# InterPARES 2 Project

International Research on Permanent Authentic Records in Electronic Systems

## Title: Case Study 13 Final Report: *Obsessed Again...*


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## Report Version History

| Date | Version | Notes | Individual |
|---|---|---|---|
| 18 Feb 2004 | 1.0 | Final report | Scott Amort |
| 29 Aug 2006 | 1.1 | Revised final report | Randy Preston |
| 29 Sep 2006 | 1.2 | Revised final report | Scott Amort |
| 23 Sep 2007 | 2.0 | Final copy editing, addition of Appendix 1 | Randy Preston |

## A. Overview

*Obsessed Again...* is a work for bassoon and interactive electronics written in 1992 by Canadian composer Keith Hamel. The work was composed to fulfil a commission from bassoonist Jesse Read, who requested a piece involving interactive electroacoustic elements, and was premiered on May 9, 1992, at De IJsbreker, Amsterdam, the Netherlands. The work realized these interactive elements by utilizing the Max music software environment along with a commercial Proteus 1 synthesizer and an IVL pitch-to-MIDI converter. Although the composition was designed to use state-of-the-art commercial hardware and software, the equipment required to perform *Obsessed Again...* is quickly becoming obsolete - the computer files are incompatible with current operating systems and some are stored on older single-sided computer disks, and much of the hardware used is ageing and will soon be inoperable. The work has not been performed for several years, but Dr. Read has expressed a desire to reintroduce it into his repertoire in a form that can be performed easily using current technology (both hardware and software). To meet this requirement, the composition will require recovery and a substantial reworking of both the interactive and electronic elements. In addition, migration strategies will be investigated so that the current scenario does not repeat itself. However, before any such attempts are undertaken, it is necessary to identify and determine the current state of the component elements of *Obsessed Again...*

## B. Statement of Methodology

The primary information gathering activity for this case study was a series of interviews with the composer, Keith Hamel and performer, Jesse Read. The interviews were designed to obtain enough information from each interview subject to answer the required twenty-three core questions (see Sections D and E for the specific questions and their answers).

## C. Description of Context

The composition *Obsessed Again...* is represented by a musical score, which notates and provides instructions governing the interaction of all of the elements making up the piece – the performer/bassoonist, a Barkus Berry pick-up (microphone), an IVL pitch-to-MIDI converter, a Macintosh computer with a MIDI interface running the Max software, an external Proteus 1 synthesizer and a sound amplification system (i.e., amplifier, mixer and speakers). By accurately following the score, the sonic entity that is the musical work will be produced. Achieving this sonic event will involve two creative processes: the composition of the musical work (i.e., the preparation of the score) and the performance (i.e., the act of realizing the musical work through an accurate interpretation of the score).

**Provenancial**

The primary individual responsible for the creation of *Obsessed Again...* is the composer, Keith Hamel. He is the sole creator of the musical work. However, as performer, Jesse Read plays an essential role in contributing to the dissemination of this work and is also responsible for additional entity creation (i.e., recordings). Additionally, Dr. Read collaborated with Dr. Hamel during the compositional process, testing many aspects of the work. Dr. Read considers his role as one of an 'interpreter' of Dr. Hamel's musical work. Also of importance is that by virtue of being the commissioning agent, Dr. Read did provide the initial impetus for the creation of this work and dictated the basic framework within which Dr. Hamel would create *Obsessed Again...* (i.e., a specification for a musical work for solo bassoon involving the use of interactive electronics).

**Juridical-administrative**

There are no specific or extraordinary regulations or laws that affect musical composition. Of interest, though, is the use of Copyright law as the main legal instrument of authenticity and ownership.

**Procedural**

No generally accepted or documented procedural rules or schemes exist for entities created through musical composition and performance.

**Documentary**

The documentation process is chiefly the responsibility of the composer, in whose fonds the composition still resides,[1] and as with the procedural element above, there are no generally accepted rules or schemes.

**Technological**

The original digital environment used for the creation of *Obsessed Again...* was an Apple Mac II computer (68020), running Mac OS 7. However, this environment has been updated to an Apple PowerBook laptop computer (G4), running Mac OS X 10.3.2. As well, the initial Max software (version 2), has been upgraded to Max/MSP (version 4.2). Additionally, a NeXT computer was used for additional file storage and backups. Although initial compositional work for *Obsessed Again...* occurred away from a digital environment (involving basic sketches of overall form and determination of pitch material and rhythmic aspects for the bassoon part), most of the remaining work occurred at the computer. The Proteus 1 synthesizer was also used as a test platform, simulating the MIDI input provided by the IVL converter. This allowed Dr. Hamel to construct and test many of the interactive elements without requiring a bassoonist to be present.

[1] While the composition still resides in the fonds of the composer, technically it should belong to the performer, Jesse Read, who commissioned the work.

## D. Narrative Answers to the 23 Core Research Questions

*1. What activities of the creator have you investigated?*

This study examined the compositional process utilized to create *Obsessed Again...*, and the procedures that Keith Hamel uses to maintain the elements comprising his musical work. As well, an additional party (a performer, in this case Jesse Read) is required to fully realize the sonic event that is the end result of the compositional process. The role of the performer has also been investigated, as it contributes to the creative process.

*2. Which of these activities generate the digital entities that are the objects of your case study?*

The compositional process can be considered an ongoing event, directly involving the act of maintaining and updating the musical work and component elements. This overall process generates the main digital entities being examined. Additionally, *Obsessed Again...* is disseminated by way of performance, and this act may also generate digital entities.

*3. For what purpose(s) are the digital entities you have examined created?*

There are two purposes for the digital entities comprising *Obsessed Again...*: (1) to provide the necessary data and instructions with which a performer can (re)produce a performance of the musical work, and (2) to provide a framework allowing the composer to continue the compositional process as deemed necessary (i.e., updates, revisions, etc.).

*4. What form do these digital entities take?*

Dr. Hamel maintains three digital entities: (1) a representation of the musical score, (2) the software patch for Max/MSP, which contains a digital description of the computer 'instrument' and additional MIDI sequencer data, and (3) the Proteus Editor/Librarian file, which describes the sounds to be used by the Proteus 1 synthesizer.

> *4a. What are the key formal elements, attributes, and behaviour (if any) of the digital entities?*
>
> For (1), the digital representation of the musical score:
>
> > NoteWriter music notation software computer files, contained on Dr. Hamel's Apple PowerBook computer.
> >
> > The following four files are stored, located in the file folder *Grisey9.2/Documents/NoteWriter Files/OBSESSED AGAIN*:
> >
> > 1. Obsessed-Bsn (contains the Bassoon part only)
> > 2. Obsessed-final (contains the Bassoon part along with information about the electronic part)

3. Obsessed-lib1 (graphic images used in the scores)
4. Obsessed-lib2 (more graphic images used in the scores)

Additionally, these files have been converted to postscript format for backup storage.

For (2), the software patch(es) for Max/MSP:

15 Max/MSP patches (computer files) + 15 MIDI computer files, also stored on Dr. Hamel's Apple PowerBook computer, in the file folder *Grisey9.2/Documents/MAXFiles/OBSESSEDNew*:

1. BASSOON-MASTER (the master patch file, which will load all other required Max/MSP elements)
2. FX1.midi, FX2.midi, etc. (the MIDI files containing musical data sent to the Proteus synthesizer)

For (3), the Editor/Librarian file:

A Proteus Editor/Librarian computer files, also stored on Dr. Hamel's Apple PowerBook computer, in the file folder *Grisey9.2/Documents/MAXFiles/OBSESSEDNew*:

1. Bassoon-Voices (description of voices (sounds) to be assigned to the Proteus 1 synthesizer)

*4b. What are the digital components of which they consist and their specifications?*

The format of each digital entity is dictated by the specifications of the individual software programs with which each file was created. The NoteWriter (.nwr), Max/MSP and Editor/Librarian files are proprietary, binary formats, and as such, their specifications are unreleased. The MIDI files used by the Max/MSP patches are standard text files following the MIDI specification.[2]

*4c. What is the relationship between the intellectual aspects and the technical components?*

The main intellectual aspect of *Obsessed Again...* (the interaction of bassoon and electronics) is completely realized and documented by the technical components.

*4d. How are the digital entities identified (e.g., Is there a [persistent] unique identifier?*

Each of these digital entities is identified through the assignment of a semi-descriptive filename.

[2] Available at: http://www.midi.org/about-midi/specshome.shtml.

*4e. In the organization of the digital entities, what kind of aggregation levels exist, if any?*

As described above, two aggregation levels exist: (1) the digital score entities, and (2) the digital entities necessary to provide the electronic interaction.

*4f. What determines the way in which the digital entities are organized?*

The organization method is at the sole discretion of Keith Hamel.

*5. How are those digital entities created?*

Each digital entity was created/maintained through the use of a commercial computer software program. The original 1992 version of *Obsessed Again...* utilized Max version 2.0 (for the Max patches), Performer version 5.5 (for creating the MIDI sequences and saving them as standard MIDI files), NoteWriter (for the score) and version 1.0 of the Galaxy Editor/Librarian (for the Proteus Editor/Librarian file). Recently, Dr. Hamel has updated many of the digital entities in preparation for recreating this piece. Newer software includes Max/MSP version 4.2 and NoteAbility (a replacement for NoteWriter).

*5a. What is the nature of the system(s) with which they are created? (e.g., functionality, software, hardware, peripherals, etc.)*

As it is possible to consider two distinct but related creative processes (creation of the musical work, and creation of the performance), there are also two creative systems. For the creation of the musical work and its digital elements, the original digital system used was an Apple Mac II computer (68020), running Mac OS 7 (as mentioned above, this environment has recently been updated to an Apple PowerBook laptop computer (G4), running Mac OS X 10.3.2). Additionally, a NeXT computer was used for additional file storage and backups. These computers executed software designed to create each of the necessary digital entities (see above for a list of the software employed).

