UMEÅ UNIVERSITY
Institute of Information Processing – ADB

Postal address:	Tel (direct dialing):	Telefax:	Email (Internet):
S-901 87 UMEÅ (Sweden)	+46 90 166030	+46 90 166126(166688)	kivanov@cs.umu.se

Professor KRISTO IVANOV
Chairman, Administrative Data Processing

Draft 24 February 1992

A MUSICAL PERSPECTIVE

Introduction

The founding father of mathematical logic, Leibniz, is known for having once made the significant remark that music was "a hidden pactice of the soul, which does not know that it is dealing with number....In a confused and unnoticed kind of perception the soul achieves that which, in the midst of clearer perceptions, it is not able to observe. It therefore the soul does not notice that it calculates, it yet senses the effect of its unconscious reckoning, be this as joy over harmony or as oppression over discord." (von Franz, 1970, pp. 32-33, quoting from a letter from Leibniz to Goldbach, April 12, 1712, as referred by Ernest Bindel, Die Ägiptischen Pyramiden, Stuttgart, 1966, pp. 26f. See also Bindels Die Zahlengrundlagen der Musik, Stuttgart, 1950.)

Historical aspects.

This reminds us of the fact that music has been recognized as being intimately related to mathematics, something which has been also remarked by psychologists and many of us in daily observations about connections of skills in people around us. In Greek mythology Apollo or the god patronizing music is appears often to be also the god of clear thinking, of medicine, etc. (Groves, 1960). The Pythagorean school discovered the mathematical basis of the musical concords, e.g. that what the ear accepts as the same note an octave higher is produced by a string exactly half as long. Morality could be seen as a mean between opposites, a proper "tuning" or harmony of the souls. Mathematical relations were already being discovered in the physical universe an Pythagoreans thought that they could find a mathematical basis for religion and morality. "Mousike", which included poetry and dance, played a great part in Greek education . Harmonics was considered an exact science together with arithmetic, geometry, and astronomy, where harmonics was considered as the applied aspect of number (Kitto, 1957, pp. 192-193; Kline, 1954, pp. 97, 116). Plato has been referred to believe that he who steers the music of a people steers also its politics.

Later in the history of music we hear for istance about Frank of Köln, or of Paris, a German theorician of music who about 1260 wrote the Ars Cantus Mensurabilis, and the Compendium Discantus, where principles were set forth for defining the precise value relations among musical notes and for developing a theory of intervals. Through Giuseppe Zerlino (1517-1590), as well as through influences passing from John Dunstable to others, Frank of Köln's mathematical view of music was developed into an "applied mathematics" concerning the system of the universe as it was reflected in the world of music [Enciclopedia della musica [La nuova], 1983 #11, p. 285].

All this indicates one possible background of the religious aspects of today's "worship" of so called artificial intelligence, but also of the serious efforts of some modern mathematicians who approach the great problems of our time through a study of the history of mathematics (Zellini, 1985a; Zellini, 1985b; Zellini, 1988).

Relations to ethics

In considering the religious and ethical aspects of music as mathematics there are, however, ambiguous tendencies. They may throw some light on why, for instance, in the area of computer science a whole book has been dedicated to the formal aspects of computer science (Hofstadter, 1979) without any attention being paid to the concept of God or to divine inspiration, as it can be inferred from the index of the book. Of ten index references to the word God and eight references to the acronym GOD not a single one refers to a serious treatment of God or of theological subjects. Entries such as religion, divine, morality or ethics do not appear at all in the index. The whole discourse is held on a playful level and the nature of this playfulness could be a fruitful object of research itself.

Masters as Bach and Schoenberg constructed and advocated vast mathematical theories for the composition of music, but is has sometimes been believed that "In such theories cold reason rather than an innefable, spiritual feeling supplies the creative pattern"; at the same time, however, "Essentially both mathematician and composer are moved by a divine afflatus that enables them to 'see' and 'know' the final edifice before one stone is laid" (Kline, 1954, p.342, 511).

