Eastern Inquisition: Three Explorations

A Documentation

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This paper is submitted
in partial fulfillment of the requirements
for Music 599C

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Northern Illinois University
May 1999

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Introduction

This paper is submitted in partial fulfillment of a Master's Degree in Computer Music and New Media Technology at Northern Illinois University's School of Music. The goal of this paper is to document the compositional process of the work involved. The documentation includes the historical reference for the material, an extensive explanation of the work, and notes for the performance of the work. This composition exists as three separate works: a trilogy of Southeast Asian-inspired computer music entitled Eastern Inquisition: Three Explorations. The trilogy was created using the following criteria as a guideline:

1. Each work/composition must be inspired by, but not necessarily an imitation of, various genres in traditional Southeast Asian Music.

2. One of these compositions is to take the form of a computer program that, through interactive elements, will improvise the music for the piece.

3. Compose a second work for live performance with interaction between computer and acoustic instrument.

4. Compose a third piece for multiple-channel sound diffusion.

A large, diverse body of performance possibilities exists for the modern computer musician. This thesis was initiated, in part, for the composer to experience a variety of these possibilities and to develop skills composing and performing them. Eastern Inquisition: Three Explorations, the composition originated for this study, is a trilogy of pieces that explores three basic genres of performance: multi-channel sound

spatialization, computer as performer, and computer controlled, signal processing of a live, acoustic instrument.

This piece was composed using the Power Macintosh computer platform. The MAX graphical programming language, created at IRCAM by Miller S. Puckette, was the primary software used for the design of the three compositions. Cycling '74's MSP, designed by David Zicarelli, operates within the MAX environment. MSP was used in the composition "MSP DB" because of its ability to manipulate sound in real time. For a list of the technical specifications for each piece see appendix A.

Compositionally, the three pieces in Eastern Inquisition: Three Explorations are unified by the fact that they are each inspired by traditional music of Southeast Asia. An important concern for the composer was to use this inspiration to create an original contemporary composition, and not merely recreate or reproduce the traditional music using a different medium. This paper attempts to illustrate, in detail, how this was achieved.

The first piece, "gamBANG," was inspired by the gamelan music of Bali. It was composed for multiple-channel sound diffusion, which separates the layers of polyphonic stratification between audio channels. The second, "MSP DB," was composed for live performance of the Vietnamese dan bau and computer. The computer traces drawings, created by the composer, using the computers mouse and uses this information to manipulate the sound. The third piece, "Samay Chakra," implemented a computer program that performed music according to the rules of traditional Indian music. The work is designed to be a sound installation that plays continuously throughout the day. This paper explains the realization for each of these works.

gamBANG

The choice of gamelan music for a multiple-channel, sound diffusion composition was inspired by an interest in splitting the polyphonic stratification found in gamelan music between the channels of audio in a multi-channel environment. Sound spatialization has two environments: virtual and physical (Roads 451). In the virtual world, a composer would use delays, reverberation, filtering, and panning techniques to achieve the illusion of sound travelling through space, but originating from a stereo sound source. The physical world, however, may offer the use of the panning and delay techniques, but the sounds would originate from multiple channels and speakers placed within a controlled environment. "In the physical world of concert halls sounds can be projected over a multi-channel sound system from a variety of positions around, above, below, and within the audience" (Roads 451). These sounds may also allude to travelling through the space, yet it is the physical placement of the speaker that causes the greatest effect.

The name "gamBANG" was chosen for two reasons. First, this composition was inspired by the gong gamelan of Bali; therefore "gam" was used. Second, the composition was created using the MAX programming language which uses the word "bang" to describe an operation that the program performs. In Bali, words relating to music often have the word bang as a second syllable. The word "gambang" is actually the name for a Southeast Asian xylophone. This instrument, however, does not relate to the composition "gamBANG."

Gamelan music has been inspiring musicians of the West for many years, including Cage, Debussy, and Steve Reich. In "gamBANG" the goal was to use the

polyphonic stratification and the nuclear theme, found in Balinese music, in a non-traditional form. "Structurally, Balinese music forms are based upon repetition... most Balinese orchestral music is an instrumental development of simple nuclear melody, slow in tempo and regular in beat, which is performed in unison by one section of the gamelan" (McPhee xv-xvi). The nuclear theme, in Balinese music, is known as "pokok" (McPhee 375). "gamBANG" uses a nuclear theme (see appendix B) based upon a nontraditional pentatonic scale. This theme is first heard in its slow form at the beginning of the composition. The sound is slow and sustained, imitating the sound of a rebab – a two string, bowed lute commonly found in gamelan music and native to Bali and Java (McPhee 375). It is heard along with the random sounds of the computer-synthesized gongs.

There are two types of scales used in Balinese music, pelog and slendro. Pelog scales often have seven notes and are considered to be mysterious and closer to divine music. Slendro scales are five-tone scales with no semitones and are the most common scale in gamelan music (McPhee 376). In "gamBANG" a five-note, slendro style scale (A-C-D-E-F) was used. This scale is unique because it omits the notes that produce the effect of leading to the tonic.

"gamBANG" originated as a series of MAX patches that performed variations of the nuclear theme (see appendix C). Gamelan music is cyclical in nature – patterns are repeated precisely, as if they were scored to begin where they end. The MAX object "counter" provided a way to imitate this type of composition. The "counter" object counts from "1" to a specified number (in this case "15") and then returns to zero. It then begins to count again, starting at "1." This process organizes the composition's actions

according to a sixteen-beat cycle. Various versions of these cycles were written as MAX patches to be recorded and mixed using Digidesign's Pro Tools software.

The Pro Tools software allowed for the sounds to be recorded onto separate tracks and to be played back to separate channels. In order to achieve the effect of having sounds travel from speaker to speaker the sounds had to be recorded individually and then synchronized in Pro Tools. The MAX patches also needed to be redesigned and organized according to which sound would be recorded to a specific channel. The easiest way to achieve this was to label each of the "noteout" objects according to the channel on which they were to be recorded. Each "noteout" was assigned a number that corresponded to the channel on which it was to be recorded. The "noteouts" were then turned either on or off depending upon the channel that was being recorded.

This process worked, however it became increasingly difficult to synchronize the sounds in Pro Tools. A master patch had to be designed in MAX that would group each of the rhythm patches and play through them chronologically according to the score. The main control of this "master patch" was a "counter" object which controlled the performances of the sub-patches. This solved the synchronization problem, except for sub-patches that contained random or probability actions. The only solution for this was to rerecord each track/channel until a desired sound was reached. This proved to be very tedious, but successful.