The system required to actually perform the work consists of: (1) a platform running Max/MSP (the generator of the electronic elements) loaded with all of the required patches, (2) the Proteus 1 synthesizer (which converts the digital MIDI data output from Max/MSP to an analogue sound signal) loaded with the necessary Editor/Librarian patches, (3) a microphone (to record the sound of the bassoon as an analogue sound signal), (4) an IVL pitch-to-MIDI converter (to convert the analogue bassoon signal to digital MIDI data for input into Max/MSP), and (5) a sound amplification system (necessary to output the analogue signal produced by the Proteus synthesizer).

*5b. Does the system manage the complete range of digital entities created in the identified activity or activities for the organization (or part of it) in which they operate?*

Yes, all operations performed on the digital entities occur within the confines of the above two digital systems.

*6. From what precise process(es) or procedure(s), or part thereof, do the digital entities result?*

The digital entities are a direct result of the personal compositional process as employed by Keith Hamel. This process is unique to each composition, but can be generally summarized (in the case of *Obsessed Again...*) as follows: (1) pre-compositional ideas were sketched, using pencil and paper away from the computer and included items such as the overall form of the work, the working out of basic pitch and harmonic content and determination of the nature of the interaction between the instrument and electronics; (2) working from this initial draft, the interactive elements were created at the computer using the necessary software; (3) these interactive elements were then tested (utilizing the Proteus synthesizer as a virtual performer) and modifications to both the draft score and software files were made as necessary; until, (4) final versions of the digital entities were created and a final score was prepared in digital format.

*7. To what other digital or non-digital entities are they connected in either a conceptual or a technical way? Is such connection documented or captured?*

The three digital entities are connected to each of the remaining non-digital elements of *Obsessed Again...* summarized at the beginning of this section (i.e., the additional hardware necessary to perform the piece). The connection is documented in a general sense through the musical score, although the composer admits that he has not adequately notated the electronic entities involved, and that the score is more focused on the musical elements (i.e., traditional pitches and rhythms) that the bassoonist is required to produce. This was a result of a performer-focused attitude, and the fact that the performer did not need to know the details of these entities to satisfactorily perform the piece. Dr. Read echoes this last sentiment; however, as a performer, he does not feel that a more accurate notation for the electroacoustic entities is necessary.

*8. What are the documentary and technological processes or procedures that the creator follows to identify, retrieve, and access the digital entities?*

The digital entities are accessed through generally employed computer usage (i.e., files are stored on disk and accessed from within the associated software program), and are identified through the use of semi-descriptive file names.

*9. Are those processes and procedures documented? How? In what form?*

Although not specifically focused on accessing the digital entities of *Obsessed Again...*, instruction manuals exist for each of the software programs utilized that describe the general procedures necessary to interact with their digitally stored materials. However, specific information concerning filenames and versions directly employed by *Obsessed Again...* are available only through communication with Dr. Hamel.

*10. What measures does the creator take to ensure the quality, reliability and authenticity of the digital entities and their documentation?*

Specific procedures are not in place to ensure these qualities; however, by being the sole possessor of all the digital entities in question, Dr. Hamel is able to maintain what he views as an adequate level of control over the distribution of authentic digital elements to performers or other agencies. No specific procedures would prevent a second-hand distribution (i.e., by the performer or agency to another performer), but a general sense of respect for the composer is usually found in these instances. Dr. Read states that as a performer, he feels a responsibility to the composer to be certain that any further dissemination of the piece occur only as prescribed by Dr. Hamel.

*11. Does the creator think that the authenticity of his digital entities is assured, and if so, why?*

Dr. Hamel is the sole arbiter of authenticity and the only preserver/distributer of these digital entities, and as such, is confident that they are authentic. However, no specific procedures are in place that would allow a third party to independently confirm this authenticity. Additionally, no technological method (i.e., encryption technique, digital signature, etc.) is employed to prevent a third party from redistributing these digital entities and/or compromising their authenticity. However, the creative work as a whole is copyrighted, and Dr. Hamel feels this is a reasonable deterrent against unauthorized alteration and reproduction.

*12. How does the creator use the digital entities under examination?*

The digital entities are stored for future dissemination to performers and/or for alteration as judged necessary by Dr. Hamel.

*13. How are changes to the digital entities made and recorded?*

All alterations are made by the composer himself, and he does not record these changes in any formal manner.

*14. Do external users have access to the digital entities in question? If so, how, and what kind of uses do they make of the entities?*

External users do not have access to the master copies of the digital entities, as maintained by Dr. Hamel. However, duplicates are made and distributed to potential performers and/or other interested parties (e.g., students, arts organizations, etc.). These distributions may result in a fragmentary dissemination of the work, as certain individual elements (most notably the score) are often the only object duplicated. Of course, the most likely scenario for a distribution would be to allow for a performance of the work.

*15. Are there specific job competencies (or responsibilities) with respect to the creation, maintenance, and/or use of the digital entities? If yes, what are they?*

Basic technical knowledge of computer hardware, as well as specific proficiency in the software applications involved, is necessary for maintenance and use of the digital entities. Additionally, an adequate musical training and an ethical responsibility and respect for the composer's work are both necessary for any performance-related interaction and revision.

*16. Are the access rights (to objects and/or systems) connected to the job competence of the responsible person? If yes, what are they?*

This question is somewhat inapplicable to the current study; however, as stated in the answer to the previous question, a certain level of competence with computer hardware and software, as well as an adequate level of musical training, is required to intelligently access/modify the digital entities. As a result, access is in a sense restricted to persons in possession of these abilities.

*17. Among its digital entities, which ones does the creator consider to be records and why?*

Dr. Hamel does not consider any of these entities to be records. As a composer, he is focused more on the present use of a work, not its past or future states. Many works have only a short-term existence, and this is most evident with those involving technology. Limitations of current software and hardware, and the speed of advances in capabilities are the most limiting factors. All of the digital entities for *Obsessed Again...* are treated in a utilitarian, not archival, sense.

*18. Does the creator keep the digital entities that are currently being examined? That is, are these digital entities part of a recordkeeping system? If so, what are its features?*

Although the creator does keep the digital entities in question, there is no formal recordkeeping system employed by Dr. Hamel. The digital entities are stored on computer disks, which remain in the possession of the composer.

> *18a. Do the recordkeeping system(s) (or processes) routinely capture all digital entities within the scope of the activity it covers?*
>
> As answered above, no such system exists, but Dr. Hamel does capture and store all the digital entities he feels are required by the work.
>
> *18b. From what applications do the recordkeeping system(s) inherit or capture the digital entities and the related metadata (e.g., e-mail, tracking systems, workflow systems, office systems, databases, etc.)?*
>
> Not applicable.

*18c. Are the digital entities organized in a way that reflects the creation processes? What is the schema, if any, for organizing the digital entities?*

The digital entities reflect the creation process in so much as they are organized by file type (i.e., the individual files are dictated by the software program used to create them).

*18d.Does the recordkeeping system provide ready access to all relevant digital entities and related metadata?*

Again, no system exists, but Dr. Hamel currently has ready access to all relevant digital entities.

*18e. Does the recordkeeping system document all actions/transactions that take place in the system re: the digital entities? If so, what are the metadata captured?*

No such documentation exists.

*19. How does the creator maintain its digital entities through technological change?*

Initially, no active actions were taken to protect against technological advance. However, as described in the overview to this report, a recent attempt to reintroduce this work into the active repertoire has forced a re-examination of this decision. As of the writing of this report, Dr. Hamel has translated many of the original entities into forms accessible by current technology. Unfortunately, it does appear as though particular elements – the editor/librarian patch for the Proteus 1, specifically – will be impossible to update due to obsolete software, and as a result will need to be recreated. Additional concerns have been raised with regards to the age of some of the non-digital entities (the aforementioned Proteus 1 and the original Macintosh computer). While these entities can be updated to current hardware versions (or possibly of more benefit to future storage, be converted to a software representation), these changes will alter the nature of the composition (i.e., sound production will change, overall sound quality will differ, etc.), and may also require alteration to connected elements. As a result, the sonic event that is *Obsessed Again...* will be fundamentally different. It is interesting to note, however, that Dr. Hamel does not view this outcome in a negative manner, and in fact, he is quite pleased to rework elements of his piece. Dr. Hamel sees the process of archiving not as an act of historical preservation, but instead, as a means of ensuring his composition's future existence. This focus will require a more complete musical score with much more detailed indications of the interaction between the acoustic and electroacoustic elements, and the inclusion of a digital recording of an authentic version of the work by which future performances can be judged.

*19a. What preservation strategies and/or methods are implemented and how?*

The main preservation strategy implemented by Dr. Hamel has been to reduce the hardware dependence of *Obsessed Again...* and re-implement as many of the interactive elements as possible in software. Currently, the Proteus 1 synthesizer is no longer required, and its

sound production procedure has been implemented as a software synthesizer patch in Max/MSP. Dr. Hamel has identified Max/MSP as the current best option for software/hardware amalgamation. Although not currently employed, Max/MSP pitch-to-MIDI converters do exist, which would allow for the additional replacement of the IVL converter.

*19b. Are these strategies or methods determined by the type of digital entities (in a technical sense) or by other criteria? If the latter, what criteria?*

Yes. Dr. Hamel's ultimate goal is to remove external hardware dependencies (with the exception of the system necessary to run Max/MSP) and re-implement them as a Max/MSP patch.

*20. To what extent do policies, procedures, and standards currently control records creation, maintenance, preservation and use in the context of the creator's activity? Do these policies, procedures, and standards need to be modified or augmented?*

There is currently very little in the way of formalized policies, procedures or standards involved with *Obsessed Again...* The creation of such elements is seen as a priority for the composer, with respect to both this specific work and as a means to introduce standardized procedures and policies for archiving electroacoustic music as a whole.

*21. What legal, moral (e.g., control over artistic expression) or ethical obligations, concerns or issues exist regarding the creation, maintenance, preservation and use of the records in the context of the creator's activity?*

As composer, there is no external moral or legal responsibility concerning the creation, maintenance, preservation and use of the digital entities that comprise *Obsessed Again...*[3] There is, however, a more internal moral dedication to ensuring the future life of this work.

*22. What descriptive or other metadata schema or standards are currently being used in the creation, maintenance, use and preservation of the recordkeeping system or environment being studied?*

No such schema or standards are used.

*23. What is the source of these descriptive or other metadata schema or standards (institutional convention, professional body, international standard, individual practice, etc.)?*

Not applicable.

