The New Visual Age: The Influence of Computer Graphics on Art and Society

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Abstract
The author discusses the current status of computer graphics with respect to art and society. It is argued that the most recent developments in microelectronics have made computer art accessible to a large number of artists and amateurs. As a result, computer graphics will play an increasing role in studies of the theory of art, in education, and in entertainment, as well as in the shaping of the visual environment. Initial applications of computer graphics to traditional two-dimensional formats have now been superseded by more revolutionary modes of expression. It is argued that computer art could be considered an example of a 'gentle' technology that will gain more importance as large numbers of individuals are able to explore its potential.

Only a few years ago it would have seemed ridiculous to discuss the influence of computer graphics on art and society. Although computer-generated graphics had already been applied in important areas of science and technology, its influence was not yet felt in the arts or in society at large. Those few who used the computer as an artistic instrument were regarded as outsiders: with their freelance experiments they deviated from the solid ground of strictly defined tasks, but on the other hand found no approval in artistic circles. One of the causes for this lack of approval may have been that they did not submit to the frequently changing fashions which are prevalent in today's visual arts. Rather, they were, at least in the beginning when searching for motifs, guided by mathematical and geometrical aspects. The fact that they succeeded in opening up a largely unknown realm of graphically attractive forms went unheeded by the critics.

At the beginning of its development it was to be expected that the artistic forms of computer graphics would be integrated into the fine arts, but the latest situation leads one to conclude that computer art will develop into a new field of aesthetically-oriented activity which can neither be classified as part of the existing classical branches of art, nor must it be recognized as art at all. Thus a new profession could emerge as was the case with photography and cinematography. Some parallel developments may result: the latter are, like computers, technical media which permit the realization of artistic goals with unprecedented perfection, using, however, realistic pictures as objects. Such questions which are now being posed in reference to computer art are concerned with more formal aspects: they decide which channels of communication will be accessible to this new field of creativity, which section of the public it will appeal to, how quickly it will spread, and what institutions will be responsible for educating students in this field.

It was the most recent developments in microelectronics which also led to a turning point in the history of computer art. Particularly the opportunities opened by microprocessors, their decreased execution time and increased storage capacity allowing ever greater access at lower prices to larger groups of interested amateurs have opened new perspectives to the most diverse ranges of activity. Thus many professional applications of computer graphics have developed which have become feasible only with the aid of microelectronics. It is surprising what a large number of applications computer artists have found as a result of the experience they have gathered to date. In particular, the fact that pictures can be produced effortlessly and quickly and can be adapted to private means will have considerable impact. To be precise, it is only at this point that the often quoted visual age' begins which previously was considered to have started with the advent of visual media, illustrated magazines, films, and television. These are the so-called mass media, and it is characteristic for them that they permit the flow of information in one direction only - in the direction of the passively waiting recipient. The possibility of expression by means of technically perfect pictures was limited to a few institutions which could afford large financial investments. The microcomputer, connected to a private television set, has extended this possibility to people of all walks of life and of all ages.

As is now well known, the range of human activities is defined by technical media of which particular importance is to be attributed to data processing because of its decisive influence on human behaviour and thinking. The consequences of the

introduction of writing, printing, and radio were analyzed only subsequently. At least today we are in a position to evaluate the possible impact of the transition into an age in which letters can be replaced by picture elements.

Once one has become aware of the problem, certain consequences can easily be foreseen, such as the use of visual demonstrations in presenting instructional material in schools or of private image generators for designing new patterns for one's own carpets or textiles. But the transformations transgressing such apparent uses, such as that of thinking itself, are more than just slogans. Verbal language is a linear construction, a sequence of words and sentences. It is therefore particularly well suited to the description of linear relations of order, whereas all others, such as topological relations, circular functions, or interactions, cannot be mapped directly, but usually require complicated transformations into a linear representation. Since his means of expressing himself is closely related to his way of thinking, man is better prepared to register linear relation ships such as chronological and causal ones than two- or three-dimensional ones, access to which is more difficult for him. It is the latter ones which can be better described by pictures. Thus, the existence of image creating systems increases our means of expression and of imagination.

Changes in our way of thinking must certainly be thought of as a long-term effect, but should not be overlooked in spite of the more visible modifications in technical behaviour. Changes are most pronounced in those areas in which artistic and technical (asks overlap; this process is all the more remarkable as it expresses a new type of interaction between technology and art.

'Free' computer graphics can serve as a source of new programming methods and of ideas for creating new shapes. It is through playful experiments, but also through confrontation with classical art, that experience is gained which can be useful in several ways:

- (1) *Theory of Art*. From the viewpoint of the theoretician or the behavioural scientist who is concerned with aesthetics, computer-generated drawings represent examples of simulated pieces of art. They lend themselves well to a study of the principles of production: one can, for instance, investigate which aesthetic laws apply in each case. Work according to programs is particularly closely related to this mode of thinking, because it makes the quantification of visual information easy. The possibility of rapid creation and of variation in structures, as in text analysis, is also essential.

