Computer Programming and Musicology

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Abstract **- Computer Science modules enable us to learn about the theories which underpin software, hardware and computing techniques – and how to apply them in the real world. Use of technology is to create new opportunities and solve problems. We could learn about things like artificial intelligence, computer game development, human-computer interaction and cyber security. There is a strong emphasis on programming but you do not need to have Maths A level. Music Technology modules encourage us to work at the frontiers of the creative application of technology in composition, music production, sound design, screen music, audio-visuals and software. You can also access modules from the Music program to create a program which reflects your passions.**

Index Terms **- Music, Computer, computer programming, Computer Music, language**

I. INTRODUCTION

The computer science and music combined major with concentration in music technology focuses on the creative application of digital sound technologies to a broad range of artistic, social, and industrial purposes. An emphasis is maintained throughout on imaginative exploration, collaboration across disciplines, and real-world experience. It is designed to give students a firm foundation in music and computing for digital audio technologies. This program is recommended for students with a strong background in music prior to entering Northeastern.

II. COMPUTER PROGRAM

A program is simply a set of instructions given to a computer to carry out a certain task or tasks.The instructions are typed into the computer by a programmer in a special language that the computer will understand. The language may be a numerical code which tells the computer fairly directly which circuits to turn on and off (this is termed a "low level" language), or the language may closely resemble a normal human language which will not directly control the computer's operation, but will be translated into low level terms and then to binary code that the computer can understand. A programming language such as Basic or HyperTalk is a "high level" language which is interpreted or evaluated by other programs and is thus translated into low level instructions.

The user of the program is usually unaware of the precise instructions, and knows only the result of using the program. The user sets the program into action (by pushing a button, clicking a mouse, typing a command, etc.). The program may require the user to supply information necessary to perform its task; or the program may give the user choices as to exactly how the task is to be performed.

Another term for a program is a "routine". Yet another nearly synonymous word is algorithm. An algorithm is any set of rules by which an input is transformed into a different output. Here are three examples of algorithms contained in a single sentence:

1. "When the starting gun is fired, run forward as fast as you can until you cross the finish line."
2. "When the command 'F to C' is received, ask 'What is the temperature in degrees Fahrenheit?', then wait until a number is received, subtract 32 from the number, then multiply the result by 5, then divide the result by 9, then print out 'Here is the temperature in degrees Celsius: ', then print out the result."
3. "When a key is pressed down, play the corresponding note until either the key is released or the sustain pedal is in the up position, whichever comes later."

III. MUSIC PROGRAMMING

Programming is a form of music production and performanceusing electronic devices and computer software, such as sequencers and workstations or hardware synthesizers, sampler and sequencers, to generate sounds of musical instruments. Programming has been used in most electronic music and hip hop music since the 1990s. It is also frequently used in "modern" pop and rock music from various regions of the world, and sometimes in jazz and contemporary classical music.Music programming is the process in which a musician produces a sound or "patch" (be it from scratch or with the aid of a synthesizer/sampler), or uses a sequencer to arrange a song.

IV. PROGRAMMING ENVIROMENT

Another important factor for most computer musicians is the programming environment. In earlier days of computing, programs were prepared with a simple text editor, compiled with a translator, and executed by the operating system. Modern language development is typically more integrated, with language-specific editors to check syntax and offer documentation, background compilation to detect semantic errors, and the ability to tie run-time errors directly to locations in the program text. Some programming languages support

"on-the-fly" programming (or "live coding") where programs can be modified during program execution. Some music programming environments include graphical time-based or score-like representations in addition to text

V. LANGUAGE FOR COMPUTER MUSIC

Specialized languages for computer music have long been an important area of research in this community. Computer music languages have enabled composers who are not software engineers to nevertheless use computers effectively. While powerful general-purpose programming languages can be used for music tasks, experience has shown that time plays a special role in music computation, and languages that embrace musical time are especially expressive for many musical tasks. Time is expressed in procedural languages through schedulers and abstractions of beats, duration and tempo. Functional languages have been extended with temporal semantics, and object-oriented languages are often used to model stream-based computation of audio. This article considers models of computation that are especially important for music programming, how these models are supported in programming languages, and how this leads to expressive and efficient programs. Concrete examples are drawn from some of the most widely used music programming languages.

VI. COMPUTER PROGRAMS TO MAKE MUSIC

When new technology is introduced to society, society generally takes a certain time to develop the use of it fully. (Many would argue, for example, that the full potential of television has never been remotely approached, although its usage is certainly more developed than when it first appeared.) This time lag is all the more pronounced with new technology so general in purpose as the computer, which is programmable to perform an almost unlimited variety of tasks.

The first inclination is to use the new technology to duplicate already existent functions (test scoring, for example). This may be in order to demonstrate the usefulness of the technology, or it may be to eliminate the traditional (perhaps tedious, dangerous, or otherwise undesirable) method of performing the function. The second way of using technology is to perform previously un performable but desired functions (telecommunication, for example). A third, less frequent, use of technology is to discover new, previously unconceived functions. For example, the idea of performing surgery without incision, by reflecting concentrated beams of light through fine, flexible cylinders inserted through an orifice in the body, would likely never have existed without the prior invention of lasers and fiber optics.

So far, a large amount of the work done in computer music has involved the first way of using technology, trying to make computers behave similarly to humans. In the making of music, however, the only activities which could really be termed tedious are technical instrumental practice (scales, arpeggi, etc.) and music copying. While it is unlikely that computers will help people become virtuosi without practicing (although the possibility may one day warrant consideration), many admirable attempts have been made to reduce the tedium, and to improve the speed and quality, of music copying. Attempts to duplicate other aspects of human music making have proven less successful, and are, in any case, rather pointless since the other aspects of music making--composing, rehearsing, interpreting, improvising, listening--are mostly enjoyable human activities.

VII. CONCLUSION

Since the early days of programmable computers, i.e. for at least 30 years, it has been said that the computer provides a means to overcome the technical and acoustic limitations of conventional musical instruments, to explore and occupy new musical worlds, and thus to heavily affect our musical life and experience. Nowadays, computers are everywhere present and we have become accustomed to use their data and signal processing power in many areas of human life. However, the computer's role in music actually as yet is very limited. The music we normally hear from the radio, from records, and in concert, is largely independent of computers. If new musical worlds have been discovered, they do not appear to be specific of computers. It might seem thus that the euphoria of the early computer pioneers has led them to over-estimate the real significance of computers for music. Yet this conclusion would probably be a grave mistake. There are several indications that the forthcoming decade will bring an enhanced and almost explosive infiltration by computers of all life domains, and the musical.

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