The performance of "gamBANG" required a Power Macintosh running Digidesigns Pro Tools. Pro Tools allows for up to eight channels of sound both in and out. "gamBANG" only required six of the eight channels out. The six channels were then paired and sent to an amplifier. Three stereo amplifiers were required for the three

pairs of channels. The sounds recorded onto channels 1 and 2 were designed for the speakers placed in the front of the audience. 3 and 4 were designed for the middle speakers. Finally, channels 5 and 6 were designed for the rear two speakers.

"gamBANG," although a six-channel piece, has also been mixed into a stereo version for compact disc. Currently, the composer is producing a video for the stereo version of "gamBANG." Video images include traditional Balinese and Javanese gamelans and an authentic Thai dancer in traditional costume.

MSP DB

The dan bau is a single-string, guitar-like instrument unique to Vietnam. Its body is made out of wood, but was originally made from bau (a Vietnamese melon) (Schaefer 10). The modern version of the dan bau has a single metal guitar string that is stretched from its base, over a wooden fret board, and into a flexible piece of wood that allows the string to be tightened or loosed by the performer. Near the base is a small electric pickup, which allows the instrument to be amplified. It was traditionally used in "courting music and other social music of the villages" (Malm 132). This particular instrument is unique to Vietnam, yet there are other similar instruments in other parts of the world, such as the phin nam tao of Thailand or the monochord of ancient Greece. The monochord first appeared in Greek literature circa the 5th century BC and was primarily used for teaching, tuning, and experimentation (The New Grove Dictionary of Music and Musicians 495). Due to the fact that this composition began as an exploration of the program MSP, the dan bau was implemented in an experimental process similar to the monochord's initial purpose.

Due to the dan bau's uniqueness several problems initially hindered the composition of this piece. First, it was very difficult to find a performer for this instrument. Eventually a player of guitar and lute, with an interest in ancient Asian instruments, agreed to teach himself how to perform the dan bau. A second issue was the instrument itself. While the composer had access to a dan bau, it was in deteriorating condition and was not playable. After a search to acquire a new dan bau failed, the deteriorated dan bau was refurbished. However its condition continually caused interruptions during the composition of "MSP DB."

Inspiration for "MSP DB" was initially conceived from hearing " Ru Con Nam Bo (Nam Bo Lullaby)," a composition for dan bau performed by Phan Kin Thahn on the Music of Vietnam vol. 1.1 compact disc. A similar mood of a lullaby was intended for "MSP DB." Initially, a score was written (see appendix D) to assist the dan bau performer to realize the process and mood of the piece. The score was only rarely strictly followed and eventually discarded. It may, however, be used in the future for a recorded version of "MSP DB." For the live performance of "MSP DB" a text-based score was used (see appendix E). This contained cues for both the dan bau performer and the computer operator, which specified times when rhythms and melodies would be performed.

For "MSP DB," the programming language MSP was used to directly manipulate and process the signal of the dan bau in real-time. The following paragraphs illustrate how MSP was used, and the actions are listed in the order that was used for performance.

The signal was first sent through an EQ that was built using a Fast Fourier Transform function available in MSP. The level of the EQ was controlled by the "multislider" object, which allowed the computer performer to draw (using the mouse) the level of filtering (see appendix F). The "multislider" was set or drawn in a random pattern, however the desired sound filtered the low end of the sound spectrum. After two bars were performed by the dan bau player, a delay was introduced to the signal via the "tapin~ and tapout~" objects. This delay was used minimally, mainly to spatialize and sustain the sound of the dan bau.

The live signal was then convolved with soundfiles that were stored on the computers hard drive. Convolution is a multiplication process where all of the samples in

one sound are multiplied by all of the samples of another sound. The convolution is the result of this multiplication (Roads 423). Each of the sounds that were recorded and stored, in order to be convolved, originated from the dan bau. These sounds, however, were used mainly because they were caused by actions that could not be reproduced in a live setting. This included using a metal slide on the string and blowing/chanting on the string. Convolution was used sporadically throughout the piece depending upon the particular action being performed by the dan bau player. For instance, if the performer was performing a pluck with loud attack the convolution may produce undesirable spikes of sound.

The main computer control of the signal manipulation was achieved through the use of the "lcd" object in MAX that allowed for the graphical-line drawing via the computer's mouse. This object records the x y placement of the mouse as it draws on the screen. It also allows for the color of the line to be manipulated and output in the form of an integer. These three numbers were then used to control levels of flange and delay. The x y pair was used to control the amount of delay/feedback for the right and left channels, respectively. The number, originating from changes made to the color of the line, controlled the frequency of the "cycle~" object (flange). This effect produced the most noticeable computer effects.

"MSP DB" is a composition for live performance, however a recorded version for compact disc is currently in production. The recorded version will contain material from the live performance along with a re-synthesis of these sounds.

Samay Chakra

"Samay Chakra" is a program written with the MAX programming language. This program uses the basic rules of India's Classical Hindustani music to guide its composition. Indian music is rich in history, tradition, and belief. The fundamental element of the music is the raag. The literal meaning of this word is "color" or "coloring of the mind" (Sharma 16). Obviously we are not meant to think of "color" in the visual sense alone. Rather, we should compare the effects that colors have on our minds and emotions to the similar effect that a series of musical notes has on us.

Musically, a raag is a system of scales and melodies performed according to specific times of the day and during certain seasons. Vaidyanahan describes a raag as "an abstraction of possibilities, one particular set of guidelines and thumb-rules which assist and facilitate the organization of a given scale into melodies" (4). These melodies are the fundamental basis for Indian music, which does not use chords or polyphony (Vaidyanathan 3). Unlike the music of the West, the raag is not based on harmony. Another difference is that the "mood" of the raag is not to change, meaning it "centers on one particular emotion" (Gosvami 54).

The raag's emotion is known as the raas. Generally raas means "juice, satisfaction, or taste" (Sambamurthy 160). Sharma describes raas as "the ultimate goal of all artistic creation" (28). The nine general emotions that are recognized as the main raas to be achieved are sexuality, humor, pathos, valor, violence, fear, disgust, surprise, and peace (Deva 205). The relationship between the raag and the raas is most important in Indian music. The ability of the performer to communicate the raas is the foremost goal

in a raag. Through proper pitch, intensity, timbre, form, and rhythm the performer can appropriately render a raag (Sambamurthy 170).

The association between the raag, its emotion (raas), and the time of day at which it is performed is also definitive of Indian music. Gosvami explains that "... in India each raag is in tune with a generic human mood or sentiment that nature, in a particular season and time of day and night, arouses in men and women" (88). He continues, stressing that "the emotional, evocative effect of the morning is quite different from that of noon, evening, dusk, or midnight. Different moments of the day arouse and stimulate different moods and sentiments" (89). Therefore, different raags are prescribed to specific times of day and seasons of the year.