The apparent ambiguity about the place of reason verus of divine afflatus as apparent in music may be removed if they are seen as an expression of the historical opposition between sacred versus profane natural law. John Locke is quoted for having said that the Scriptures confirm the moral laws which reason discovers and Immanuel Kant, among others, for having believed that our morals are the basis for religion rather than the other way around (Kline, 1954, p.309). This may be also the background for the unclear relation between religion and morality or ethics in the work of the rare scientists who have cared to introduce these concerns in systems science (Churchman, 1979). In any case it would explain how the divine afflatus mentioned above is implicitly understood as deriving from reason. One significant danger, obviously, that all this leads to identify reason with mathematics and to becoming "too mathematical and not sufficiently scientific" (Kline, 1954, p.382).

This train of thoughts evidences how a study of musical aspects of our problem situation may suggest interesting research. An important hypothesis is that the danger of becoming too mathematical and not sufficiently scientific is what characterizes the increasing application of the computer seen as an embodyment of mathematics. Other more hypotheses may be suggested by a study of debates in the history of music.

Debates

One general hypothesis based on the intimate realtionship between music and mathematics is that the study of historical debates in the field of music may originate insights in debates that are going on, or should be going on in the computer and information science seen as applied mathematics. In this context we are reminded of the conflicts between Claudio Monteverdi and Giovanni Maria Artusi about offences against the rules of composition. Perhaps that was related to Giovanni Paolo Colonna's (1637-1695) famous criticism of Arcangelo Corelli's (1653-1713) passage in his third sonata in op.2.

Then we have also the conflict between Christoph Willibald Gluck and Johann Sebastian Bach concerning ethics versus aesthetics of inessential musical ornament in relation to "truth to nature" according to the ideals of Jean Jacques Rousseau and the philosophers of Diderot's Encyclopaedia. Gluck (1714-1787) being influenced by rationalism and naturalism refused the hedonistic "playful" principle in music which would regard that form of art as entertainement for the senses. Gluck's reform of

melodrama, beyond its deep purely musical meaning, is considered to reflect a rebellion of ethical character.

One of the most famous debates is that between Richard Wagner and Nietzsche (Nietzsche, 1983) concerning matters related to sociology, politics, history, psychology, and moral philosophy, in terms of which e.g. Der Ring des Nibelungen can be interpreted. In that context, among the issues which are debated, figure the role of Christianity versus nazism, communism and "dialectical negations", morals, etc. including their relation to Schopenhauer's aesthetics were, with reference to Kant, music is considered as the direct expression of "the thing in itself". Reflection on music is one fundamental theme of Nietzsche's philosophical thought. Having formulated the way to today's relativism, nihilism, and postmodernism, he considered music as a stimulus for penetrating the essence of Western thought and for criticizing its schemes and structures [Dictionary of composers, 1981 #984; Enciclopedia della musica [La nuova], 1983 #11; Nietzsche, 1983 #1113]. This is clearly a task that is analog to the one we have defined for our research program in the context of the use of the "mathematicized" information technology.

Coming closer to our times and later debates about so called modern music one must certainly note Arnold Schönberg's suspension of tonality and his development of a new "method of composition with twelve tones related only to one another" gave his works a basis of organization that enabled him to write in larger instrumental forms, but these innovations were attacked for making music unintelligible or "mathematical". (Dictionary of composers, 1981).

One thing that could be learnt in the context of musical debates and conflicts is that, in spite of they being often interpreted in terms of curious purely personal antagonisms or questions of pure "taste" (a term that has deserved serious reflection in the history and theory of art), they still may the visible expression of important objective matters. To ignore them may open the way to what we today call ethical relativism or situational ethics. These people obviously struggled for certain ideals and sometimes dedicated their lives to certain causes. Their conflicts may have been as much serious as, and perhaps even related to, say, the conflicts in the world of mathematics between Georg Cantor, Leopold Kronecker, David Hilbert and Jan Brouwer (Reid, 1970, pp. 26, 50, 99, 148ff,173). To ignore them for the sake of a not well understood "success" or "power" of later mathematics may have led to consequences that are becoming full visible with the widespread use of the applied mathematics of computers, and only now begin to get formulated (Barrett, 1987; Davis & Hersh, 1986).

