

Finer Human Expression and The Super Machine

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Music and Arts are the articulation medium for Man's subtle feelings. These are fine addition to the man's primary power of logic as required for sustenance and existence in terms of continuing the process of the species. The current overpowering impact of information technology on the whole human race is prominently present in fulfilling general necessities of modern life and in almost all disciplines of study. When we view this in context of art expressions we at times spend time to seek the 'mix down points' where is the contrast and where is the match? It is possibly all a matter of consideration; the matter lies on how one takes it. With the world is getting oriented through computerization, the man has found out the potentials of information storage and retrieval systems and the power of arranging and rearranging the available information in many different ways. So, the creative faculties have also spread their wings in search of creativity in this semi-dead [or should we say semi-living?] machine.

For music the computers are getting used in music production [and promotion], music teaching and research and storage and catering of music information. Because of understandable reasons the orthodox musicians are skeptical on the effects on adaptation of computers in the teaching and learning of music. In a seminar held at Bhopal in November 2000 on Distance Education in Indian Music there had been an initial hue and cry from the assembled musicians on the proposal paper which gradually subsided and the tune changed from cacophony to harmony. After six sessions of exchanges we could clearly see the prospects of the use of computers in music teaching. We could see that this device could be used even for advanced training of music when appropriate speed in Internet connectivity is made available and this can be done through net-conferencing. With this a busy musician can be hired for any specific advanced training and the musician can impart training despite the geographical positioning of the teacher and the student. So far conceived ultimate level of distance education promises every communication medium excepting direct physical contact.

Here are some music areas where Computer may be used for many purposes that include:

Music production

- Recording music
- Music editing and effects on recorded music
- Music marketing [does not directly relate to the subject itself]
- Music composition

Music information

- virtual library of music texts and audio

About the author

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- Music related multimedia database
- music information: performance, storage, transmission and reception

Music study and research

- Distance Education in Music
- sound synthesis
- Computer Aided Musical Education
- Computer-Aided Musicology
- Internet Applications in Music

- Real-time Interactive Systems

I shall briefly discuss the role of music informatics in the two basic areas, namely, '*Music Production*' and '*Music Study and Research*'. But, I must confess that the statement will be too insignificant in length and elaboration, and each sub-area mentioned above demands for elaborate discussions if we really want to understand the subject and its possible implications under the perspective of Indian music.

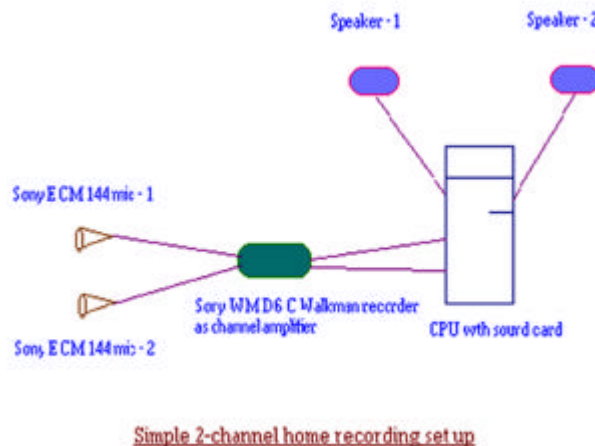
Defining Music Information Technology

Information Technology is often seen as the means by which information can be manipulated using computer hardware and software. In context of music this is slightly different. In music, some electronic equipment e.g. synthesizers, signal processors, tape recorders etc. are generally classed as systems that can store, retrieve and handle data. These resources are recognized as systems that directly relate to the notion of information technology.

A new and fast growing field is internationally developing throughout computer science departments, acoustics engineering laboratories and western conservatory laboratories, which, from a 'computer science' point of view, is termed 'musical informatics'. The possibility of analyzing 'musical data' has become available through the calculating power of the computers. This may provide a breakthrough in both analysis of musical patterns and in re-synthesis of audible musical signals.

Music productions

The potentials of computer require no elaboration for effective music productions. It has become nearly indispensable for serious recording, editing and effects producing. For fun I tried this and directly recorded an hour-long music in my computer hard disc. I used my tiny SONY microphones and passed the sound through my SONY Walkman recorder [I did not even had a mixer!] and recorded directly on my computer hard disc. The output was simply amazing. After due processing like noise-reduction, reverb, normalization and finally mixing channels, it appeared as good as we hear around in the commercial CDs! I did all these at home! The sound editing software did all the wonder and of course the know-how received through my computer scientist friends. So, if you have a computer and some appropriate sound input devices and a simple recording studio, then you are almost ready for a commendable music production by general standard.