The Hindustani raag system recognizes six seasons of the year and eight watches of day. Due to the differences in the seasons of India and those of North America, the use of seasons in "Samay Chakra" has been eliminated. Also, of the eight watches of day, only the four fundamental times of noon, midnight, sunrise, and sunset are performed by "Samay Chakra." This is because only these four are strictly observed by the raag system (Kaufman 14).

The raags that have been incorporated into "Samay Chakra" are Raag Lalita (sunrise), Raag Todi (noon), Raag Marava (sunset), and Raag Bihag (midnight). The variations between these raags are primarily within the notes that are played and how the notes are stressed. These differences in scale contribute to the development of the raag's character. The scale, along with variations of tempo, timbre, and melody, defines the raas of the raag.

The composer chose these four raags mainly in compliance with specific rules that uniquely exist in each of the raags. These rules do not necessarily apply to all raags. For instance, certain raags are played differently depending upon their ascending or descending scale or certain notes may only be played in a specific order.

Raag Lalita, a raag of sunrise, is described as evoking the feeling of peacefulness, tenderness, and expectation (Danielou 17). The scale is C-Db-E-F-F#-A-B and is the same in both its ascent and descent. The note G represents the sun. The note's absence or infrequence is determined by the sun's placement in the sky. The notes F and F# are both present in Raag Lalita. This is a characteristic of critical moments of the day such as sunrise, sunset, noon, and midnight (Danielou 17).

One of the most important raags of North India is Raag Todi. Todi is said to represent a mood of "delighted adoration in a gentle, loving sentiment" (Kaufmann 551). Todi is actually a raag of late morning, but can also be played at noon. Its scale, C-Db-Eb-F#-Ab-B, is the same in both ascent and descent, except for the fact that G may appear in descent, although minimally. Each of the flattened notes (Ab-Db-Eb) should be intoned slightly lower than normal and F# should be slightly higher (Danielou 48). However, this practice is becoming increasingly less common due to western influence.

Sunset in North India arrives much faster than that of latitudes further north. Therefore, a feeling of anxiety and expectation fills the soul at this time of day (Kaufmann 315). Likewise, Raag Marava, a raag of sunset, also exhibits these emotions while expressing quiet contemplation and love (Kaufmann 551). The scale for the raag is C-Db-E-F#-A-B. Due to the fact that neither the perfect fourth nor fifth are present in the scale, the tanpura must take on a special tuning of B-C-C and C (two octaves lower)

(Kaufmann 316). The E note must precede the F# and not be too pronounced. Also the ascending B note must not lead to C but, rather, to Db, and in descent it leads to A.

Raag Bihag is the raag chosen for use at midnight. The raas is that of "thoughtful longing combined with gentle anxiety" (Kaufmann 133). Like many of the raags of noon and midnight Raag Bihag employs both F and F#. However the F must appear between two E's (Kaufmann 133). Both notes A and D are totally avoided in ascent yet do appear (rarely) in descent. The scale for Raag Bihag is B-C-E-F-G-B (ascending) and B-A-G-F#-E-F-E-D-C (descending).

An intriguing mysticism exists within the relationship of the time of day to music. Kaufmann states, "the personifications and particularly the deifications of certain raags led to the belief that certain raags, if correctly performed at the prescribed time of day and night, work miracles and bring divine beings down into the melody and so into performers and listeners" (12). Other theories about playing a raag at its incorrect time suggest that ill health could be brought upon a performer or listener of the raag. Even world calamities, such as World War II, have been blamed upon the improper performance of a raag (Gosvami 90, Kaufman 18). The attempt to adhere to these beliefs has been incorporated into "Samay Chakra." All practicing, recording, and performing of "Samay Chakra" and its corresponding raags were done at the appropriate time. Only the conceptualization and computer programming activities took place outside of the specific times.

Currently in India the tradition of playing raags at appropriate times is becoming less common. Trichy Sankaran suggests that this is happening due to the fact that concerts mainly take place in the evening and mainly inside auditoriums (11).

B.C. Deva suggests, however, this occurrence is a result of radio broadcast (126). Therefore a major concern for the composition of "Samay Chakra" was to write a program in MAX that would only play the proper music at the proper time. This is achieved through the use of the "date" object in the MAX programming language (see appendix G). The composition is able to track the current time by using the computer's internal clock. The program can then be assigned a particular time to begin to improvise its appropriate scale.

For "Samay Chakra," only the four fundamental times of day are observed (noon, midnight, sunrise, and sunset). However, the remaining four may be included in a later version of the program. Of the four fundamental times of the day, both noon and midnight are constant; however, sunrise and sunset change on a daily basis and therefore must be reset each day. (Note: currently research and development is being done to create a MAX "patch" that can perform these transitions daily – a computer almanac.) The "date" object outputs both the date and the time, yet the time is currently all that is needed for "Samay Chakra." The time is output from "date" in the form of a six-digit list that is broken up into hours, minutes, and seconds. This list of numbers is then filtered through a "vexpr" object that subtracts the current time from the set time. For example, noon is set as 12 00 00. The current time is subtracted from this number each second. When the current time is 12 00 00, the result of the subtraction is zero. In order to use the resulting numbers they first need to be "unpacked" from their list into three sets of numbers (hour, minute, and second respectively). The "select" object is then used with an argument of zero in order to set the proper hour that the raag is to be played. The hour will only be equal to zero once a day. A different approach had to be taken for the

minutes and seconds. The minute will reach its zero setting once every hour and in a similar way the second will each minute. Therefore a "logical OR operator" object was used. This object searches for non-zero numbers and outputs a zero when its input is equal to zero. This way an "if/then" object can be used to determine when all of the three time elements are equal to zero. When the number zero is reached, the "select" object sends a "bang" to the proper sub-patch that contains the composition engine for the raag.

Before further discussing the technical operations of "Samay Chakra," a more in-depth description of India music needs to be given. In Indian music there are three elements upon which the music is based. They are the drone, melody, and rhythm (Han). The melody has already been briefly discussed in its relation to the raag. The specific raag and the appropriate time of day determine the melody. The rhythm, in India, is known as the taal. Taal literally means the "palm of the hand" or "clapping of the hands" (Kaufman 20). However, due to its intricacy as well as the time requirements to fully understand the Indian taal system, it has not been fully incorporated into this composition. Several elements related to the taal will be discussed later in this paper.

