interpretive stance. The information superhighway will bring us a growing flood of visual information in digital format, but we will have to take great care to sift the facts from the fictions and the falsehoods. (p. 73)

From such perspectives, the most important change brought about by digital technologies is the challenge posed to each individual to reconcile with the meaning of images and to redefine their cognitive value. On a larger scale, the challenge for the media is to responsibly direct this cognitive revolution. In fact, the media's role is critical due to their leading position as providers of both highly denotative photographs in some instances, and profoundly connotative images in others.

Bilbeny (1997) describes the cognitive revolution of the digital media age as a new way of symbolizing reality. According to him, during the industrial age, reality was understood as a set of events happening independently from the individual. In modern times, this conception shifted to a more "representative" interpretation, where reality was influenced by personal points of view. Furthermore, Bilbeny affirms that the digital age has evolved into a "presentative" mode of reality, where this reality, however, is not self-subsistent, but created by the media as a "virtual" one. Bilbeny explains that our perception of reality is directly determined by the existing means for transmitting information. Therefore, the media's role in the cognitive revolution of image perception is undoubtedly crucial.

From a different point of view, the media are not merely a channel for the transmission of information which will shape our perception of reality. Rather, the media are perceived as a product of the collective state of our society. In his essay on digital

encounters, Henning (1995) compares two arguments on the relationship of the digital media and the "derealisation" of images. The first approach suggests that "the user (or viewer) of computer-generated imagery will eventually lose the ability to distinguish between the 'simulated' or 'hyperreal' world and the real one" (P. 219). The second approach, based on Baudrillard's postmodern theories, argues that reality has actually been replaced by the world of simulation. That is, "simulation is experienced as our collective 'reality,' not because we are necessarily deluded or deceived, but because social interaction has been reduced to an exchange of signs unrooted in material existence" (p. 219).

Material existence has indeed become an irrelevant characteristic in many aspects of the digital era. The abstractness of electronic information is transposing a good part of the perception of our "external" reality to a field closer to our "internal" reality. In fact, this intermediate field, the "virtual" reality, is mainly characterized by its lack of defined boundaries. In order to cope with the challenge of reconciling with the meaning of images and redefining their cognitive value we need to learn how to navigate virtual sees without confusing internal and external realities. According to Barry (1995), within the realm of visual communication, the digital technology age is moving towards dissociating technology from scientific disciplines. The controversy over the credibility of images in the digital world questions the effectiveness of technology in its attempt to equalize vision and truth by means of strict scientific discipline. Barry concludes:

"Yet surprisingly technology and discipline have not been as hegemonic-or perhaps as effective-as is sometimes imagined. For in conjunction with discipline, human 'personality,' 'ethics' and 'professional experience' have provided, and continue to be expected to provide, the means by which distant objects and events may be known and acted upon. The vision of the individual is not something which has been eradicated by technology. Rather it has been formed into a technical instrument itself." (pp. 54-55)

Conclusion

The introduction of digital imaging technology has led today's society into new cognitive levels of the value of images. Modernity has built a great part of its conception of truth and reality on its sense of vision. When the Lumiere brothers first projected the image of an incoming train on a movie screen, people immediately reacted to the realism of the image. This same realism, however, has led us not to run away from images on a screen but rather, to grow attached to them and believe in their realistic objectivity. Over the last century, considerable political and economic investments have been geared towards developing technologies capable of producing images that would provide visual evidence (Barry, 1995). As a result, images have been used in courtrooms and as legitimate visual accounts that have reshaped people's perception of social issues. In fact, impersonal involvement in the picture taking and image developing processes has caused a lack of awareness of the possibilities of image manipulation. Image alteration is inherent to the photographic process-be it analog or digital-and may range from cropping and framing, to partial elimination or image compositing. However, the technical possibilities for image alteration have drawn public interest only when individual

consumers gained access to electronic imaging technology and became actively involved in imaging processes. The digital era is falsely being associated with the misuse of visual information and unethical handling of images. The context in which digital imaging is being criticized, however, reveals the need for a cognitive revolution and a re-evaluation of the truth value placed on images. It is imperative to stress a higher level of visual literacy that will enable us to better identify image manipulation. Moreover, it is important to raise awareness of the subjectivity of images so that the popular concept of "seeing is believing" can be redefined. In a world where reality is increasingly constructed within the abstract frame of "virtuality" it is imperative to dissociate it from material representation. Increasingly image-based media face the challenge of monitoring the cognitive revolution of society while at the same time using the new technologies responsibly and innovatively. Digital imaging opens up an incredibly wide spectrum of visual language possibilities that imaging artists, technicians, and the audience alike are excited to explore. In the words of W. J. Mitchell: "An interlude of falsehood has passed" (1992, p. 225).

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