The meaning of debates is being misunderstood from the scientific methodological point of view whenever one thinks that the fact that a Beethoven or Monteverdi were opposed in their time, and yet are recognized today, shows that opposition is a dubious attitude of mind. The methodological catch is that there are no "control groups" to validate such a coarse inference. Some oppositions may have been good, other bad, and this is not known a priori. We do not really know what would have happened if no opposition had existed. As a matter of fact we do not even know what has happened today and, if we do not believe to some kind of social darwinism, we cannot infer that things have turned out to be good only because they have succeeded in the struggle for survival and today happen to be considered successful. If this or that composer had not been opposed he might not have evolved as he did, or one hundred other bad composers with deleterious influences would perhaps have made their way, etc.

It is indeed remarkable how the superficial interpretation of debate, conflict and opposition has become popular today in the light of the story about the accumulation of

knowledge. If somebody shows to be apprehensive for the consequences of computerization he may be rebutted with the observation that people in earlier generations have been also apprenhensive about railways, telephones, etc., with the implicit message that if one apprenhension turned out to be misplaced, the other will too. The reasoning may be extended to the critique of the attitudes of youngsters, and so on. Our proposed reserach, then can also be seen as an attempt to reinstate the importance of not only history but also of the concept of debate, dialogue or conversation as a source of knowledge.even in the exact sciences, in a rhetorical and dialectical tradition.

Conclusions

In summary we claim that some particular understanding of the computer phenomenon and of the implications of the formalization of society in terms of increased utilization of computers may be obtained through the study of music, especially in its relations to mathematics. Attempts have already been made to study organizations through music (Ziegenfuss, 1989). Experiences of education for creativity also point to the importance of certain kinds of music for stimulating images and emotions and for reintegration of aesthetics and ethical sensibility into science (Hill, 1989). The implications are that analog efforts could and should be made for the purpose of developing better methods of systems design and for better utilization of computer support.

References

Barrett, W. (1987). Death of the soul: From Descartes to the computer. Oxford: Oxford University Press.

Churchman, C. W. (1979). The systems approach and its enemies. New York: Basic Books.

Davis, P. J., & Hersh, R. (1986). Descartes' dream: The world according to mathematics. New York and London: Harcourt Brace Jovanovich, and Penguin Books.

Dictionary of composers (1981). . Papermac - Macmillan:

Enciclopedia della musica [La nuova] (1983). . Milano: Garzanti.

Groves, R. (1960). The Greek myths (2 vols.). Harmondsworth, Middlesex: Penguin Books.

Hill, R. C. (1989). Freeing the internal environment for problem-solving and creativity: A precursor to education and the future. In Proc. of the ISSS Int. Society for the Systems Sciences, 33rd Annual Conference, Edinburgh, Scotland, 2-7 July 1989. Vol. 1 (pp. 152-158).

Hofstadter, D. (1979). Gödel, Escher, Bach: An eternal golden braid. A metaphorical fugue on minds and machines in the spirit of Lewis Carroll. New York: Basic Books.

Kitto, H. D. F. (1957). The Greeks (2nd ed.). London: Penguin Books.

Kline, M. (1954). Mathematics in Western Culture. London: Allen & Unwin.

Nietzsche, F. (1983). Il caso Nietzsche contra Wagner [The case Nietzsche versus Wagner]. Milano: Unicopli.

Reid, C. (1970). Hilbert. New York: Springer Verlag.

von Franz, M. L. (1970). Number and time: Reflections leading towards a unification of depth psychology and physics. Evanston: Northwestern University Press.

Zellini, P. (1985a). Breve storia dell'infinito (2nd ed.). Milano: Adelphi.

Zellini, P. (1985b). La ribellione del numero. Milano: Adelphi.

Zellini, P. (1988). Humanistic and ethical aspects of mathematics No. Report UMADP-RRIPCS-4.88). Umeå University, Inst. of Information Processing.

Ziegenfuss, J. T., Jr. (1989). Exploring organizations through music: Commonalities between human and natural systems. In Proc. of the ISSS Int. Society for the Systems Sciences, 33rd Annual Conference, Edinburgh, Scotland, 2-7 July 1989. Vol. 3 (pp. 215-223).