The drone is the foundation of all Indian raags. It is the medium through which the frequency relationships of the notes are established (Sambamurthy 163). In a comparison to western music, the drone provides the background and stability usually provided by harmony (Gosvami 96). The instrument that most often provides the drone is the tanpura. The tanpura is a four stringed, lute type instrument with no frets. The performer plays this instrument by plucking the four open strings in a constant, repetitive motion for the duration of the raag.

In "Samay Chakra" the drone has been incorporated in a manner identical to that of traditional Hindustani Music. The tuning of the tanpura varies according to the notes of the scale. The first string is tuned to the middle fifth of the scale. The middle two strings are tuned two octaves above the middle tonic. The fourth, and last string, is tuned to the middle tonic (Chowdbury). The "metro" object is used to play each of these notes similarly to the way that they would be played on the tanpura. This is the first sound heard through the program and it continues throughout the piece.

Compositionally, the raag is divided into three movements. They are the alap, the jod, and the gat. Only the alap and gat have been incorporated into "Samay Chakra." The jod is merely a bridge between the two sections and is sometimes omitted from traditional raags. The alap is the raag alone. This means that it consists of the notes of the raag without strict melodies, percussion, or embellishments. Vaidyanathan describes the alap as "step by step progression... created by weaving together the fundamental phrases of the raag along with other related phrases and lines highlighting the significance of the central notes" (8-9). It is also improvised and free of meter.

The jod section usually follows the alap and exists as an improvised section that is also free of meter. The jod is a bridge between the alap and the gat that prepares the musician and the listener for the gat. The gat is a "instrumental song or tune" (Gosvami 313). It is the main movement of the raag. It contains the phrases and melodies traditionally associated with the raag, and the gat is improvised. Unlike the alap and jod, the gat has a steady rhythm known as the taal. The taal is a rhythmic structure based on syllabic names given to hand actions on the tabla (an Indian hand drum).

Although the taal system is not strictly followed in "Samay Chakra," the principle 16-beat measure is used. When the appropriate time is reached, the "bang" from the time patch is sent to the "counter" object. The "counter" object has an argument of 15 that will count from 1 to 15 and then start again at zero. The zero accounts for 16 in the 16-beat cycle. Therefore "1" exists as the primary note of the raag. It is the "focal point" of the raag also known as the "Sam." Sam literally means time and is used in the title "Samay Chakra" which means "time cycle" (Chowdbury). This is the note to which the performer returns after improvising a line (Vaidyanathan 10). A "select" object with an argument of "1" triggers both the improvisation engine and the rhythm engine in order for the melody and the rhythm to convene on the Sam.

The "counter" object also outputs the number of times it completes a cycle. This number is used in "Samay Chakra" to trigger elements of the alap and to end the performance. After the "counter" has cycled through once, it triggers the first "Gswitch" in a set of "Gswitches." This allows the notes of the raag to be played. Each successive cycle triggers the next ascending note or set of ascending notes in the raag. This continues until all of the "Gswitches" have been triggered. At this point the alap would normally descend through the scale, omitting notes on the way down. This, however, was left out of "Samay Chakra." Instead the composition continues directly into the gat and the taal is triggered accordingly.

The composition engine that has been referenced earlier in this paper serves as the performer of both the solo (melody) instrument, and the taal (rhythm) instrument. Its main drivers are the objects "prob" (probability) and "tempo." The "tempo" object sets the beat and its division, which is selected by the "prob" object. The arguments for the

"prob" object determine if the piece will have more quarter notes than half notes, more whole-notes than eighth-notes, etc. The "bangs" sent from the "tempo" object arrive at the "random" object which is a random number generator. The "random" object usually has an argument of 12 – 15 (the number of notes to be played by the raag). It then randomly steps through these numbers which are routed through a bank of "select" objects with arguments that correspond to the numbers being output by the "random" object. When these numbers are selected a "bang" is sent to a corresponding number that represents a note in the scale. This note is then sent through "makenote" and "noteout" objects which output the notes to the MIDI device (in this case a Korg O1W).

In order to achieve the raas of the various raags, certain parameters had to be configured that would control elements of pitch, timbre, velocity, and duration. The first basic way to manipulate this is through the "makenote" object. The "makenote" object allows for two arguments. The first controls the velocity of the note, and the second controls the duration. Each note in "Samay Chakra" is sent through its own "makenote" object that assigns it its velocity and duration. The velocity is constant for each of the "makenotes," and is determined according to the note's importance within the scale. For instance, the tonic note would have a higher velocity than its major third.

The duration of each note, however, changes frequently. The duration is set in relation to the type of note (half, quarter, etc.) that the "prob" object (or rhythm engine) has output. This allows for each note's duration to change with the rhythm and not be influenced by which particular note is being played. Typically "Samay Chakra" has been programmed to assign a longer duration to a note with a greater value. For example, a half note would have a longer duration than that of a sixteenth note. (Note: many other

pitch, velocity, and duration values have been configured through the use of the Korg O1W, however, they in no way relate to the programming in MAX and will not be discussed in detail).

Another important aspect of achieving the raas and of Indian music in general is the use of ornamentation or embellishments. Gosvami suggests "a melody is a bare skeleton and when it is played with varied ornamentation it puts on flesh and blood" (147). Embellishments are typically achieved in Indian music through the bending of a string on the sitar or bending the human voice. This creates microtonal notes that are commonly found in traditional Indian music. The use of the "bendout" object with the Korg O1W primitively imitates the sound of embellishments.

The control of the "bendout" is achieved through the "prob" object. The "prob" object outputs numbers that are filtered through "select" objects. These "select" objects then send a "bang" to a number that is connected to the "bendout" object. These numbers determine which notes are bent and how much to bend them. A "pipe" object with an argument of 500 is used to reset the "bendout" to zero. This resets 500 milliseconds after the bend has begun.

Although many steps have been taken in order for "Samay Chakra" to have a dynamic "performance engine" - this is still its greatest weakness. The composition lacks intriguing elements and sounds that offer both a conceptual and physical reward. Since this composition has been designed to be a public installation, it must be enjoyable to a wide variety of audiences. It is possible, through MAX/MSP, for "Samay Chakra" to generate music in a much more fluid and original way. Through interactive elements, such as sensors or interface, the event controllers that are currently programmed in

"Samay Chakra" could be manipulated via random activity. The current sound activator of "Samay Chakra" is the "date" object. However, the task that the "date" object performs could also be implemented through the use of solar panels. This would allow the composition to reflect better the reality of the raag music, which suggests a closer relationship with natural elements. Some of these "elements" might also include the weather, human expression or emotion that could be interpreted through interaction with them. The boundaries appear quite numerous and challenges made to them will likely appear in a later version of the program.

