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Interactive Computer Music for Double Bass

Jeremy C. Baguyos
University of Nebraska at Omaha, jbaguyos@unomaha.edu

Jeremy Baguyos playing Museau de Singe (photo by Craig Sapp)

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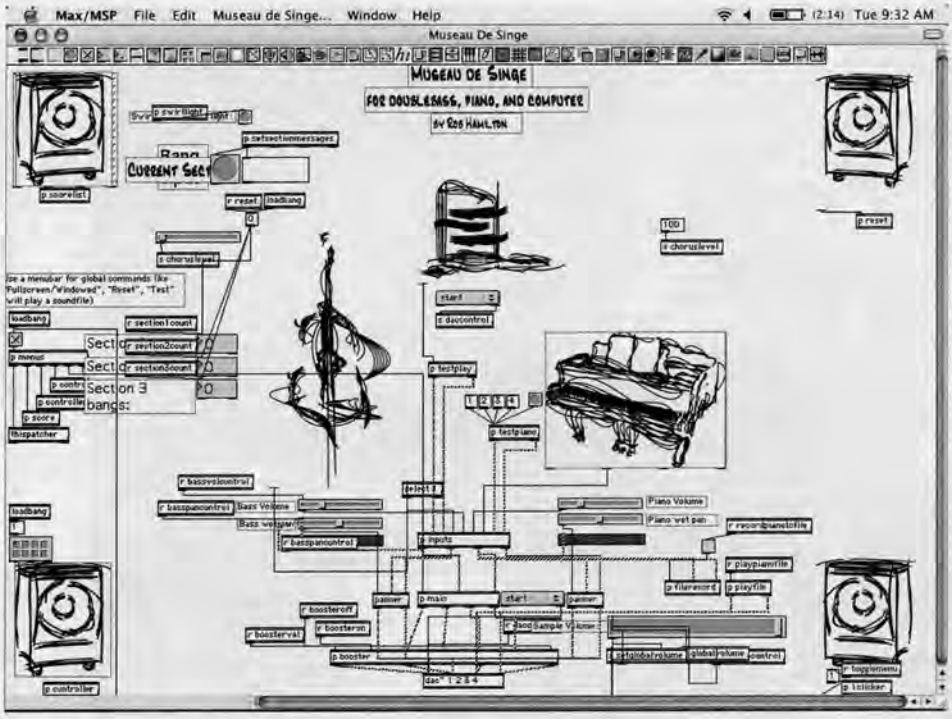
By Jeremy Baguyos

The rise of the academy as patron of art music, the philosophical underpinnings of "futurists" like Russolo and Busoni, the increasing power and cost-effectiveness of computer-based systems and the new compositional directions of the Post World War II avant-garde have all contributed to establishing the genre of electroacoustic music in the United States. Composers have increasingly turned to electronics for new source material and as a result, there is an entirely new repertoire that was generated to take advantage of the emerging technologies and aesthetics. For the double bass, this new repertoire included compositions like Jacob Druckman's *Synapse/Valentine* (1969), Charles Whittenberg's *Electronic Study II* (1962), and Donald Erb's *Basspiece* (1969). In recent decades, composers have added to the repertoire. Many composers should be recognized for their contributions to electroacoustic double bass repertoire, but some merit more than a passing reference. Of particular interest are *Death of Desdemona* (1987) by Frank Proto, *Moby Bass* (1975) by David Neubert, *Birth of Venus* (1990) by Christos Hatzis, *Three Pieces for Double Bass and Tape* (1990) by Orlando Jacinto García, *Radio Sonata* (1982) by James Sellars, and *Mist* (1997) by Robert Gibson. Additionally, a number of double bass soloists have championed the cause by commissioning, promoting and regularly performing electroacoustic music. Two of the most prominent double bassists in this repertoire are Bertram Turetzky and Robert Black.