In music industry Music Technology has entered convincingly and its presence is almost all over. One of the key areas supported by the use of music technology is the issue of access and entitlement. The technology provides with the tools to explore the nature of sound. It also gives us the control for modification of sound that leads to exciting and challenging explorations. Technology is not a substitute or even an alternative to existing sound producing devices but a complimentary one. Technology offers all of us an extension to the sound palette, a means of control and a medium in which to record, revise and realize our music ideas. Although computer has touched most of the areas of music making the maximum quantitative use of computer in music is in terms of music editing. As Dr. Bernard Bel reacts during an email exchange:

"Today, music making with the aid of the computer has narrowed its focus to sound editing, "cut-and-paste" operations to the detriment of composition in a broad sense." [Bernard Bel <bel@wanadoo.fr> 02/23/2001 8:36 PM]

A recorded midi file that is usually created by using a synthesizer keyboard can be used to generate any available tone and maintain the basic music composition. The technology offers a degree of control over the expressive qualities in music that at one time was exclusively reserved for practitioners with highly advanced skill levels.

Music composing: The computer scientists are exploring the areas of music compositions. I do not know if we at all require the computer to do such a work under the Indian music scenario. However; this may be an interesting area of work for the computer scientists but we, the musicians, do not feel that exploration and efforts in this area can bring in an output that is required under the present music production scene. Of course, this will let a mediocre musician-composer have a powerful tool to compose that would have been otherwise impossible for a composer of his/her height. I have some brief opportunities to listen to some computer composed music and my feeling is, it still have miles to go before it matches a human composer.

Music study and research

Use of 'Music Informatics/Technology' is yet to get active in the general study of Indian music. We are yet to start any significant use of this tool in the field of classical music practices and study, excepting some use of the devices popularly known as electronic *Tanpura/Surpeti/Tabla/etc.* I am doing some simple work on the computer and trying a multimedia documentation of the journey of *Hindustani* plucked instrumental music styles during the 20th century and this to be followed by some simple analysis. The documentation will contain text, photograph of musicians and audio samples of different music parts. The analysis will not be computational because of the simple reason that I do not have adequate computer knowledge to design the software of my requirement that may provide me with necessary analysis output in terms of musical components. But, I believe the scientists are on for designing music analysis software appropriate for Indian Music analysis. I look forward for many user-friendly software from our scientists those will help us to perform music analysis through computers.

I look forward to have a software that will possibly tell us the presence of the amount of different stylistic elements of *Jaipur/ Kirana/ Gwalior/ Agra/ Patiala/others* in a vocal performance or the components of *Imdadkhani/ Maihar / Zaffarkhani/others* present in an

instrument performance. May be we have a music analysis software that will show us the presence of mood in respect of Kalyan ang, Kanara ang, Malhar ang, Bhairav ang, etc. We already have software like PRAAT [and may be many others] that can give us acoustic analysis [speech analysis] of sound. It is now easy through a computer to study whether a musical phrase articulated twice has the same intensity, pitch, etc. or these are different and how different. Incidentally, I contacted my friend Prof. H.V. Sahasrabuddhe, Head, Department of Computer Sciences at the University of Pune to know the status of research in this domain in the country. HVS has specialization in Computational Musicology and now involved researches on Music Analysis where he has involved his students. The feed back I got is;

"--- We may have much more modest goals as the first step - e.g. determining the laya and the swaras being used. But some day we may get there.---" [there' refers to the objectives of analysis as I proposed in this paragraph/ H V Sahasrabuddhe <hvs@cs.unipune.ernet.in> Wednesday, February 21, 2001 9:05 AM Subject: Re: Hindustani Music analysis++]

So, it seems we have to wait for sometime before we lay our hands on a computer software that will significantly help us in music analysis, at least from the point of view of Hindustani Music.

Some CD-ROM titles are already available in the market that provides some music documentation of general interest. Ustd. Abdul Halim Zaffar Khan, the renowned sitar exponent, has brought out a CD-ROM. The CD includes some video presentations of general playing techniques adopted by the musician. This has included some interactive features. This CD should prove to be a helping tool to students. I believe there may be a few others but definitely not enough in number.

Music teaching software: For study of Indian music there are a few software nearly ready to be launched. Mr. Kiran Vyas, Mumbai displayed the potentials of his software that can commendably demonstrate composition patterns of *tabla* [Bhopal, 29 Nov 2000]. It can play different *tabla vistar-s* of a given *kayeda* or *rela*, etc. at different speeds. This software can prove to be a good teaching aid to students. There may be other enthusiastic music-scientists who may have developed other useful software. Dr. Bernard Bel has created BolProcessor, a highly potential software [*Mac* platform] that can be used for music compositions.