Another difficult issue with the composition is its reliance on a MIDI synthesizer for the sound. In this particular application the sounds were limited to the sounds available within the Korg O1W Digital Synthesizer. Another problem is that each raag used the same sounds supplied by the synthesizer. An exciting possibility for the sound is real-time manipulation. This sound might be manipulated in a way similar to the suggestions for the performance engine's manipulation (i.e. sensors, interface). Cycling '74's MSP offers this by allowing signal processing and synthesis directly within the MAX framework. A future version of "Samay Chakra" will likely involve a greater use of interaction and enhanced sound.

Composer's Thoughts

Eastern Inquisition: Three Explorations satisfied the requirements set forth in its conception. The three pieces are no longer "explorations," but instead are realizations and manifestations. They are no longer unified by the title Eastern Inquisitions: Three Explorations. They are, instead, three separate individual works with no relation other than the fact that they were created during the same period and created with similar goals. The premiere recital held on April 16, 1999, which showcased these works, will be the only time that they are to be performed in conjunction with each other.

"gamBANG," the piece for multiple-channel sound projection, has been mixed for stereo speaker performance and video. "MSP DB" will be recorded in a live studio version of the performance, as it was performed at its premiere. A second recording will be made and manipulated for an upcoming compact disc release. "Samay Chakra" is currently being developed into a sound installation that incorporates solar and heat sensors. These sensors will eventually replace the "date" object as the coordinator of actions within MAX. These pieces are being separated and refined in order that the work will be accepted and performed for the widest audience possible.

Appendix A

Technical Specifications for the Performance of Eastern Inquisition: Three Explorations.

"Samay Chakra"

CPU: Power Macintosh G3
Software: Opcode MAX 3.5.8
MIDI: Opcode Systems Inc. Studio 4
Synthesizer: Korg O1/Wfd Music Workstation
Stereo Speakers

"MSP DB"

CPU: Power Macintosh G3
Software: Opcode MAX 3.5.8, Cycling '74 MSP
Stereo Speakers

"gamBANG"

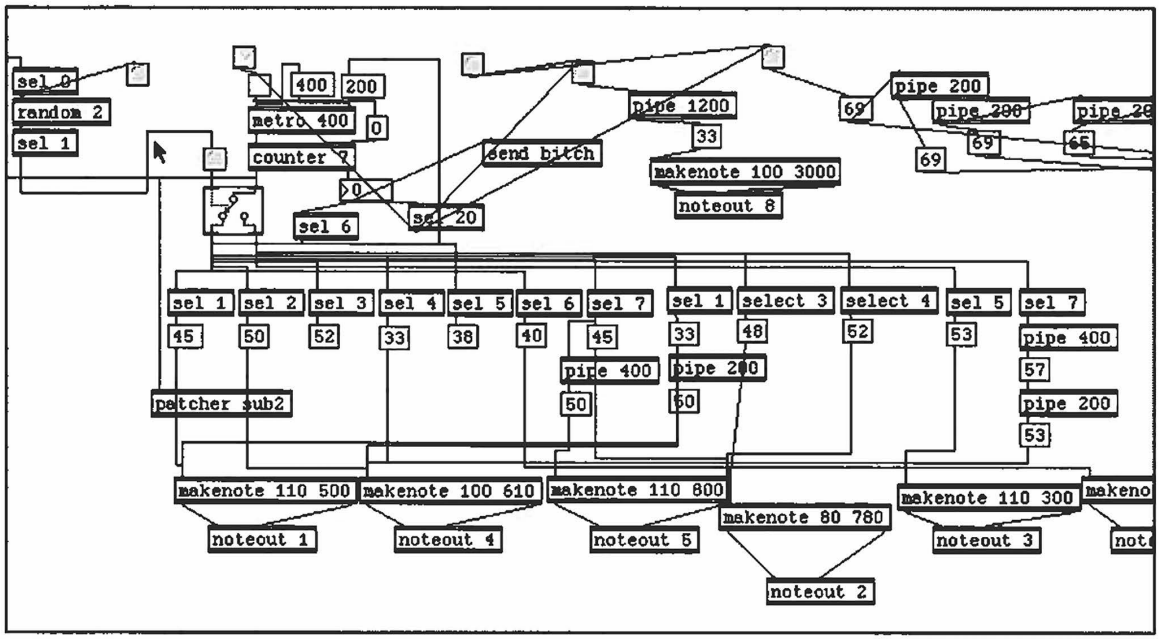
CPU: Power Macintosh G3
Software: Digidesign Pro Tools 4.1.1
Hardware: Digidesign Pro Tools 882 I/O Audio Interface
Six Speakers