[3] It appears that *Obsessed Again…* constituted an informal, verbal commission with no legal obligations. Moreover, as noted in question 17, Dr. Hamel does not consider any of the digital entities comprising *Obsessed Again…* to be records.

## E. Narrative Answers to Applicable Domain and Cross-domain Research Questions

### Policy Cross-domain

*4.4 What legal or moral obligations exist regarding the creation, maintenance, preservation, and use of the records of artistic and scientific activities?*

As discussed above, the composer feels a moral obligation to ensure the future existence of his work, but no real compulsion towards preservation for archival purposes. Legal obligations do exist, focused mainly on copyright and authorship issues (for authenticity verification, performing rights, etc.); however, these do not constitute a pressing concern for Dr. Hamel.

*4.5 (a) What principles should guide the formulation of policies, strategies and standards related to the creation of reliable, accurate and authentic records in the digital environments under investigation?*

The main concern for Dr. Hamel is that the future existence of his work be ensured. This principle should guide all policy formulations. Specifically, Dr. Hamel feels that priority should be given to the development of descriptive procedures that can ensure that the creation of the electroacoustic elements of *Obsessed Again…*, as well as the descriptive documentation of the interaction between performer and computer, results in digital entities that are reliable, accurate and authentic. Combined with existing music notation procedures (which can be described as adequately accurate and authentic), these descriptive procedures would allow for a complete account of the actions necessary to (re)create *Obsessed Again…*

*4.5 (b) What principles should guide the formulation of policies, strategies and standards related to the appraisal of those records?*

As explicitly stated above, the accuracy and authenticity of all digital entities must be assured.

### Description Cross-domain

*6.8 (a) What is the relationship between the role of descriptive schemas and instruments needed by the creator and those required by the preserver to support the archival processes of appraisal, preservation and dissemination?*

It would seem likely that a means to ensure accuracy and authenticity could be integrated into the descriptive schemas developed as described above in question 4.5a. Separate schemas for the creator and preserver would not be necessary.

*6.9 What is the role of descriptive schemas and instruments in rights management and in identifying and tracking records components, versions, expressions, performances, and other manifestations, and derivative works?*

This would be a vital role, as it is an examination of these attributes that will allow for others to ensure the accuracy and authenticity of the work (and its digital components).

*6.10 (a) Is it important to be able to relate the record of artistic and scientific activity to the associated expression, performance, product, work, or other manifestation of it?*

Yes it is important, however, not necessarily for the creator. Documentation of the processes involved in creating *Obsessed Again…* may have a historical value to musicologists or others, but for the composer, it is the *musical work* that must be preserved. For his purposes, all digital entities must ultimately relate to the future (re)creation of this work.

*6.10 (b) and, if so, in what ways can descriptive activities facilitate it?*

Descriptive facilities are the core means of ensuring the accuracy and authenticity of *Obsessed Again…* during its (re)creation, and the preservation of its accuracy and authenticity over the long-term. Current efforts at creating a text-based meta-language for digital storage of musical scores can already be seen to facilitate a complete digital description of the musical work. Examples such as GUIDO and MusicXML (see bibliography) are also extensible, allowing for the addition of means to help ensure the accuracy and authenticity of electroacoustic musical works.

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## G. Glossary of Terms

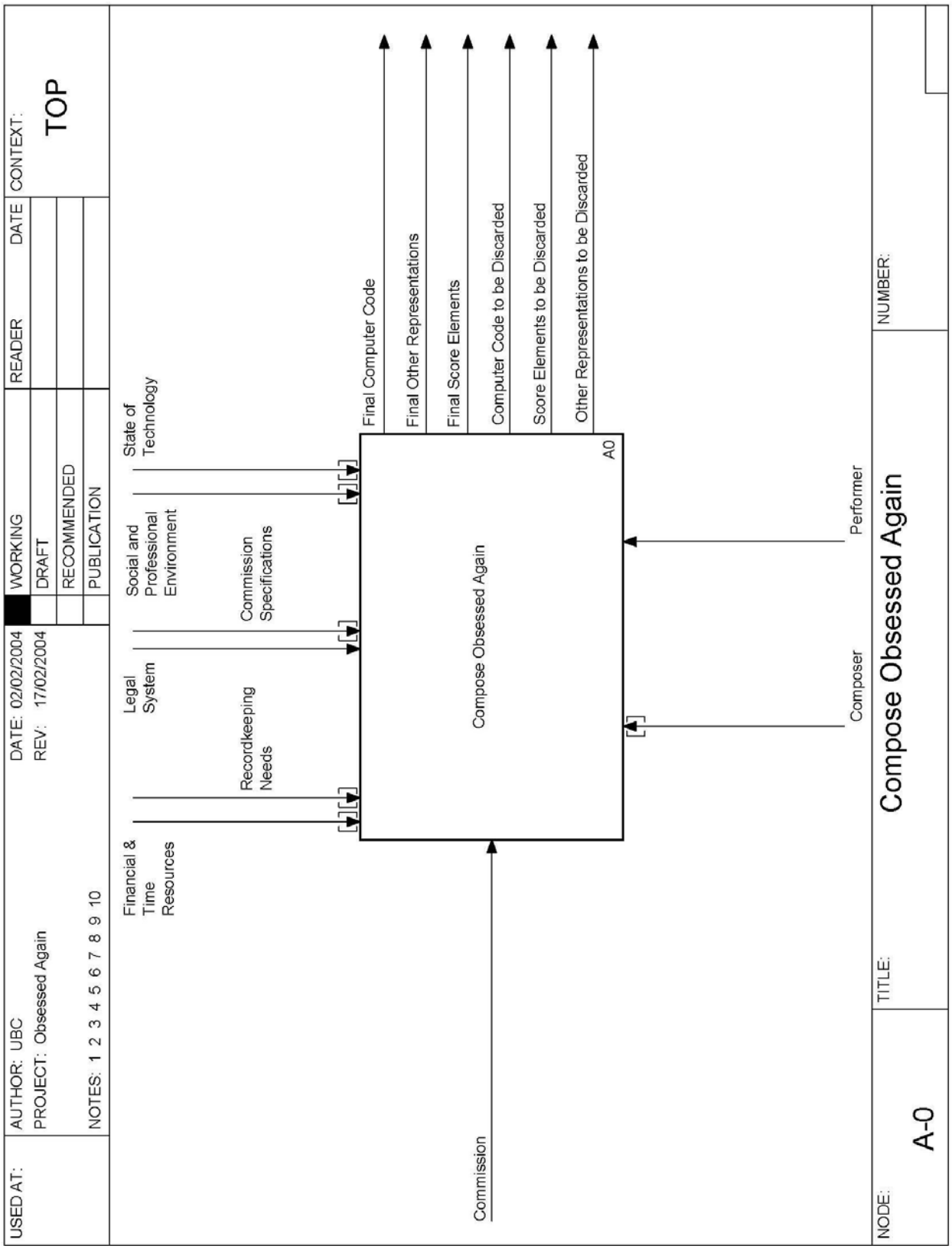
| Term | Definition (in context of this report) |
|---|---|
| commission | A contract directing a composer to create a musical work. |
| composer | The creator of the musical work. |
| electroacoustic | Aural events generated by an electronic device. |
| instrument library | A series of specifications for use with a synthesizer, dictating the specific sound output (timbre) to be produced. |
| interactive electronics | Electroacoustics generated by an interaction between a performer and an electronic device. |
| interpreter | The creator of the musical performance. |
| Max/MSP | A digital sound processing (DSP) software application, designed to provide a platform to produce interactive electronics. |
| microphone | An electronic device designed to translate aural events into an electronic signal |
| MIDI | Musical Instrument Digital Interface. A standardized means of representing acoustic information (i.e., pitch, dynamics, etc.) in digital format. |
| music | A temporal experience of specific aural events. |
| music notation | Text or graphical symbols designed to convey musical meaning. |
| music notation software | Computer software designed to aid in the production of a musical score. |
| musical score | A means of providing instructions in the form of musical notation to the performer/interpreter, resulting in the musical performance. |
| musical work | The composed music itself, as well as the musical score and any other descriptive documentation required to interpret this score. In the case of electroacoustic music, or mixed acoustic/ electrocacoustic music, it also includes the technology required to reproduce any digital components (i.e., interactive electronics). |
| patch | Computer code designed to produce an expected output given a specified input. Used with Max/MSP to design specific interactions between the performer and the Proteus synthesizer. |
| performance | To translate the musical score into an acoustic reality. |
| performer | The interpreter of the musical work. |