- (2) *Education*. Computer graphics work can also be used to illustrate relationships of all kinds as occurring, for example, in mathematics, in the sciences, in psychology and in sociology. In the framework of transfer of knowledge by aid of media coordination, the visual media assume an increasingly important role. Computer graphics is nearly indispensable when one is confronted with dynamic processes which cannot be illustrated by individual pictures, but only by animated sequences. As opposed to the predetermined linear course of a film, computer graphics permits the user to intervene actively during the real-time operation, it allows the simulation of the processes under study (in pictures and data) and specific experiments with parameters which can be chosen arbitrarily. The use of new means of representation should not be limited to schools and universities, but should also he extended to museums: in a new kind of museum, the 'electronic museum', historical objects would play a secondary role, and visitors would be offered far better opportunities to satisfy their appetite for experimenting. The visualization of instructional material is one of the great tasks of our future.

- (3) *Entertainment*. In a society in which the time for leisure is steadily increasing, the task of providing people with meaningful activities becomes more and more important. A greater share of it will fall to art, less to art in the classical sense which restricts the spectator to the role of a passive consumer, but more an art which will stimulate him to participate creatively. In this regard computer art offers the best conditions. Forms of aesthetic activity can be imagined which allow the viewer to enter into a sort of dialogue with the computer or the aesthetic program; by interaction some sort of a play with graphic structures may emerge. As experience has shown, such an activity is not only pleasurable but has also positive effects on the creative capabilities.

- (4) *Shaping of the Environment*. Until recently, the shaping of our environment was left to the more or less spontaneous ideas of individuals. But today we are convinced that an optimal coordination of our living space with its inhabitants has become a necessity. Apart from the task of a technical transformation and often adaptation to existing psychological and sociological conditions, we are confronted with the problem of aesthetic structuring. This includes the whole spectrum from wallpaper patterns to a new town. Such a coordination requires the taking into consideration of the highly complex system of action and reaction which can only be done with the aid of the computer. The sudden interest in visual computer art has had repercussions on its artistic forms, which, while still being ignored by art critics, have drawn the attention of designers, educators, and the entertainment industry. An additional stimulus was

created by the advancement of microelectronics which added a new dimension of artistic activity: the old dream of being able to play freely with colours and shapes has come true.

The method used by programming makes it possible to obtain a series of pictures by changing the parameters and not only one single picture. By modifying the parameters, slowly and step by step, the raw material for animation pictures is obtained. The individual pictures taken as single shots result in a motion picture. By increasing both execution speed and memory size it became possible to modify the images on the screen so rapidly as to stimulate continuous movements. In this way the computer has opened the possibility to go a step beyond the limits existing so far and to enter the realm of unlimited play with shapes and colours. The new interactive method facilitated

through the above-mentioned improvements even allows a sort of graphic improvization: the artist conceives the general framework for multitude of graphic creations which the user, now promoted to the successor of the hitherto passive onlooker, is able to activate according to his own taste.

At the beginning of computer graphics activities, mechanical plotting represented the only possible choice, the production of a picture took ten to twenty minutes; at times even half an hour or more. The result was an image which could be hung on the wall: which means that at least from an external viewpoint, the traditional artistic criteria were still respected. The newly obtained dynamics, however, explode the classical frame and lead to an expansion which makes the integration into classical art forms impossible. The universality of means and the peculiarities of data processing systems make the traditional categories questionable for yet another reason: acoustic instruments can be used for the output of data just as well as the screens. That means no less and no more than that the program can be used to create and to structure musical and linguistic elements artistically. It is clear that the old ways can no longer satisfy the needs of these expanding forms of expression

But what about the relationship between the classical and the new creative activities made possible by computers which - to avoid any prejudice - do not necessarily need to be defined as art? Even this question of nomenclature is not devoid of socio-political consequences, as for instance the question which type of art is worthy of being subsidized and which is not.

The arguments in favour of dealing actively as well as passively with art in the classical sense are known and need not be repeated here. Nonetheless, it mentioned that acceptance of computer art does not entail a renunciation of classical artistic activities; on the contrary: it is only by getting involved in aesthetic questions that the 'scientific community' becomes aware of creative tasks and capabilities. On the other hand, a certain competitive aspect cannot be overlooked, especially where contemporary art is concerned, which, in many of its manifestations, is met by a lack of understanding by the general public. this becomes most obvious in those cases where art ignores the basic aesthetic rules which are timeless-with regard to the basic facts of our explorative and cognitive behaviour - and where it presents itself as mystically motivated autotherapy of elitarian groups. Disregarding any philosophical value judgements for the time being, and arguing 'politically,' in the broadest sense of the word, a definite social purpose of art emerges: that of a means of stimulating our creative abilities and of sensitizing our judgements. However, art can fulfil this task only if it is considered to be a special form of communication in which as many individuals as possible can be involved.

Most of the classic branches of art cannot really be mastered before the hurdle of technical and manual skills has been overcome. Contrary to this, the computer is able to generate perfect artistic results within a very short time, affording the author a sense of achievement. The demands made by computer art are transformed from manual dexterity to the capabilities of the mind such as imagination, creativity, and self-critical assessment. Artistic programming is by no means a matter of routine, but rather is one of the most complex tasks imaginable located on the border between heuristic problem solving and 'artificial intelligence' techniques. This, however, means that involvement in computer art sets free not only artistic creativity, but, in addition, an all-round creative potential. The computer is often seen as situated between contrary forces, human needs on the one hand and on the other a world that is becoming increasingly technical and which is opposed to human nature.

The example of computer art shows that the computer can be used also in a humane way in the true sense of the word. Seen in this way, it could be considered an example of that 'gentle' technology which in future years should gain more and more importance and which, even today, deserves our attention.