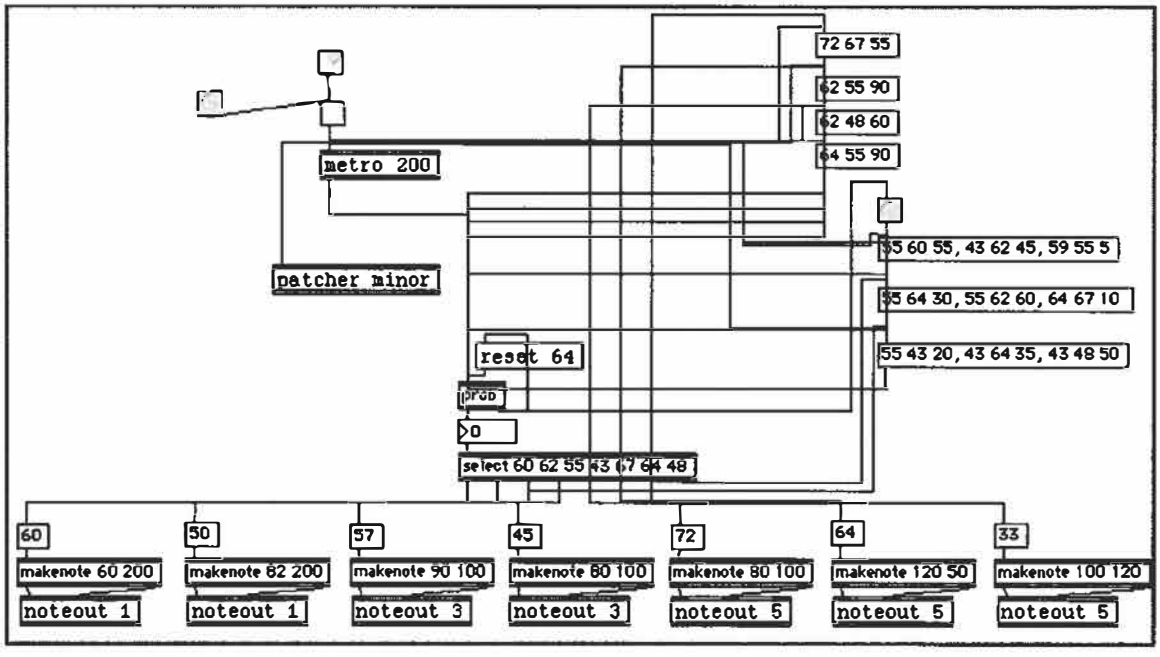
Appendix B

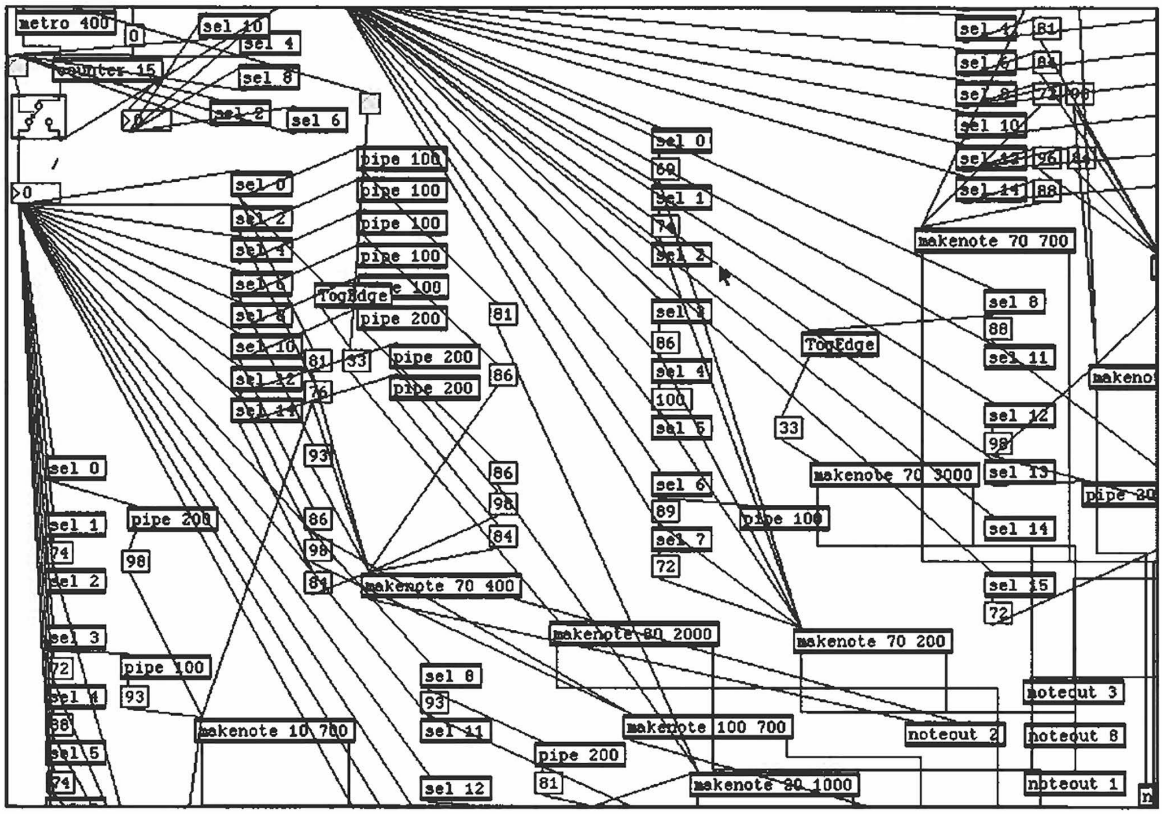
Nuclear theme for "gamBANG"

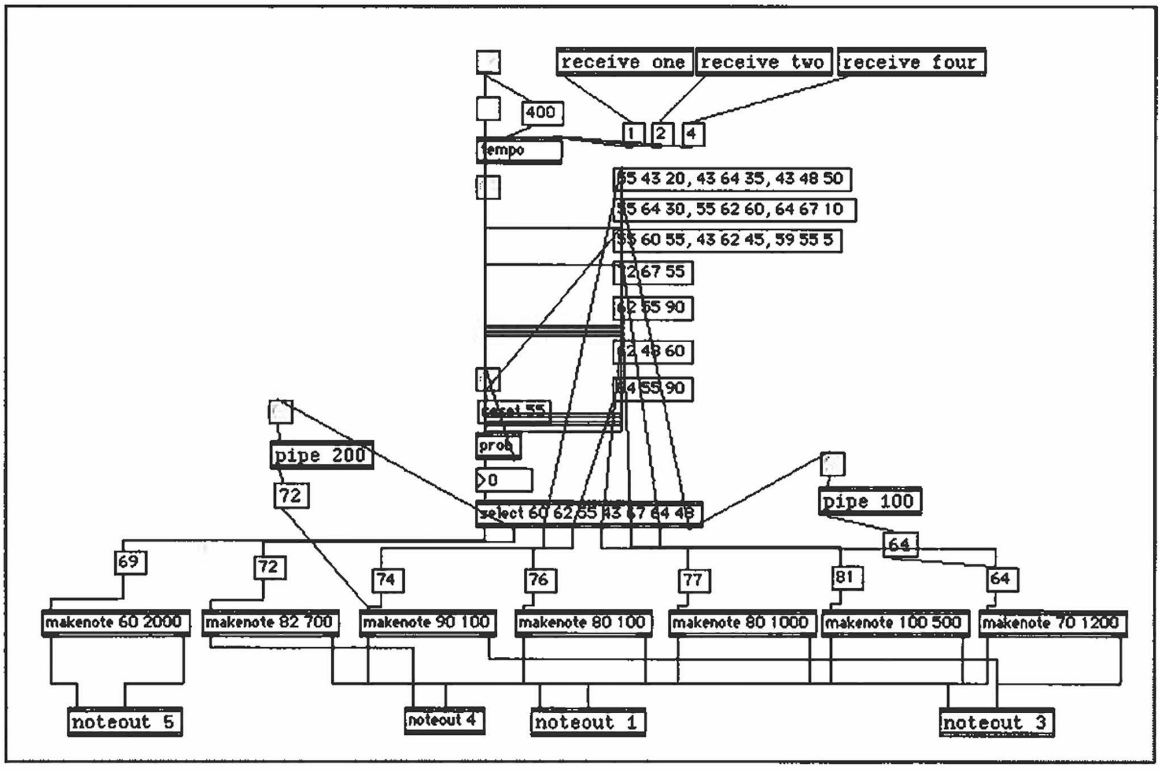
Appendix C

MAX patches for "gamBANG"