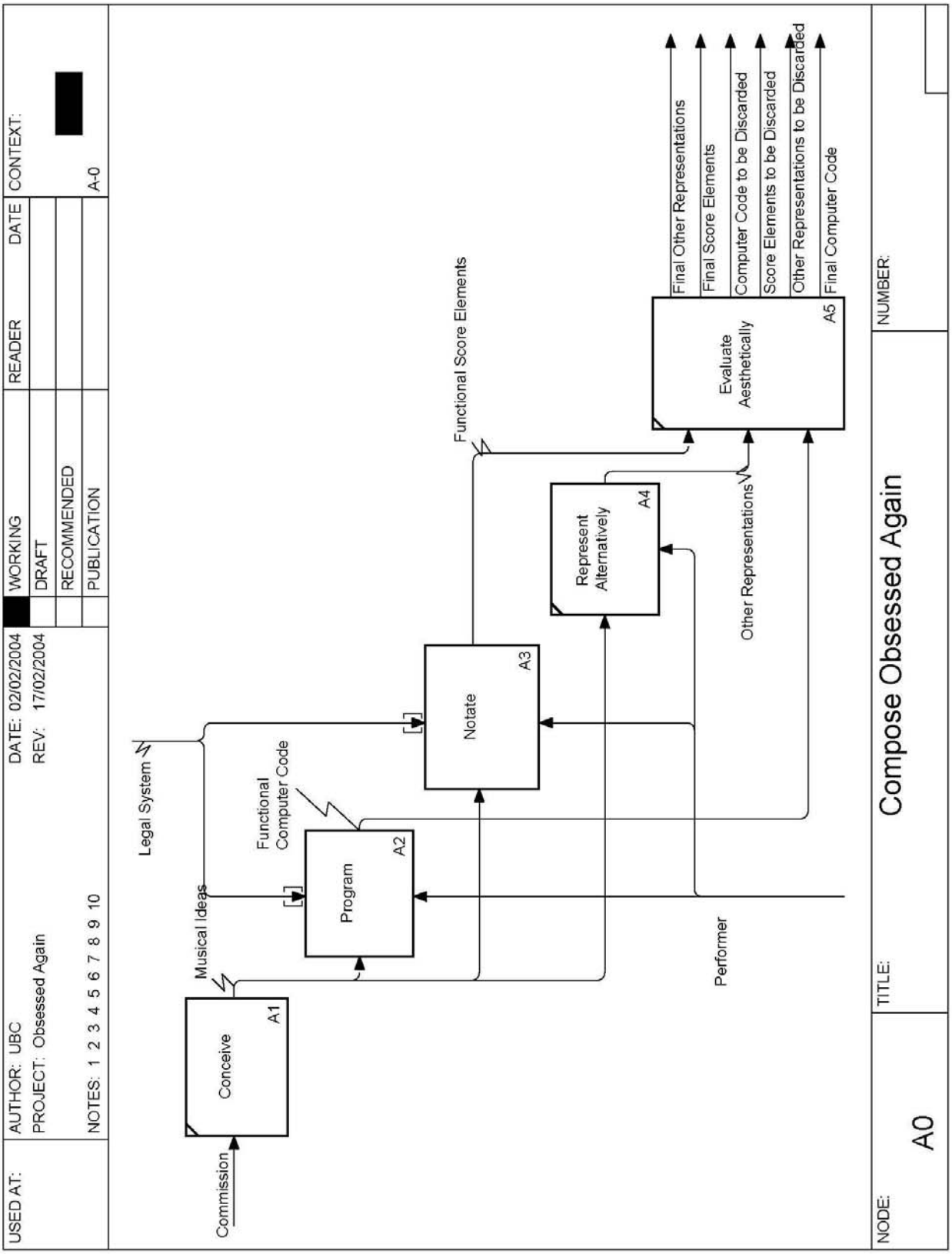
| | |
|---|---|
| pitch-to-MIDI converter | An electronic device designed to translate analogue electronic sound signals (provided by a microphone) into a digital format (MIDI). |
| synthesizer | An electronic device designed to produce electroacoustics. Utilizes an instrument library to create a variety of unique sound outputs. May be coupled with a standard piano-like keyboard to control specific pitch output, or may rely on MIDI communication for musical parameters (i.e., pitch, dynamics, length, etc.) |

## H. Preliminary Models

IDEF0 Activity and Entity Relationship models follow, with definitions.

## IDEF0 Activity Model: Diagrams




USED AT:
AUTHOR: UBC
PROJECT: Obsessed Again
NOTES: 1 2 3 4 5 6 7 8 9 10
DATE: 02/02/2004
REV: 17/02/2004
WORKING
DRAFT
RECOMMENDED
PUBLICATION
READER
DATE
CONTEXT:
A-0
Commission
Conceive
A1
Musical Ideas
Legal System
Functional Computer Code
Program
A2
Notate
A3
Represent Alternatively
A4
Functional Score Elements
Other Representations
Performer
Evaluate Aesthetically
A5
Final Other Representations
Final Score Elements
Computer Code to be Discarded
Score Elements to be Discarded
Other Representations to be Discarded
Final Computer Code
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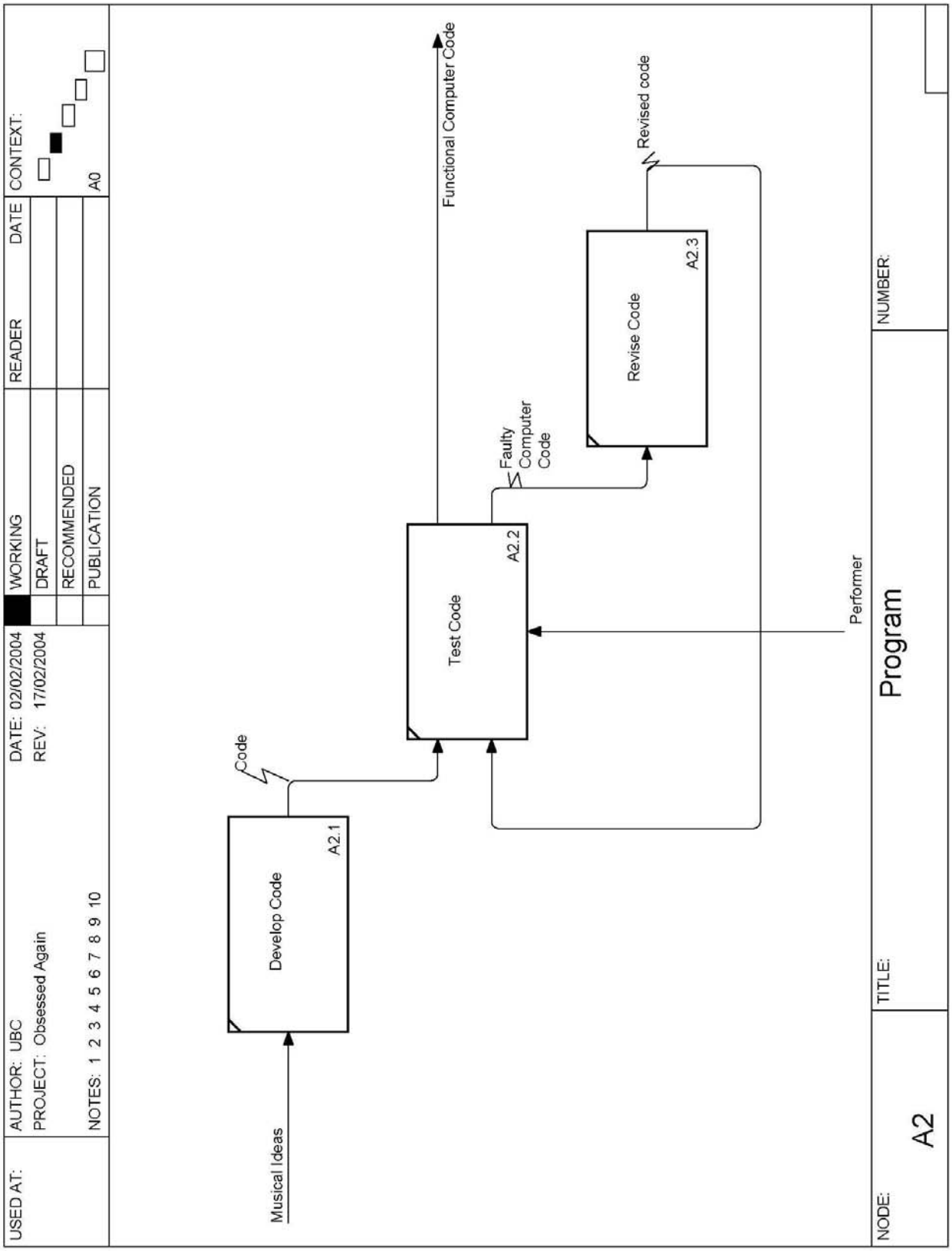
TITLE:
Compose Obsessed Again
NUMBER: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PROJECT: Obsessed Again
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WORKING
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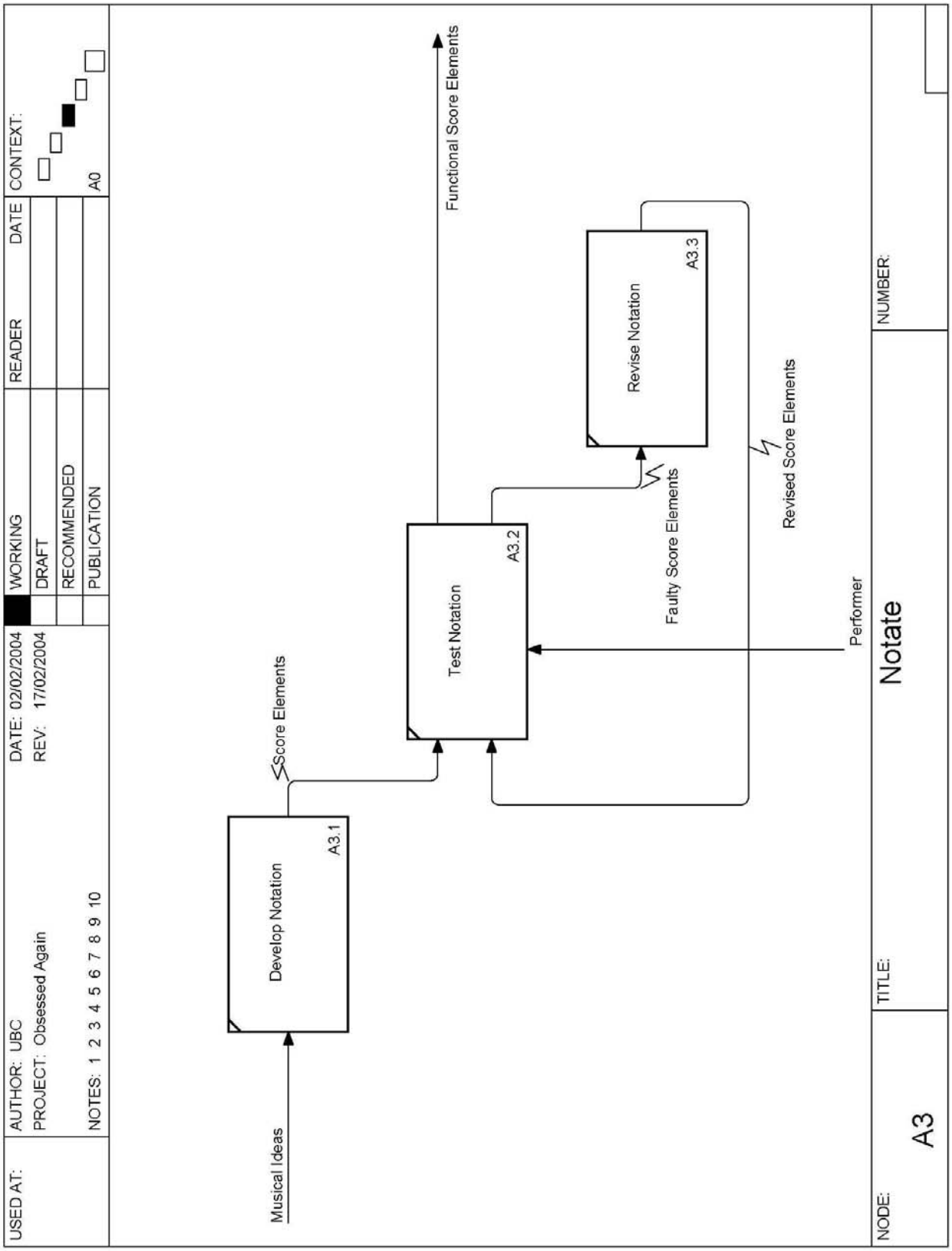
RECOMMENDED
PUBLICATION
READER
DATE
CONTEXT:
A0
Musical Ideas
Develop Code
A2.1
Code
Test Code
A2.2
Functional Computer Code
Faulty Computer Code
Revise Code
A2.3
Revised code
Performer
NODE:
A2
TITLE:
Program
NUMBER: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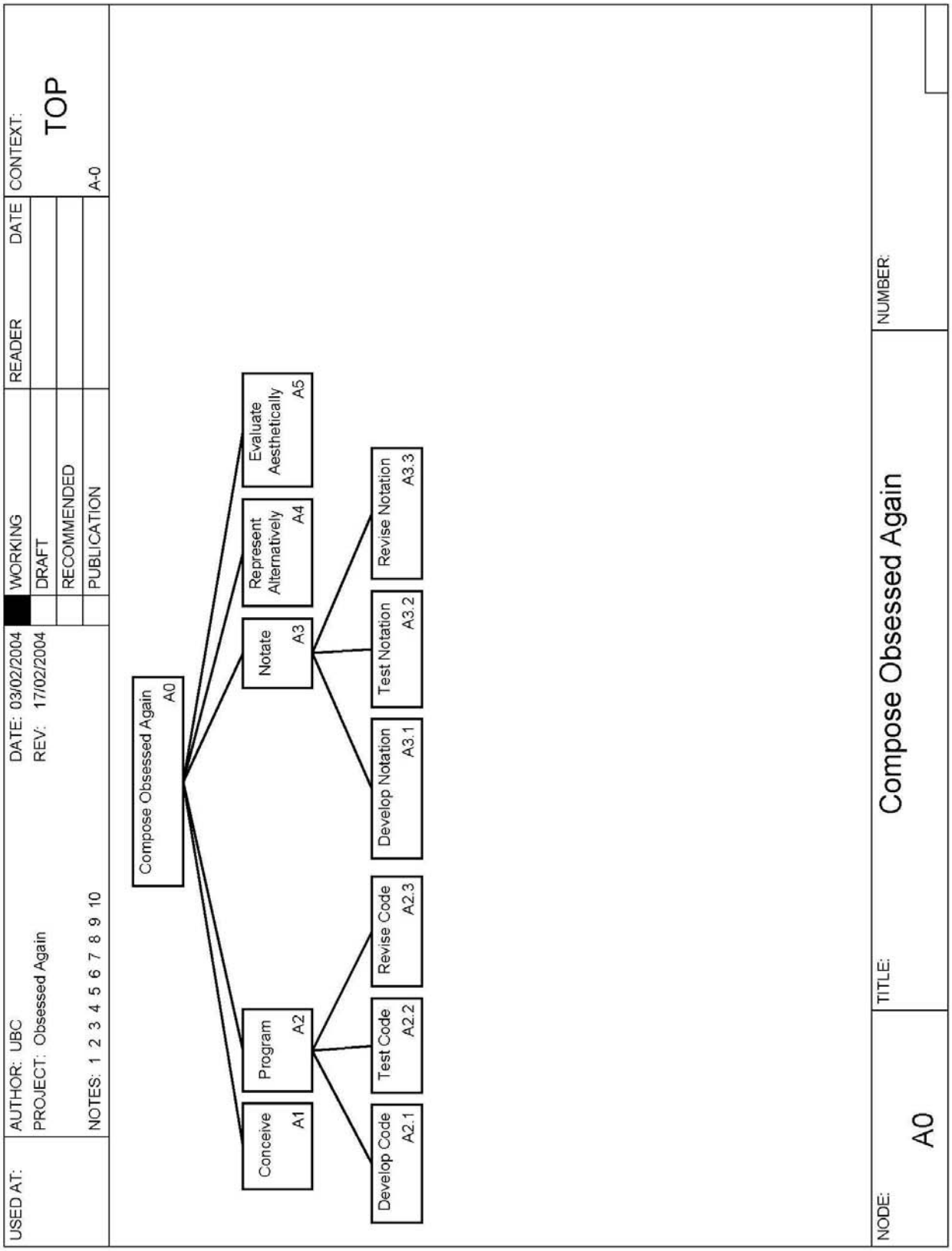
PUBLICATION
READER
DATE
CONTEXT:
A0
Develop Notation
A3.1
Test Notation
A3.2
Revise Notation
A3.3
Musical Ideas
Score Elements
Functional Score Elements
Faulty Score Elements
Revised Score Elements
Performer
NODE:
A3
TITLE:
Notate
NUMBER: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PUBLICATION
READER
DATE
CONTEXT:
TOP
A-0
Compose Obsessed Again A0
Conceive A1
Program A2
Develop Code A2.1
Test Code A2.2
Revise Code A2.3
Notate A3
Develop Notation A3.1
Test Notation A3.2
Revise Notation A3.3
Represent Alternatively A4
Evaluate Aesthetically A5
NODE:
A0
TITLE:
Compose Obsessed Again
NUMBER:

## IDEF0 Activity Model: Definitions

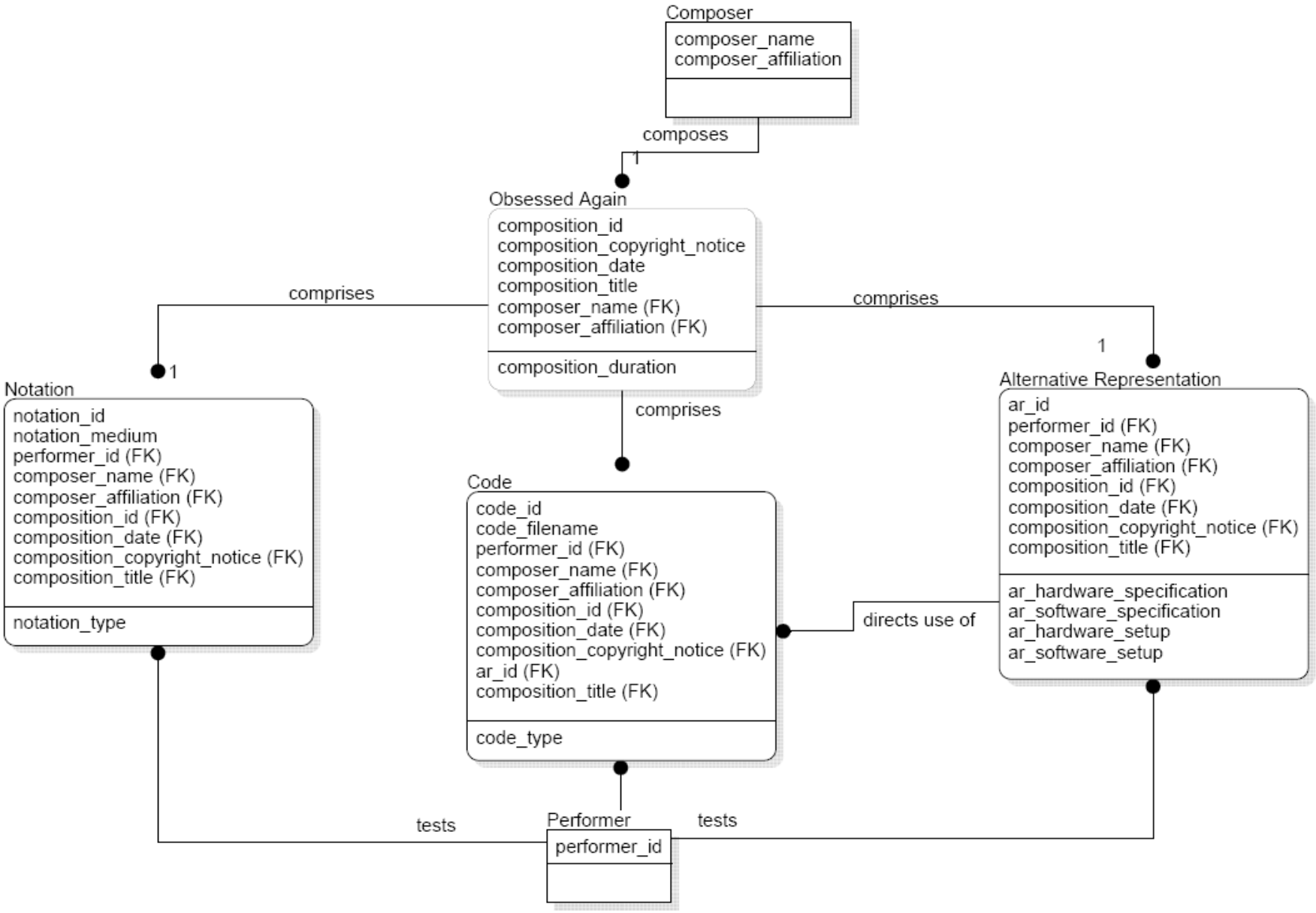
| Case Study 13: *Obsessed Again...* IDEF0 Model: Activity Definitions | | | |
|---|---|---|---|
| **Activity Name** | **Activity No.** | **Activity Definition** | **Activity Note** |
| Compose Obsessed Again | A0 | To fulfil the Commission. | Involves conceiving, programming, notating, producing other representations and evaluating. |
| Conceive | A1 | To produce Musical Ideas. | May involve activities such as sketching, brainstorming, doodling, etc. |
| Program | A2 | To represent applicable Musical Ideas as Functional Computer Code. | Involves developing code, testing code and revising code. |
| Develop Code | A2.1 | To produce Computer Code. | Involves writing Computer Code to provide an expected output given a specified input. Computer Code developed here is untested, and may not be functional. |
| Test Code | A2.2 | To determine whether Computer Code is functional. | Involves evaluating Computer Code (by the composer and/or performer) for functionality. If the Computer Code produces an expected output given a specified input, it is functional, otherwise it is faulty. |
| Revise Code | A2.3 | To repair Faulty Computer Code. | Involves revising Computer Code that has been evaluated as faulty (nonfunctional). Defects in the Computer Code must be identified and corrected. |
| Notate | A3 | To represent applicable Musical Ideas as Functional Score Elements. | Involves developing notation, testing notation and revising notation. |
| Develop Notation | A3.1 | To produce Score Elements. | Involves writing Score Elements to provide instructions to the performer on how to produce specific element(s) of the musical work. |
| Test Notation | A3.2 | To determine whether the Score Elements are functional. | Involves ensuring that the Score Elements accurately represent the musical idea, and that it is practical for the performer to realize the Score Elements in terms of playability. |
| Revise Notation | A3.3 | To repair Faulty Score Elements. | Involves revising Score Elements that have been evaluated as faulty (nonfunctional). Defects in the Score Elements must be identified and corrected. |
| Represent Alternatively | A4 | To represent applicable Musical Ideas as Other Representations. | Involves creating any representation that is not Computer Code or Score Elements, possibly including verbal instructions, and graphic doodles. |
| Evaluate Aesthetically | A5 | To determine whether an element is aesthetically acceptable. | Involves aesthetically judging functional musical ideas (represented by computer code, score elements or other representations) for inclusion in the final musical work. |