The compositions mentioned in the preceding paragraph are tape pieces or fixed medium pieces, where the electronic part is realized electronically and stored for future



Museau de Singe (photo by Rob Hamilton)

use on a fixed medium like analog electromagnetic tape (cassette or reel-to-reel), Digital Audio Tape (DAT), or Compact Disk (CD). The electronics are fixed and not in real-time while the double bass part is expected to be played "live." In a sense, the tape and the live bassist play a duet. Though the tape as chamber music partner never argues with the bassist in rehearsal, there is the obvious drawback of the inflexibility of the tape in musical collaborations, something that could be perceived as sterile and/or confining. But there are many ingenious conventions that composers use to allow the performer to have more freedom when collaborating with the tape. One is to write vaguely defined ambient sections of music. But no matter the ingenuity of the composer, there is always the danger that the tape plus bassist performance combination sounds like it was written for a CD to be played in a home stereo system or the performance comes across as a music-minus-one performance.

This problem is obviously not unique to double bassists, since other instrumentalists have wrestled with the problem and the pursuit for a solution has resulted in a new subgenre of electroacoustic music. The new approach has been called "real-time computer music performance" or "interactive computer music performance" or "interactive electronic music performance," or some other permutation. The biggest difference between the newer flexible approach and the older fixed medium approach is that the new electronics (almost always with the computer as intermediary, hence the name computer music) are able to react and adjust to the performer, in addition to the performer reacting and adjusting to the electronics. As cliché as it sounds, this creates a whole new frontier of possibilities. In the same way that new musical systems liberated sound, now new interactive computer music systems are able to liberate the performer.

It must be mentioned that the first computer music systems (not analog synthesizers) date as far back as 1968. The invention of the MIDI protocol in 1983 for communication between electronic musical instruments and devices allowed for a level of interactivity in terms of control of MIDI instruments, but MIDI did not represent important musical information like the nuances of timbre that are so important to the Western art music tradition. As recently as 1993, Robert Black and Richard Zvonar collaborated on the performance of *Two In Hand*, which had a high level of interactivity even by today's standards. Composer and double bassist Curtis Bahn has also been one of the pioneers of interactive computer music and continues to perform and record his own interactive computer music compositions with his electronic chamber ensemble, Interface.

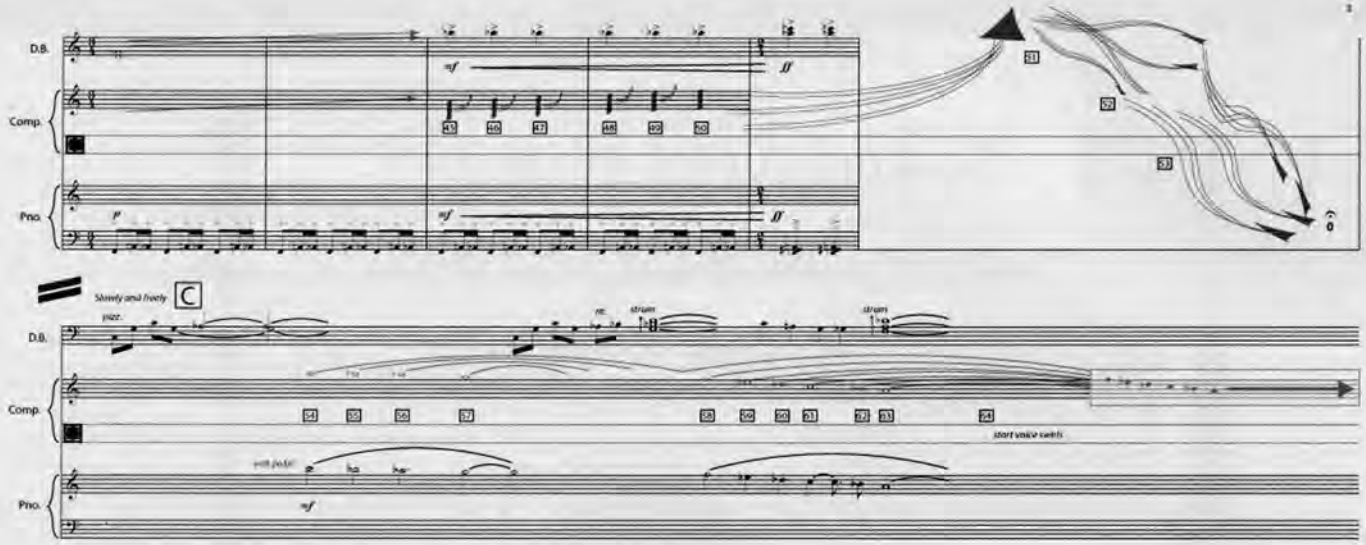
The implementation of interactivity in contemporary electroacoustic music is facilitated through software in a music-programming environment called MAX/MSP.