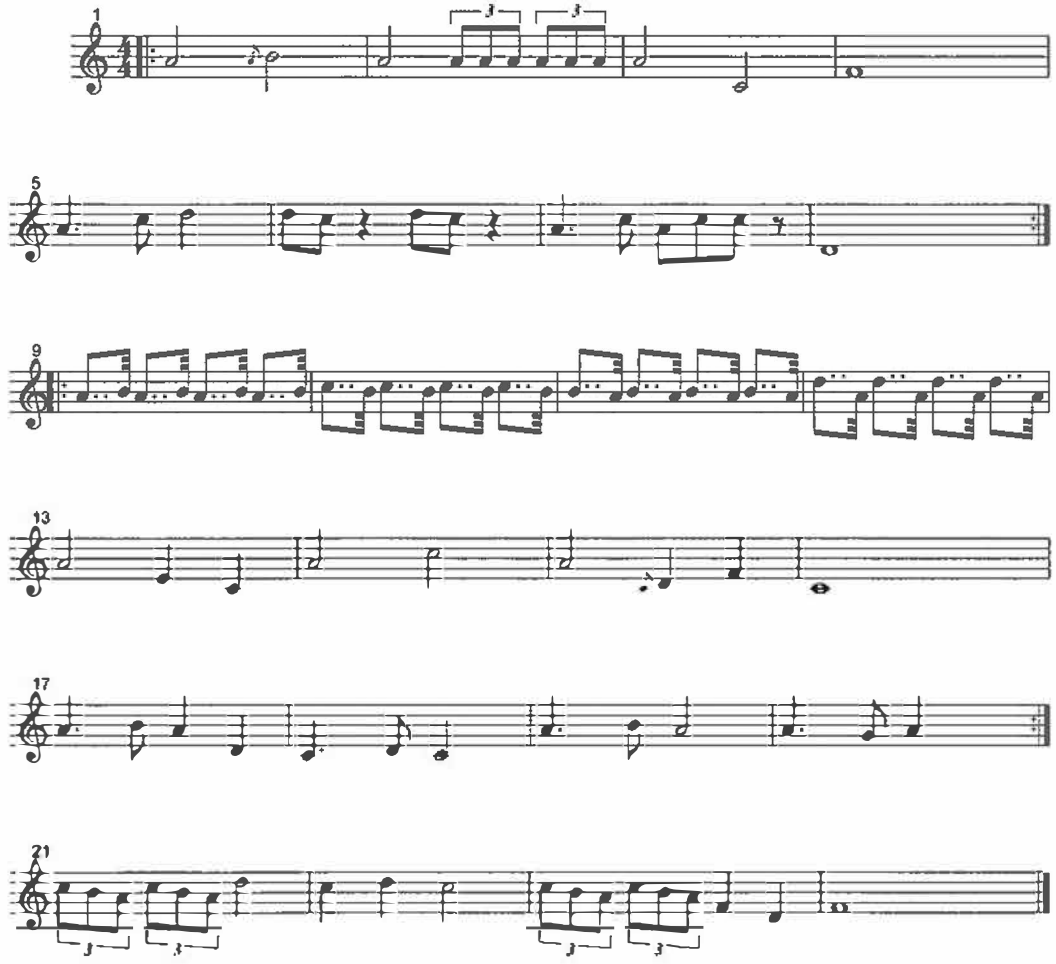

metro 400
sel 10
sel 4
sel 8
sel 2
sel 6
pipe 100
pipe 200
sel 0
sel 1
sel 3
sel 5
sel 7
sel 9
sel 11
sel 12
sel 13
sel 14
sel 15
TogEdge
makenote 70 400
makenote 80 2000
makenote 70 200
makenote 70 700
makenote 70 3000
makenote 10 700
makenote 100 700
makenote 80 1000
noteout 1
noteout 2
noteout 3
noteout 8


receive one
receive two
receive four
400
tempo
pipe 200
pipe 100
select 60 62 65 43 67 64 48
makenote 60 2000
makenote 82 700
makenote 90 100
makenote 80 100
makenote 80 1000
makenote 100 500
makenote 70 1200
noteout 5
noteout 4
noteout 1
noteout 3

Appendix D

Prototype score for "MSP BD"

By Byron Wise



Appendix E

Text score for the improvisation of "MSP DB"

By Byron Wise

Main Theme Harmonics (slow out of time) (rhythmic)