| Case Study 13: *Obsessed Again*... IDEF0 Model: Arrow Definitions | | |
|---|---|---|
| **Arrow Name** | **Arrow Definition** | **Arrow Note** |
| Code | A set of computer readable instructions designed to produce an expected result from a specified input. | May consist of Max/MSP patches, MIDI data or other helper utility code. |
| Commission | Contract between the commissioner and the composer for production of a musical composition. | The commission may be the generative impulse for creating a composition. |
| Commission Specifications | The specific attributes that the final composition must posses. | The commission specifications may include elements such as a requirement of originality, instrumentation (musical instruments and associated musical technology available), length of the piece, completion date and fee. |
| Composer | The creator of the musical work. | Keith Hamel. |
| Faulty Computer Code | Computer code that does not produce the expected output given a specified input. | Computer code will be judged faulty by the composer or performer when it fails during the testing phase (i.e., does not function as expected). This code cannot be used in a faulty state, and therefore must be revised to function correctly. |
| Faulty Score Elements | Score elements that do not properly convey a specific musical meaning, or require a musical action that is impossible to perform. | A score element will be judged faulty by the composer or performer when it fails during the testing phase (i.e., does not convey a musical meaning as expected, or produces results that are unperformable). This score element cannot be used in a faulty state, and therefore must be revised to function correctly. |
| Final Computer Code | Computer code that will be used in the final musical work. | Certain musical ideas represented by computer code will be judged as aesthetically acceptable by the composer, and will be included in the final musical work. |
| Final Other Representations | Other representations that will be used in the final musical work. | Certain musical ideas represented by other representations will be judged as aesthetically acceptable by the composer, and will be included in the final musical work. |
| Final Score Elements | Score elements that will be used in the final musical work. | Certain musical ideas represented by a score element will be judged as aesthetically acceptable by the composer, and will be included in the final musical work. |
| Financial & Time Resources | Time and financial constraints upon the composer. | May limit any/all steps of the composition process. |
| Functional Computer Code | Computer code that has passed the testing phase. | Computer code will be judged functional by the composer or performer when it passes the testing phase (i.e., functions as expected). |
| Functional Score Elements | Score elements that have passed the testing phase. | A score element will be judged functional by the composer or performer when it passes the testing phase (i.e., conveys a performable musical meaning). |

| Case Study 13: *Obsessed Again*... IDEF0 Model: Arrow Definitions (cont.) | | |
|---|---|---|
| **Arrow Name** | **Arrow Definition** | **Arrow Note** |
| Legal System | Relevant rules and laws affecting the composer's work. | May include concepts such as author copyright, performance rights for both composer and performer, software licensing agreements, etc. |
| Musical Ideas | The basic creative elements of the musical work. | Abstract creative elements that will be transformed into more concrete components of the musical work (i.e., score element, computer code, other representation) |
| Other Representations | Any representation of a musical idea that is not computer code or a score element. | May include musical ideas or instructions described either graphically or verbally. |
| Other Representations to be Discarded | Other representations that will not be used in the final musical work. | Certain musical ideas represented by alternative representations may be judged as aesthetically unacceptable by the composer. These will be discarded, and will not be included in the final musical work. |
| Performer | The individual responsible for the sonic production of specific element(s) of the musical work. | The bassoonist (Jesse Read). |
| Recordkeeping Needs | The needs of the composer for storing and making accessible the work and entities generated in the course of its creation. | May involve practical constraints in size and format for maintaining the material and distributing it to interested parties, as well as reduce Financial and Time Resources. |
| Revised code | Faulty computer code that has been altered and is in need of (re)testing. | Computer code that has been deemed faulty will be revised to correct any functional defects. |
| Revised Score Elements | Faulty score elements that have been altered and are in need of (re)testing. | A score element that has been deemed faulty will be revised to correct any functional defects. |
| Score Elements | A text or graphical symbol designed to convey a specific musical meaning. | Instructions to the performer on how to produce specific element(s) of the musical work. May consist of traditional music notation, but may also be extended to provide more specialized instructions. |
| Score Elements to be Discarded | Score elements that will not be used in the final musical work. | Certain musical ideas represented by score elements may be judged as aesthetically unacceptable by the composer. These will be discarded, and will not be included in the final musical work. |
| Social and Professional Environment | The social and professional environment in which the composer is active. | Constraints on aesthetics choices such as form, materials, etc., will be dictated by the specific time and place in which the composer is active. |
| State of Technology | Technology currently available to the composer. | Constraints on technological functions of the work due to speed, storage capacity, and general functionality of current technology. |

## Entity Relationship Model: Diagram

OBSESSED_AGAIN(20040217 -- Display 1 / <Main Subject Area>

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## Entity Relationship Model: Definitions

| Case Study 13: *Obsessed Again*... Entity Relationship Model: Definitions | | | |
|---|---|---|---|
| **Entity Name** | **Attribute Names** | **Entity Definition** | **Entity Note** |
| Alternative Representation | ar_id (PK) | | |
| | performer_id (PK) (FK) | | |
| | composer_name (PK) (FK) | The composer's name. | |
| | composer_affiliation (PK) (FK) | Any professional affiliations the composer may have. | May include professional organizations such as the Canadian League of Composers or SOCAN. |
| | composition_id (PK) (FK) | | |
| | composition_date (PK) (FK) | The date of composition. | |
| | composition_copyright_notice (PK) (FK) | A notice of copyright for the composition. | Notated in text on the title page or first page of the score. In the usual format of "Copyright (c) Year by Composer Name." |
| | composition_title (PK) (FK) | The title of the composition. | |
| | ar_hardware_specification | Hardware required to perform the composition. | Dictates the necessary hardware: computer, pitch rider, synthesizer, etc. |
| | ar_software_specification | Software required to perform the composition. | Dictates the necessary software: Max/MSP, etc. |
| | ar_hardware_setup | Instructions on how to set up the hardware components. | Specifications for how the hardware must be connected. |
| | ar_software_setup | Instructions on how to set up the software components. | Specifications for how the software must be set up (i.e., which patches should be loaded, etc.) |
| Code | code_id (PK) | | |
| | code_filename (PK) | A unique, semi-descriptive filename identifier. | A means of identifying specific code for use with ar_software_specification, ar_software_setup, etc. |
| | performer_id (PK) (FK) | | |
| | composer_name (PK) (FK) | The composer's name. | |
| | composer_affiliation (PK) (FK) | Any professional affiliations the composer may have. | May include professional organizations such as the Canadian League of Composers or SOCAN. |
| | composition_id (PK) (FK) | | |
| | composition_date (PK) (FK) | The date of composition. | |
| | composition_copyright_notice (PK) (FK) | A notice of copyright for the composition. | Notated in text on the title page or first page of the score. In the usual format of "Copyright (c) Year by Composer Name." |
| | ar_id (PK) (FK) | | |
| | composition_title (PK) (FK) | The title of the composition. | |

| | | | |
|---|---|---|---|
| | code_type | The type of code used. | The specific computer language or program used. May include Max/MSP patches, MIDI, etc. |
| Composer | composer_name (PK) | The composer's name. | |
| | composer_affiliation (PK) | Any professional affiliations the composer may have. | May include professional organizations such as the Canadian League of Composers or SOCAN. |
| Notation | notation_id (PK) | | |
| | notation_medium (PK) | The notation medium used. | May include digital formats such as postscript or application-specific file types, as well as standard printed notation. |
| | performer_id (PK) (FK) | | |
| | composer_name (PK) (FK) | The composer's name. | |
| | composer_affiliation (PK) (FK) | Any professional affiliations the composer may have. | May include professional organizations such as the Canadian League of Composers or SOCAN. |
| | composition_id (PK) (FK) | | |
| | composition_date (PK) (FK) | The date of composition. | |
| | composition_copyright_notice (PK) (FK) | A notice of copyright for the composition. | Notated in text on the title page or first page of the score. In the usual format of "Copyright (c) Year by Composer Name." |
| | composition_title (PK) (FK) | | |
| | notation_type | The type of notation employed. | May include possibilities such as common Western music notation, abstract graphical notation or even text instructions. |
| Obsessed Again | composition_id (PK) | | |
| | composition_date (PK) | The date of composition. | |
| | composition_copyright_notice (PK) | A notice of copyright for the composition. | Notated in text on the title page or first page of the score. In the usual format of "Copyright (c) Year by Composer Name." |
| | composition_title (PK) | The title of the composition. | |
| | composer_name (PK) (FK) | The composer's name. | |
| | composer_affiliation (PK) (FK) | Any professional affiliations the composer may have. | May include professional organizations such as the Canadian League of Composers or SOCAN. |
| | composition_duration | The length of the composition. | |
| Performer | performer_id (PK) | | |

# Appendix 1:
# Towards a Strategy for the Preservation of Electroacoustic Music

## Introduction

Electroacoustic music, that is, music written strictly for performance through electronic means, presents a variety of challenges for the archivist. Unlike traditional acoustic music where various physical records are created by the composer during the composition process—such as sketches and the musical score, for example—electroacoustic composition often only leaves digital entities behind for the archivist. Aside from a recording, possibly itself in digital format (e.g., wave, mp3, etc.), these digital entities are left in a proprietary software format that is generally usable only by a specific software program. Although an instrument such as the violin will most likely be available for future musicians (in more or less the same state available to musicians today), the digital and electronic components that are utilized for a particular electro acoustic composition are almost guaranteed to be obsolete within a very short time period after the work's creation. The technology employed by composers over the last half-a-century has progressed dramatically, and both hardware and software components are routinely discarded for newer, faster solutions.