MAX/MSP in the simplest sense is an object-oriented programming language. It is a high-level programming language, but the programmer/musician does not need to know the inner workings of machine language, assembly languages, or even intuitive text-based languages like C. The programmer/musician does not need to worry about a compiler or interpreter, nor does he need to know the inner workings of the source code. Instead, the programmer/musician needs only to know about MAX/MSP objects and what they can do for the musician: namely what the machine accepts as input, what it outputs, and what is supposed to do. A diagram of the relationship between MIDI data or audio signal flow and the other "objects" with which it connects/interacts is provided.

A MAX/MSP program can be as esoteric as the most complicated C++ code (a computer programming language), yet it can be used by the most technophobic of traditional musicians if the MAX/MSP programmer designs a user-friendly interface. In addition, the purchase of the full version of MAX/MSP is not required to run a MAX/MSP program. The run-time environment for any MAX/MSP program can be downloaded for free from the web site of Cyclying74, the manufacturers of MAX/MSP. If a musician wants to program as well as run MAX/MSP applications, a full version of MAX/MSP can be "auditioned" for 30 days by downloading it from the Cycling74 site. After 30 days, the software requires a password challenge that only a full-paying license owner will have. The MAX/MSP programming environment currently only runs on the MAC OS 9 and MAC OS X operating systems, but a commercial version for Windows is being developed and its release is anticipated.

Over the last few years, I have been intimately involved with the creation and performance of MAX/MSP patches for interactive computer music for double bass. Some current and past projects include the implementation and realization of Andrew May's *Ripped-up Maps* (1997/2003) for Solo Instrument and Computer, Robert Hamilton's *Museau de Singe* (2003) for double bass, piano, and interactive computer electronics, and *Conversations on the Nature of Life* (2003) which was composed by an intermedia collective consisting of Robert Hamilton (composer), Jeremy Baguyos (bassist), Leo Duborobsky (biophysicist), and Levon Lewis (spoken-word artist).

May's *Ripped-up Maps* for Solo Instrument and Computer was originally written in 1997 as an improvisation envi-



Page from score of Museau de Singe (photo by Rob Hamilton)

ronment for solo violin. It was modified in 2003 for use by *any* instrument, but the author requested its modification specifically for double bass. For this piece, there is no traditional musical score. Instead the score reads something like an application software manual. It provides details for the hardware and system software requirements to run the improvisation environment, instructions for the engineer and instructions for the musician. And the piece itself is a vehicle for improvisation. *Ripped-up Maps* captures the player's improvisations and stores them in memory buffers. As the player continues to improvise, the computer begins an algorithmic playback of complex, digitally processed samples of the player's improvisations. The computer responds to what the player is currently improvising by tracking the player's pitches, amplitudes, and amount of rhythmic activity. After the computer quickly tracks and analyses (with the fiddle> object) what the player is doing, it then responds by putting out sound according to composer/programmer-defined algorithms. In this case, composer/computer musician Andrew May has defined the algorithms. This is where the interactive computer music parts company with the fixed medium pieces of the past, because the piece is different for each performance and the computer and performer interact freely with each other in real-time.