I. Drops of rain (Bar) – quieter, slow

II. Harmonics

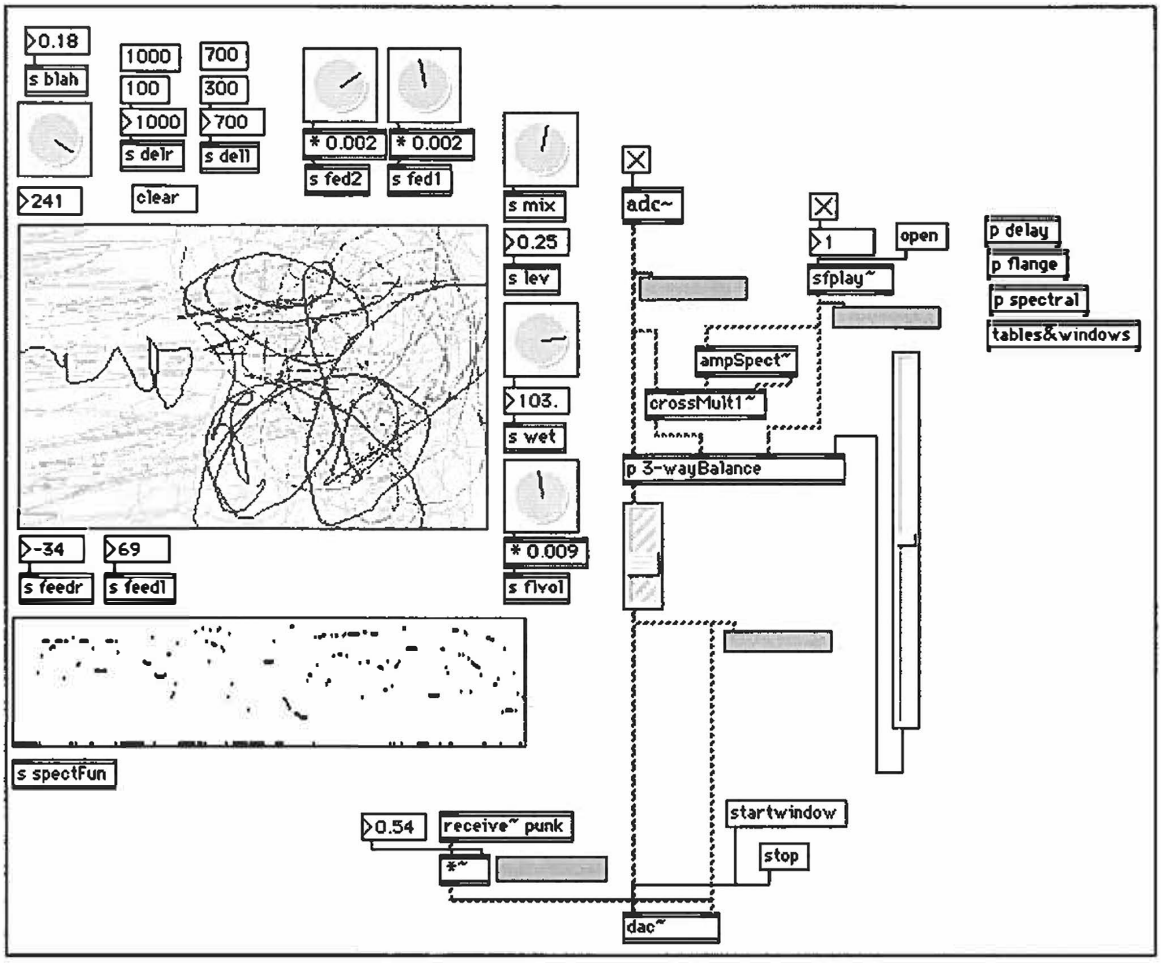
III. Rubs

IV. Pull off (melody)

V. Rhythm

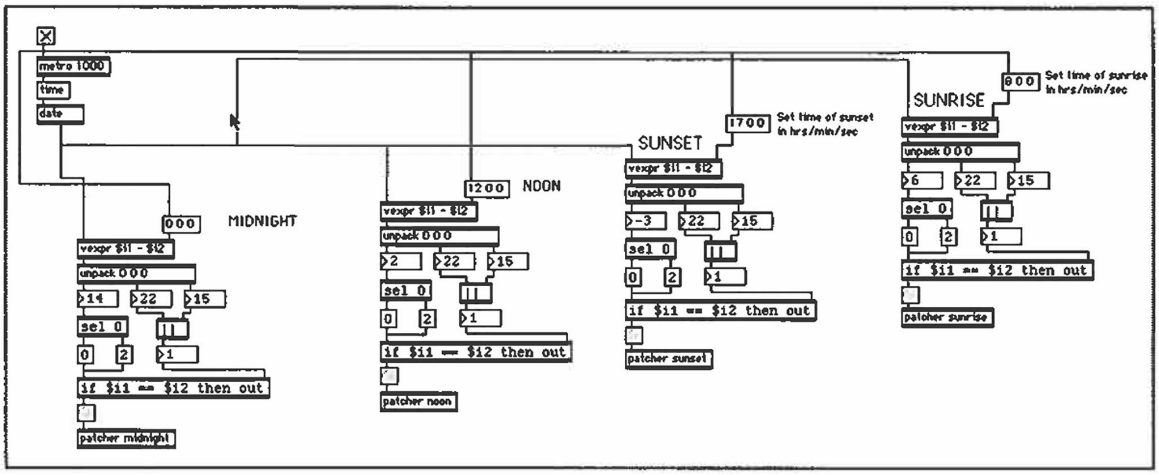
Appendix F

Main interface for "MSP DB"

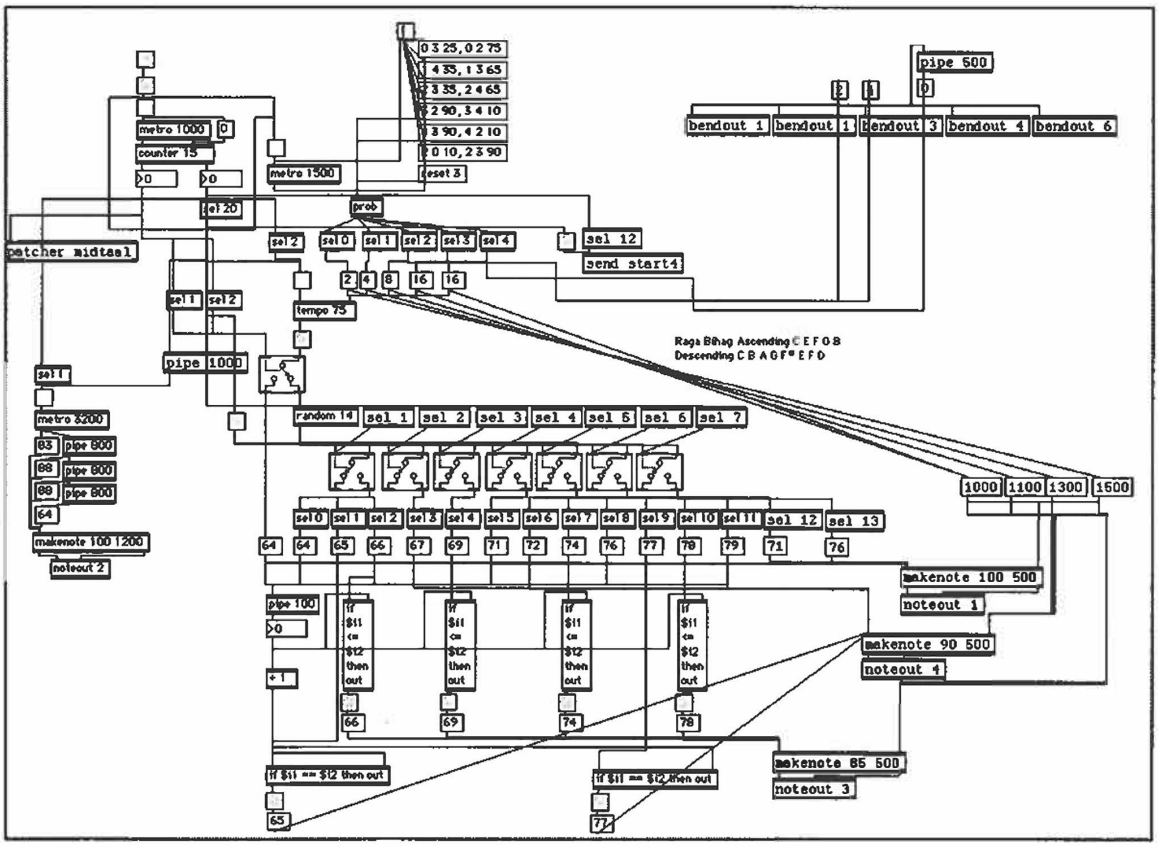


Appendix G

MAX patches for "Samay Chakra"



Main patch with controls for all raags



Sub-patch for midnight – Raag Bihag

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