## Towards a Strategy

*Obsessed Again…*, a musical composition for bassoon and interactive, live electroacoustic music, has provided an excellent case study from which to develop strategies for digital music preservation. The electronic components for this work include a variety of software components, plus two major hardware requirements. It is the latter that demonstrates the most obvious preservation problem. A hardware sound synthesizer (the Proteus) and a hardware pitch-to-MIDI converter are essential to the original conception of the piece. However, they are now technologically obsolete, and the units in the possession of Dr. Keith Hamel (the composer) are very much in danger of ceasing to function.

Currently, the clearest course for the future recreation and study of this work is to model the hardware requirements in the software realm. The specific sounds made by the Proteus synthesizer can relatively easily be copied and stored as a digital object. The most obvious form for this digital entity is currently a Max/MSP (Max) patch. Max is the software used to govern the

interaction between the bassoonist and the electronic instrument during performances. When O*bsessed Again…* was originally composed, Max did not possess a digital sound processing component (the MSP portion); it has since developed strong capabilities in this area, however. It is also possible to model the pitch-to-MIDI converter. In fact, several alternatives are freely available as Max software patches (i.e., components). The main drawback of this, however, is that while functional, these patches lack the reliability and accuracy of the hardware model. It is likely, however, that this will improve with time.

Work has been undertaken to begin this process. Unfortunately, this approach has not solved the primary issue of digital preservation. While it has aided in consolidating the data (i.e., placing all digital components of the work into a common format and location), the format of this digital entity is still dependent on a commercial software application. While it is possible to save Max files as plain text (which will then place the preservation mechanism into the same arena as a standard word-processing file), the Max application itself is still necessary for a successful performance of the piece. Dr. Hamel has since further explored other data encapsulation possibilities by engineering the ability to embed Max control data into his music notation software program (NoteAbility Pro), but this still leaves the data in a proprietary format, albeit in one controlled by the composer.

**Notation of Electroacoustic Music**

The next necessary step in developing a lasting preservation strategy is to remove all software dependence and develop a descriptive/representational language for electroacoustic music. While a format for this language is still unknown, various projects are currently at work describing conventional music notation (e.g., the GUIDO Music Notation Project), and it may be possible to extend or integrate an electro- acoustic description into these attempts. As of the writing of this report, a first step towards describing the interaction of the acoustic and electroacoustic elements of *Obsessed Again...* has taken place. The results of this attempt can be viewed at the end of this report.

However, one major caveat must accompany these attempts: this sort of descriptive record creation will in no way result in an historically accurate re-creation of the work. Only the *intent* of the composer will be recorded. It will be almost guaranteed that a future performance based on

these descriptions will result in an acoustically-unique piece that may share very little sound material with the original. Nonetheless, the basic structure and interactions of the work will be intact. The implications of this result will most assuredly need to be examined in great detail, but it is worth noting that for the particular case of *Obsessed Again…*, Keith Hamel fully expects and welcomes this re-composing.

## Obsessed Again – Section 1

- The main source of electronic interaction in section 1 is the triggering of computer-produced sonic events through analysis of the incoming bassoon signal.
- The bassoon signal is processed by a pitch tracker, which outputs the corresponding MIDI note value.
- This MIDI value is then compared against a series of defined values (show in the table below). If the value is equal to any one of these, a specific MIDI Sequence is triggered and sent out to the Proteus synthesizer which produces the sound indicated, for the indicated duration.
- The actual pitches played by each sequence are shown on the next page.

| Trigger MIDI Value | Trigger Actual Pitch | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|---|
| 36 | C1 | 7 | Long sound | 30 |
| 38 | D1 | 5 | High Cymbals | 20 |
| 44 | G#1 | 1,<br>11,<br>12,<br>or 13 (random) | Soft Drum<br>Percussion High<br>Cymbals High<br>Cymbals | 3<br>n/a<br>20<br>20 |
| 54 | F#2 | 9 | Crash | 14 |
| 58 | A#2 | 10 | Low Explode | 10 |
| 63 | D#3 | 3<br>and 9 | 3-Part Noise<br>Crash | 11<br>14 |
| 68 | G#3 | n/a[1] | variable | variable |

[1] MIDI Value 68 does not trigger a specific sequence, but instead creates a complex, long sustained sound made up of four individual notes, the first and last of which are always MIDI Value 68, while the middle two are the original pitch randomly modified. The first random generation takes the base value of 68 and then randomly chooses one of four actions: 1) subtract 12; 2) do nothing; 3) subtract 11; or 4) subtract 24. Therefore, the resulting possibilities for the second note are MIDI Values 56, 68, 57 and 44. The second random generation again takes the base value of 68 and chooses one of four actions: 1) add 13; 2) add 11; 3) add 23; and 4) add 25. The choices for the third note are then MIDI Values 81, 79, 91 and 93. The attack and amplitude are determined by a combination of random and timed events. This combination will be referred to as the **Quad Patch**, as only four notes are allowed to be sounding at once (it is also used by other sections below). The attack of each note following the first is delayed by 3500, 6500 and 10000 milliseconds, respectively. The amplitude envelope of each note is governed by yet another random function: a number is randomly chosen between 1 and 7, then multiplied by 500 and added with 5000 to decide a delay time in milliseconds. A volume value is generated beginning from zero and moving towards 110, timed to reach that goal in 8200 milliseconds. This ascent is interrupted and reversed after a period of time decided by the random delay time generated earlier, sending the volume value back to 0 in another 8200 milliseconds. The actual patches for each voice (i.e., the type of sound produced) are randomly selected from three tables, one each for low, mid and high ranges. The first voice selects from the low range, while the

second and third voices each select from the mid range, leaving the high range for the fourth voice. The values within each table are shown below.

| **Low Range Voice** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Position** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Patch Value** | 10 | 10 | 27 | 43 | 50 | 51 | 51 | 56 | 57 | 74 |

| **Mid Range Voice** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Position** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Patch Value** | 10 | 16 | 27 | 31 | 50 | 51 | 57 | 74 | 81 | 118 |

| **High Range Voice** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Position** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Patch Value** | 10 | 17 | 26 | 31 | 43 | 50 | 57 | 81 | 118 | 127 |

****NOTE:** An integer value of 1 is added to each of these to produce patch numbers between 1 and 128, instead of 0 and 127.

## Obsessed Again – Section 2

- As with section 1, the main source of electronic interaction in section 2 is the triggering of computer-produced sonic events through analysis of the incoming bassoon signal.
- However, unlike section 1, the absence of a specified pitch may also trigger a sonic event
- The bassoon signal is again processed by a pitch tracker, which outputs the corresponding MIDI note value and this MIDI value is then compared against a series of defined values (show in the table below).
- Throughout this section, a series of randomly determined pitches of velocity 120 and duration 18000ms are generated. Four of these pitches can be sounding at one time. Every 5000ms a random number between 1 and 6 is generated, and is then added to a base MIDI value of 28 to be sent through to the **Quad Patch** explained in section 1. A sonic event is activated only if a voice (one of four) is available, otherwise the MIDI data is ignored.
- Additionally, with each tick of the 5000ms metronome discussed above, a counter value is incremented, beginning from 0. Each time this counter value is cleanly divisible by 5, MIDI Sequence 7 is triggered.

| Trigger MIDI Value | Trigger Actual Pitch | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|---|
| 36 | C1 | 14 | High Cymbals | 20 |
| 37 | C#1 | special[1] | n/a | n/a |
| 38 | D1 | none | n/a | n/a |
| All other pitches | n/a | special[2] | variable | variable |

[1] MIDI pitch 37 produces two special events: 1) it opens the master gate on all pitches not matching MIDI values 36, 37 and 38 (see next note); and 2) it closes a gate, restricting the counter data discussed above from increasing, thereby turning off the possibility of triggering MIDI Sequence 7.

[2] All pitches other than MIDI Values 36, 37 and 38 are passed through, and then transposed down (the value of 12 is subtracted from the MIDI pitch). This pitch is then sent to become a member of a six-note **Chord Patch** (repeated values of the same pitch are ignored). The seventh distinct pitch replaces the first note of the chord, and this process repeats. A series of gates control the individual notes of the chord – a distinct pitch (i.e., one that is not an immediate repetition) will close the gate, and after a 500ms delay send that MIDI note on to the Proteus. After a further 3000ms, that gate is reopened, leaving that particular member of the chord to await a new pitch. This pass-through behaviour only activates once a master gate has been opened by MIDI pitch 37 above.

## Obsessed Again – Section 3

- Again, the main source of electronic interaction in section 3 is the triggering of computer- produced sonic events through analysis of the incoming bassoon signal.
- As with section 2, the absence of a specified pitch may also trigger a sonic event.
- The bassoon signal is again processed by a pitch tracker, which outputs the corresponding MIDI note value and this MIDI value is then compared against a series of defined values (show in the table below).

| Trigger MIDI Value | Trigger Actual Pitch | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|---|
| 36 | C1 | none | n/a | n/a |
| 39 | Eb1 | special[1] | n/a | n/a |
| 40 | E1 | special[2] | n/a | Variable |
| 44 | G#1 | special[3] | n/a | Variable |
| 57 - 66 | A2 – F#3 | special[4] | Variable | Variable |
| All other pitches | n/a | special[5] | n/a | n/a |

[1] MIDI pitch 39 causes the timed value discussed in the next point (counting from 1 to 127), to reverse itself, and return from its current value to 0 in 30000ms (therefore, its actual rate of descent depends on how high the current value of the timer is when this reverse command is received – i.e., the lower the current value, the longer the interval between new values from this timer).