Computational Musicology: Generally speaking, Musicology basically deals with different aspects History of Music. In contrast, the Computational Musicology generally encompass:

- Music Analysis, e.g. computation of presence of musical elements in a musical piece.
- Understanding the process of Music Creation, e.g. understanding the logic underlying in the formation of musical combinations.
- modeling of musical performances¹

¹ The idea behind this is that, both music perception and production may be represented with computational models. In 1994 Prof. H.V. Sahasrabuddhe designed computational models of performance in Hindustani

It may be interesting to note that "accurate timing" is that to produce a rhythmic structure that sounds "perfect", and the best strategy may not be that it is mathematically perfect. Because of non-linear processes in the auditory system it may be necessary to deviate from mathematical perfection so that it actually sounds "perfect". If we take a sample *theka* of any *tabla* virtuoso, we can observe that, as a whole, it fits with an electronic metronome, but certain time intervals may systematically be slightly longer or shorter although they sound absolutely regular². These are some important considerations and areas where the scientists may put in their minds when designing grammars or models.

As long back as 1993 we can see the use of computer in the study of musicology in the west. The collaboration happened between a computer scientist and a musicologist, Bernard Bel and Bernard Vecchione respectively. They wrote that

--- The challenge of a new cognitive-oriented musicology will be to establish a relevant close bond between sciences and techniques applied to music; sound and intelligence engineering; formal, experimental, historical and hermeneutic sciences³; anthropological and action sciences; and the philosophies of aesthetics, praxis⁴ and cognition.

----- In all these domains of musicology, theoretical computer science is playing a crucial role dealing with problems of knowledge acquisition and representation. Over the last decade, the computation paradigm has been brought to the front of the stage, thereby deeply affecting the practice of music and musicology and allowing the emergence of a new (transdisciplinary) domain: computational musicology. [COMPUTATIONAL MUSICOLOGY Computers and the Humanities, vol.27, 1, 1993/Kluwer Academic Publishers]

We shall look forward to witness much collaboration between the musicologists and computer scientists in our country. Along with this we may look forward to see enough multimedia documentation on Indian Music available on the net, and enough multimedia based interactive training programs in music. We may now look forward towards the scientific rephrasing of knowledge of musical craftsmanship, gathered through millenniums. Using modern computers, this should in turn result in computational paradigms, capable of recognizing styles, moods, instruments and soloists. The question may be the utility of this knowledge. Knowledge is always welcome to man. This new

Music. But the computer-generated music is of elementary level in comparison to general human performances. [Prof. H. V. Sahsrabudhe, Bhopal 27 November, 2000]

²Dr. Bel gives some more examples: "----The same applies to pitch perception. If you play exactly the same note in ascending and descending phrases it might not sound the same note... Another typical example is that a 1200 cent interval (ratio of 2/1) in a fundamental frequency may not sound as a perfect octave whereas a 1204 cent interval is more likely to sound "right"! There are many such perceptive "aberrations" that human musicians instinctively compensate by escaping from mechanical accuracy.----" [Bernard Bel <bel@wanadoo.fr> February 26, 2001 10:06 PM]

³ Hermeneutic sciences are attempts to "decipher" a text or any artistic production by making explicit certain regularities; for instance, finding the compositional rules for a raga from examples of its performance.

⁴ 'praxis' is a philosophical terminology for "the making"

paradigm and understanding of music will help the teachers to design better pedagogy and students to understand music more clearly and under different perspectives.

A general doubt

A general question is raised that how a computer can possibly help us in the actual music production and study. Can we possibly expect that this technology helping a musician of, say, a status of Ustd. Vilayet Khan Sahab or Pt. Nikhil Banerjee or Ustd. Ali Akbar Khan or help a student to become such one? To achieve high level of musical qualities depend on many factors, e.g.; required potential and talent of the trainee, capability of the teacher/s to impart appropriate training to the trainee, appropriate assimilation and synthesis of the obtained knowledge. This has to be followed by appropriate promotion of the trainee's music. Computer can directly or indirectly help in making available the study/training materials. The technology can definitely help in promotion of the art.

Summing up

The power of information technology and the subtleties in our music tradition both are unquestionable. The computer scientists are on for achieving higher compatibility of the machine with the human creativity. The effort is to mix high-tech with the qualities of human musicians so that the machine in some way or the other in the process captures the musician's sensitivity. Nowadays it is accepted that it is not sufficient to copy and paste "real sounds" (done by humans) to "humanize" music. The need possibly is the command on finer musical structures, which include "sensitive" timing, note treatment (*alankara*), control of sound quality (including "harshness", transitory sounds...) etc. Actually, it is rarely required that a beautiful or highly effective creation should also be perfect in terms of applicable mathematical measures.

There is no doubt that immense effort are going on for making the machine compatible to the artists' utmost creativity requirements. So, I believe the power of Information Technology can be intelligently used with appropriate planning for creating, fostering and archiving music with precision and with a style that the whole modern world understands. The question may be the use of caution in use of the technology. The special requirements of our rich music tradition is to be understood under the right perspective to prepare the right platform for appropriate adaptation of this technology.