Robert Hamilton's *Museau de Singe* is a MAX/MSP patch published with sheet music, and it was written specifically for the double bass as the solo instrument. There is a traditional score and a very user-friendly interface that requires almost no knowledge of MAX/MSP. Hamilton's work captures the bassist's acoustic performance of the musical score in real-time and processes that sound as the performer continues to play. Like *Ripped-up Maps*, the Hamilton work uses the live sound of the double bass as source material for the computer's response to the musician's performance. The piece also uses "spatialization" effects, sounds which are produced through four speakers. There are two versions of this piece. One version is fully automated; after the bassist presses a button and begins to play the piece from the traditional score, the computer takes care of itself. The other version involves a laptop player on stage with the bassist. While the bassist is performing, the human laptop player can control the digital signal processing in real-time.

The human laptop player can control every aspect of the real-time processing including panning, amplitude, sample playback, types of processing, timbre, and pitch. The complete version of Hamilton's *Museau de Singe* was premiered at the Peabody Conservatory of Johns Hopkins University on May 6, 2003.

Conversations on the Nature of Life is an intermedia work created through a collaboration between Rob Hamilton (composer/programmer), Jeremy Baguyos (bassist/programmer), Leo Dubrovsky (biophysicist/programmer), and Levon Lewis (spoken-word artist/visual artist/poet). In this work, otherwise disparate forms of human creativity intersect and unify through the MAX/MSP/Jitter programming environment. Jitter is an extension to MAX/MSP that allows for the real-time musical control of video images.

Conversations on the Nature of Life is a performance-piece for spoken-word, real-time computer processing, contrabass, and video which seeks to address issues regarding the biological and sociological building blocks that make us human. Onstage are a spoken-word artist and a double bass player. A computer audio application prompts the spoken-word artist with questions, culled from a U.S. Government survey. The questions are presented in a random order with a variable interval of time in between each successive question, during which time the performer will answer. Through MAX/MSP the audio of the questions will be presented as an audio signal convolved, or mixed together, with sounds from a double bass. The musical gestures provided by the double bassist are driven by text from the spoken-word artist and by text from the letter codes for the amino acid bases. The music for the double bass is semi-improvised and processed through MAX/MSP. On a screen behind the performers is a video screen showing image of a 3-dimensional protein structure: a rotating Bacteriorhodopsin protein. The image starts with a single amino acid and slowly develops into its full shape. But the speed and display of the entire video production depends on the speaker's voice. At the start of the piece, the screen is blank. As the speech progresses, a 3-dimensional image of the protein is built on the screen behind the performer. When the protein has been completely built, the piece is finished. The integration of the video is facilitated through Jitter. *Conversations on the Nature of Life* was realized at the Digital

Media Center of the Mattin Center of Johns Hopkins University and was premiered on May 9, 2003 at the Swirnow Theatre in Baltimore, MD.

The long-term implication of MAX/MSP might be considered to be "artificial intelligence" in musical performance. When a musician/programmer composes/programs a MAX/MSP patch, that musician/programmer is creating a crude but artificially intelligent musical partner that can react to a human musician. As software and hardware continue to develop at breakneck speeds, MAX/MSP patches are evolving into chamber music partners. It might seem like a far-fetched notion that techno-geeks would talk about at science fiction conventions, but the electroacoustic music tradition is moving towards ushering in an artificially intelligent computer musician that will play along side its human counterparts in the not-too-distant future.

After holding full-time posts as Principal Bassist with the Orquesta Filarmonica de GC (Spain) and as second-chair bassist with the Shreveport Symphony, Jeremy Baguyos maintains a full schedule as a freelance double bassist in the Washington, DC area, and also subs with the Milwaukee Symphony. He has performed with the Kennedy Center Opera House Orchestra and the National Symphony in addition to his electroacoustic pursuits with the 21st Century Ensemble and the Modulus Ensemble. He was on the regular faculty of Grambling State University and Indiana-Purdue University at Ft. Wayne. Baguyos received his Bachelor of Music from the Indiana University School of Music where he studied double bass with Bruce Bransby and attended the Peabody Institute of Johns Hopkins University where he studied computer music. His hobbies include dachshunds, running, and readings in the humanities.