[2] MIDI Pitch 40 causes the **Loop Patch** to send a series of looping (or repeating) pitches to the Proteus. Each event is a chord consisting of MIDI pitch 42 (F#1) and 68 (G#3), with a generated velocity (see end of this point) and a note length determined by a series of calculations – a timer begins counting from 1 to 127 in 30000ms, this value is then multiplied by 3, and subtracted from a base note length of 2100. This value also doubles as the timer value between each looping (or repeating) chord. As a chord is triggered the current value of the calculation becomes the chord's duration, and subsequently, the delay time before the next chord is triggered. This results in only one chord sounding at any given time. Finally, the generated velocity value comes from initial timer counting from 1 to 127. When a note is triggered, the current value of this counter is used for the velocity value.

[3] MIDI Pitch 44 triggers the same looping event as MIDI Pitch 40. The same two pitches are utilized (MIDI pitches 42 and 68), however, the timer event is multiplied by a factor of 4 (instead of 3), and subtracted from a base of 3000 (instead of 2100). Otherwise the event utilizes the same process as discussed above.

[4] Values within the range of MIDI Pitch 57 to 66 trigger another pulsing (or repeating) event. The trigger MIDI value is sent on to the Proteus, with a note length (in ms) determined by choosing a random value between 1 and 7, adding 6 and multiplying the result by 100. The velocity is determined by a timed value, descending from 100 to 0 in 30000ms. Whenever a note

event is triggered, the current value of this timer is used as the velocity. The sound type of this pulse is determined randomly from the following patch table:

| **Pulse Patch Selection** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Position** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **Patch Value** | 1 | 11 | 71 | 13 | 17 | 60 | 11 | 1 | 71 | 18 | 106 | 60 |

[5] Values outside the range of MIDI Pitch 57 to 66 that do not match 36, 39, 40 or 44, trigger the six-note **Chord Patch** as discussed in Section 2 (repeated instances of the same pitch are ignored). As with Section 2, the trigger pitch is passed through to the Proteus.

## Obsessed Again – Section 5

- Again, the main source of electronic interaction in section 5 is the triggering of computer- produced sonic events through analysis of the incoming bassoon signal. However, unlike previous sections, all non-consecutive (i.e., repeating) pitches produce an event.
- The one exception to this is MIDI Value 74, which does not trigger an event.

| Trigger MIDI Value | Trigger Actual Pitch | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|---|
| 74 | G4 | none | n/a | n/a |
| All other pitches | n/a | special[1] | Variable | Variable |

[1] All non-repeating MIDI Values (except 74) are passed through to the **Chord Patch** as outlined in Section 2 (an initialization message opens the master gate, removing the need for MIDI value 37 to be accepted first). A second process is also triggered by the initialization message, which is itself made up of two sub-processes. First, a counter increments by 1 a value starting from 28, every 2000ms, until a value of 72 is reached. A second timer triggers an event every 4000ms, where a random value between 0 and 6 is added to the current value from the first sub-process. The resulting value is then sent on to the **Quad Patch**, as discussed in Section 1. However, the master Quad gate appears to remain closed, so none of the note data generated by this process is actually sent on to the Proteus.

## Obsessed Again – Section 6

- Again, the main source of electronic interaction in section 6 is the triggering of computer- produced sonic events through analysis of the incoming bassoon signal.
- The Loop Patch as described in Section 3 is the main pitch generating mechanism, and Section 6 makes use of 4 instances of this patch. Each of these patches operates in the same manner, but with different values for the timer multiplier and the base note length (see below for specifics).

| Trigger MIDI Value | Trigger Actual Pitch | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|---|
| 36 | C1 | special[1] | Variable | Variable |
| 37 | C#1 | special[2] | Variable | Variable |
| 38 | D1 | special[3] | Variable | Variable |
| 39 | D#1 | special[4] | Variable | Variable |
| 40 | E1 | special[5] | Variable | Variable |
| 41 | F1 | special[6] | Variable | Variable |
| 60 | C3 | special[7] | Variable | Variable |
| 75 | D#4 | none | n/a | n/a |

[1] MIDI pitch 36 causes a reverse of each operating instance of the **Loop Patch**, as discussed in Section 3, point 1. Additionally, it closes the master gate for the **Pipe Patch**.[8]

[2] MIDI Pitch 37 triggers the fourth instance of the **Loop Patch**. The same two pitches are utilized (MIDI pitches 42 and 68) for all version of this patch except the first instance; however, in the case of the third instance, the timer event is multiplied by a factor of 2 and subtracted from a base note length of 1200. Otherwise the event utilizes the same process as discussed above.

[3] MIDI Pitch 38 triggers the first instance of the **Loop Patch**. For this instance, only MIDI pitch 42 is utilized, and the timer event is multiplied by a factor of 4 and subtracted from a base note length of 3000. However, the rest of the event utilizes the same process as discussed above.

[4] MIDI Pitch 39 opens the fourth gate for the **Pipe Patch**.[8]

[5] MIDI Pitch 40 triggers the third instance of the **Loop Patch**. For this instance, both MIDI pitch 42 and MIDI pitch 68 are again utilized, and the timer event is multiplied by a factor of 3 and subtracted from a base note length of 2100. The rest of the event utilizes the same process as discussed above.

[6] MIDI Pitch 41 opens the second gate for the **Pipe Patch**.[8]

[7] MIDI Pitch 60 triggers the second instance of the **Loop Patch**. Again, both MIDI pitch 42 and MIDI pitch 68 are again utilized, and the timer event is multiplied by a factor of 4 and subtracted from a base note length of 3000. The rest of the event utilizes the same process as discussed

above.

[8] The **Pipe Patch** receives all pitches played by the bassoon, but is controlled by a master gate. A total of four voices are available. If one of the voice gates is open, and the pitch is between MIDI Value 48 and 127, it is sent on to the rest of the patch, which stores the MIDI Value and Velocity, and delays for a period of time before sending the information on to the Proteus. If another pitch trigger is received by the patch before the delay is complete, this second pitch is queued (and so forth with any other received triggers). The random delay value is determined by a number between 1 and 10 that is generated every 5000ms. It is then added with 8 and sent to the four voices of the patch. The first voice multiplies this value by 20, the second by 40, the third by 60 and the fourth by 80. The resulting value is the delay time in milliseconds.

## Obsessed Again – Section 7

- Again, the main source of electronic interaction in section 7 is the triggering of computer- produced sonic events through analysis of the incoming bassoon signal.
- The Pipe Patch as described in Section 6 is the main pitch generating mechanism, and incoming pitches from the bassoon are sent through to this patch once the gate is opened (see below).

| Trigger MIDI Value | Trigger Actual Pitch | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|---|
| 56 | G#2 | special[1] | n/a | n/a |
| 72 | C4 | special[2] | n/a | n/a |
| 74 | D4 | special[3] | n/a | n/a |
| 75 | D#4 | none | n/a | n/a |

[1] MIDI pitch 56 opens the third gate of the **Pipe Patch**, discussed in Section 6.

[2] MIDI pitch 72 causes a patch change to be sent to the Proteus, requesting patch #119.

[3] MIDI pitch 74 closes the master gate for the **Pipe Patch** discussed in Section 6.

## Obsessed Again – Section 8

- Again, the main source of electronic interaction in section 8 is the triggering of computer- produced sonic events through analysis of the incoming bassoon signal.
- The incoming bassoon pitch is analyzed, and if it is between MIDI Value 69 and 71, a random event is triggered,[1] otherwise the pitch is compared to the values in the following table.

| Trigger MIDI Value | Trigger Actual Pitch | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|---|
| 36 | C1 | special[2] | n/a | n/a |
| 63 | Eb3 | special[3] | n/a | n/a |
| 72 | B3 | special[4] | n/a | n/a |
| 74 | C4 | special[5] | n/a | n/a |

[1] MIDI pitches 69 – 71 trigger a randomized playback of some of the MIDI sequences encountered in Section 1. At an interval beginning at 2000ms, but then randomly determined by selecting a value between 1 and 8, multiplying it by 250 and added it to 750, one of four gates is randomly opened, triggering the following sequences (every 20000ms, the special sequence is triggered):

| Gate | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|
| 1 | 2 | crash | 14 |
| 2 | 3 | Low explode | 10 |
| 3 | 4 | Loud crash | 10 |
| 4 | 2 | crash | 14 |
| Special | 14 | High cymbals | 20 |

[2] MIDI pitch 36 stops the random sequences of point 1.

[3] MIDI pitch 63 affects the particular MIDI Sequences triggered below in point 5. A counter variable is initialized at 1, and is increased for each instance of pitch 63 that is received until a maximum value of 4 is reached. This value opens a specific series of gates, allowing the following sequences to be triggered by MIDI pitch 74:

| Gate | MIDI Sequence Triggered | Sound Type | Duration(s) |
|---|---|---|---|
| 1 | 2 | crash | 14 |
| 2 | 3 | Low explode | 10 |
| 3 | 4 | Loud crash | 10 |
| 4 | 5 | Big drum | 7 |

[4] MIDI pitch 72 stops the random sequences of point 1, and opens the third gate of the **Pipe Patch** discussed in Section 6.

[5] MIDI pitch 74 closed the master gate of the **Pipe Patch**, and repeatedly triggers a MIDI Sequence batch (governed by point 3 above) starting at an interval of 2500ms, but gradually reducing this interval based on a counter value (which starts at 1 and increases by 1 for every instance of MIDI Sequence 2 that is trigger until it reaches 16) multiplied by 115 and subtracted from 2500. Sequence 2 then continues to be triggered after the accelerando until the counter value reaches 30, and the sequences stop.