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Computer Music: A New Area of Research in Computing Technology

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1. INTRODUCTION

"The Old Computing was about what computers could do; the new computing is about what users can do." - **Ben Shneidermn** Computer Music is the Musical Application of Computer that help musicians and composers to create new music. It consists of basic concepts of Music and application of computer software. The electronic music is the origin of this field. The innovations and experiments of computer music was made with electronic music at the mid of 20th century. Much of the work on computer music is based on Music Theory, Computer software's and Mathematics.

2. EVOLUTION OF THE MUSIC MACHINE FROM MUSICAL TUNES TO ALGORITHMS

thereafter. This experiment was failed because it couldn't produce sound of any magnitude since loudspeakers had not invented at that time. As early as 1913, the **Italian painter Luigi Russolo** was an exponent of synthesis music who builds a number of mechanically activated noise instruments. Most of his instruments were apparently vanish during World War II.

After World War II, US and European traditions were diverged. Thus, influenced composers in Europe and America formed their own idea .This gave rise to electronic music and the main outcome of the development was the electronic musical instruments such as Hammond organ and the Theremin that provided new timbres about 1948 onwards.

Although the major experiments in computer music was made primarily in the U.S., but the first step towards the electronic and computer music were taken in France and Germany. In 1948,a young engineer Peter Schaffer produced taped recording of natural sounds like locomotive sounds, wind, thunder, and a variety of others sounds transformed in several different ways and this transformational included combining different sounds, overdubbing, varying the sound speed etc.. The Music was named as "Musique Concrete", because the sound produced were concrete. The same experiment was composed by Herbert Eiment and Werner Mayer-Epper at West German Radio Cooperation. In this experiment the composers were more concerned with studio created sounds rather than creating atmospheric sounds like Schaeffer. Many Important new sounds recorded were free from overtones

"I dream of instruments obedient to my thought and which with their contribution of a whole new world of unsuspected sounds, will lend themselves to the exigencies of my inner rhythm."

Edgard Varese

While speaking these words, Edgard had no idea that he is going to presage the greatest achievements in Modern Computer and Music Theory: Computer-Music.

Historically, computer music is one aspect of larger development of 20th century. In 1895, Thaddeus Cahill, an American took first step to generate musical sounds electrically by building a formidable assembly of rotary generators and telephone receivers to convert electronic signals into sound. He continued to improve for years

produced by an electronic oscillator. The Verification of these discoveries were provided by Karlheinz Stcokhausen.

CSIRAC was the world's first computer to play music. TREVOR PEARCEY and MASTOR BEARD built it in the 1950's.This machine was Australia's first digital computer which stunned audience rendition of Colonel Bogey of which no recording exists.

The oldest known recordings of computer generated music such as "Baa Baa Black Sheep", "God save the King" and a truncated version of "In the mood" were played by the **Ferranti Mark 1** Computer at university of Manchester during a session recorded by BBC in the autumn of 1951.In 1957, a 30 years old engineer at the Bell Telephone Laboratory in New Jersey, developed a first computer program MUSIC playing single line tunes capable of sonic manipulation. This Engineer was **Max Mathews** known as Father of Computer Music. Although he was not the first person who generate sound with computer. MAX was the first computer musician who generated musical sound with a replicable combination of hardware and software that allowed the users to specify what kind of tones they wanted to hear. This was the time where whole 'Computer Music' thing started and soon the term electronic music is replaced by computer music with rapidly development of computer technology.

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In 1958, Music II was invented by MAX that ran on the most powerful computer of that time IBM 7094 and took one hour of computing to generate the minute of music. The sound generated was just like wristwatch today. MUSIC III was introduced in 1960. It was concerned with "Unit generators".

Few numbers from composers were needed to create a specific kind of sound. MUSIC IV and MUSIC V developed in FORTAN by MAX and his colleague J. Miller came with improved efficiency and refinement in 1963 and 1966 respectively.

By 1970, Computer music was started happening in Universities and schools. There were probably a many universities and research centers exploring computer compositions. A large mainframe was build for a typical research center and these were shared among various composers and researchers by logging on at time. After days of text entry, it might take hours to compile the sounds onto tape or hard drive. Through digital to analog conversion, the file read off the computer tape and finally the composer could hear his fruitful results of his labor. Most of the research papers were started publishing in the Computer Music Journal or The Journal of the Audio Engineering Society and these papers were shared at International Computer Music Conferences, which began in 1974. The International Computer Music Association put on these conferences later on. The goal of the research centers was to produce software as well as hardware. Research at these centers aimed that could do serious synthesis in real time. These centers produced many unique instruments and softwares. Some of which became commercial products too. They all started their work with MAX's MUSIC but built new products and softwares in their own way to meet the requirements. The major research canters concerning computer music in 70's were M.I.T., The University of Illinois at Champaigne-Urbana, the Institut de Recherche et Coordination Acoustic/Music in Paris (IRCAM), and The Center for Computer Research in Music and Acoustics (CCRMA), at Stanford University, The University of California at San Diego.

In 1980, Japanese personal computer NEC PC-88 featured audio programming language such as MUSIC MACRO Language (MML) which was used to create sounds for Video Game Music. The 1983's was the birth of **Musical Instrument Digital Interface** (MIDI). The entire computer music history would be different without MIDI. MIDI is an industry standard music technology protocol enables computers, hardwares and other digital tools to communicate each other. MIDI itself doesn't create sound itself but it is a series of messages such note on, note off, pitch, and pitchbend any many more. MIDI is still being used by composers, artists, musicians, D.J's around the world to create, perform and share works with each other. In 1985 Barry Vercoe of MIT developed a new version of MUSIC, a bit beyond original version that supported the C programming language. Steinberg got recognition because of development of **CUBASE** music software in 1989. It was recorded via MIDI and ran on Atari ST COMPUTER. U.S. firm, Pinnacle Systems acquired Steinberg in January, 2003. It was operated there and sold to YAMAHA COOPERATIONS in 2004.Various versions of Cubase were released and sold. Microprocessor based computers made possible to create real-time generation of computer music using more general programs and algorithms in 1990.

3. THE COMPUTER MUSIC ERA: 2000 ONWARDS:

In recent years, Computer has grown from popular genre to most influenced part of Music. Many digital musical instruments, musical software, digital recording, Music analysis software, Music Player Software, Music Visualization Software, audio editing software, sound creation software, Orchestration software were developed during this era.

The revolution came gradually in computer music with the development of Live coding sometimes referred to as 'Just in time programming' or 'on the fly programming'. This is often used to create musical harmony using computer programming in Live Orchestra. Mostly used Live coding environments are ChucK, MAX, Supercollider, Livecode, Sonic Pi, Colt etc. Live coding is being used for Laptop Orchestra where a group of artists or performers play laptops as instruments.

The first laptop orchestra was performed by 12-15 persons at Princeton University known as Princeton Laptop Orchestra (PLork) using computer based Meta instruments. It was found by Professors Perry Cook and Dan Trueman with their students G.Wang and Scott Smallwood in 2005. Various Universities such as Carneige Mellon University, Princeton University, CCRMA, Stanford University, Victoria University Wellington , New Zealand, University of Victoria, BC, Canada, offering the course of Computer music where researchers are getting an opportunity to explore their own unique ways of generating and manipulating musical harmonies with Computer.

Students performing Laptop Orchestra at CCRMA, Stanford University

4. FUTURE SCOPE

It's hard to dispute the fact that software has forever changed the way we make music, but the one area in which it has always fallen is that of hands-on control. Software can do everything that hardware did and much more in term of their functionality, but there's no getting away from the fact that the

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knobs and faders aren't actually real that we see on screen. There are so many directions for future work. The technology built needs to be used in India by Maestros. Collaborating with these maestros, masters, engineers, scientists, this computer music technology can breathe and make its own field by exploring new musical ideas and genres.

5. CONCLUSION

Computer music is a computer-mediated musical platform that radically reshapes the conventional music making context coined in the Western art tradition. The digitization of music and laptop orchestra is not only a platform for new musical expression, but also a vehicle for music students' digital musicianship training. It could be used in a classroom that transforms classically trained students' musical competencies into technologically oriented musicianship, allowing them to penetrate the framework of conventional musicianship and fostering their virtuosity in digital artistry for production of a convincing and expressive performance.

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