The ImmApp: A Digital Application for Immersive Interaction with Sound Art Archives

J. Milo Taylor

CRiSAP Research Unit [1]
(Creative Research into Sound Art Practice)
London College of Communication,
University of the Arts, London
j.taylor23@lcc.arts.ac.uk

Abstract. This paper introduces a doctoral research project which is developing an innovative digital research methodology based around a MySql **[2]** database. The project's aim is to deliver an innovative re-presentation of sound art discourse from a digitized, post-modern, post-Cageian perspective.

Keywords: Sound Art, Immersive Digital Environments, Database, MySql, XML, X3D, OSC.

1 Introduction

The late twentieth century saw an upsurge in the exposure and circulation of what is variously called 'sound art', 'audio art' or 'sonic art'. In such work, the auditory is given a rare foregrounding over the unquestionable dominance of the visual in western art practice. Closely associated with the emergence of affordable technologies, considerations of the contextual contingences of presentation, network art, telematic art and the continued development of intermedial practice, the rather sudden proliferation of sound art within galleries and museums highlighted a serious absence of theory or significant literature contexualising a rather liminal and apparently new form of artwork.

Since this time however, a retrospective on artists working with sound has taken place, and whilst practice 'resembles a poorly mapped geography' **[2]** a number of publications have appeared addressing this art of sound. The various examples of this (**[3]**, **[4]**, **[5]**, **[6]**, **[7]**, **[8]**) have approached their theorizing and mapping of practice from within natural language, or through an impoverished engagement with digital strategies, as typified by the unreconstructed adoption of inherited print-based page layouts of such online resources as UbuWeb **[9]** , The Australian Sound Design Project **[10]** and The Sonic Arts Research Archive **[11]**. While search engines on such sites present an alternative semantic entryway into creative practice, subverting the linearity and sequentiality evident in written texts, these resources remain structured along more or less modernist lines with material organized around specific artists, geographical locations, and temporal events.

R. Kronland-Martinet, S. Ystad, and K. Jensen (Eds.): CMMR 2007, LNCS 4969, pp. 426–440, 2008.

As I shall show later on, the ImmApp offers a new reading of sound art based upon a more contemporary discourse, a deeper exploration of today's technology, and assesses the contribution this may make to a reinvigorated conceptualization of a marginalized art history, when further enriched by contemporary critical theory

2 The ImmApp

"A synthesizer places all of the parameters in continuous variation, gradually making 'fundamentally heterogeneous elements end up turning into each other in some way."(**[12]**. pp 121)

The above quotation from Deleuze and Guattari provides some insight into the overall aim of the research process; the development of a unique means of interacting with a historical practice. While the ImmApp will involve significant aspects of sound synthesis, the above quotation should be understood as metaphorical and an application of post-structural cultural philosophy to an example of embodied digital sound practice. The ImmApp can be understood as a conceptual or cultural synthesizer; using the flattening of difference typical of digital technology to create spaces and tensions between divergent practice in order to investigate broader historical (dis)continuities.

2.1 Data Gathering and MySql Database

Following work reviewing contemporary and historical sound art practice in terms of a traditionally-styled context review, an initial sample of 20 sound artists was taken, and an in-depth search for relevant material undertaken.

There were two main strategies in selecting artists; firstly, a 'control group' of core sound artists, those artists reported as being such, who individually claim that for themselves, (Christina Kubisch, Christian Marclay, Ros Bandt for example), and secondly, more liminal artists, working on the edge of sound art practice. It soon became clear that a larger sample of artists and works was required, and the number of case studies increased over a period of three months from September to December 2006 from the original 20 to 160. This increase was decided necessary, if not to provide a comprehensive coverage of sound art practice, then at least to open up a space inclusive of as much diverse activity as possible in these early stages.

Alongside this data-gathering was the urgent need for establishing a robust research method for storing and managing this information. The vision informing decisions at this point were based upon contemporary web design, with particular interest in the possible vectors suggested by Web 2.0 discourse and open source software. Through a creative and subverting use of available technologies, a unique application may be developed.

The first stage in this was to install a database and server technology. The rationale behind this activity suggested that the combined use of a server and relational database bundle, conventionally used to deliver dynamic web sites from geographically remote sites, could be usefully deployed on a single, non-networked computer, facilitating rapid and scalable data retrieval and manipulation functions.

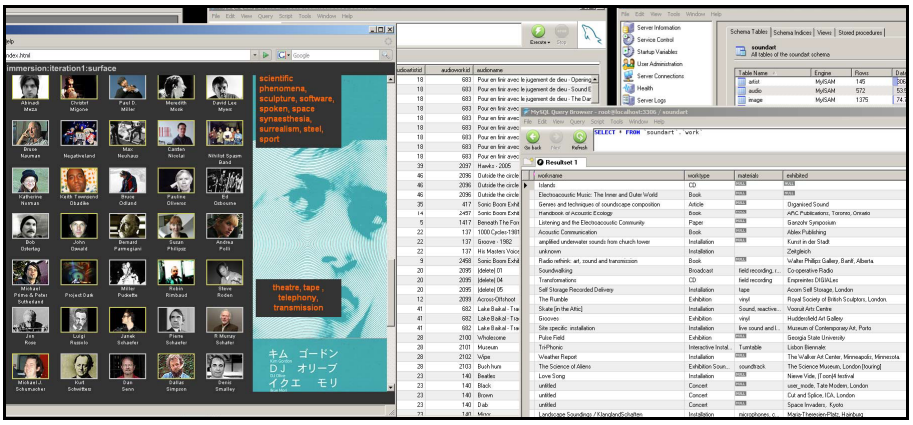

Fig. 1. Early example of the database interface (left) and an underlying MySql table (right)

The MySql **[13]** relational database is ubiquitous in contemporary database design. Open source, scalable and free, it is used from the smallest of dynamic data applications to the most demanding of situations. It has a light footprint, is fast and runs easily on the open source Apache server technology **[14]** which was simultaneously adopted for similar reasons.

2.2 Search Mechanism and Conventional Taxonomy

The next step in the development of the application was the means by which the data could be semantically manipulated, and this was achieved through a sophisticated search engine acting to shape and morph a dynamic immersive datascape. We can explore this by discussing two different aspects of this step; first by a review of the nature of the data to be accessed, and secondly by a discussion of database search techniques.

The nature of the data has been shaped in a way comparable to the strategy of selecting artists to be included in the database; a balance of the conventional and established, with the unconventional and exploratory.

The former can be applied to the inclusion of such staples of modernism as ‘artist’, ‘location’ and ‘year’; self-explanatory discrete units that run through discourse. It is seemingly quite apparent how these inter-connected elements relate within sound art and how a digital application may spatialise returned queries based upon historical and geographical co-ordinates. First efforts were directed towards grouping data from proximate years and locations closely together, and data separated by greater spatio-temporal distance further apart; it is noted that these conventions are open to questioning and dependant upon progress in the development of the application; they may be challenged as structuring forces, and it is hoped that through the second category of association that this will be made apparent.

2.3 Artist Nodes [1] : An Alternative Ontology

In 'Noise, Water, Meat' Douglas Kahn **[15]** provides some precedence for a radically different approach to an art history of sound. While the book is admittedly problematic, uneven and idiosyncratic and has been critiqued for its many shortcomings (**[16]**, **[17]**, **[18]**, **[19]**) in its contextualization of an art of sound within wider creative modernist practice it offers a perspective that until its appearance was sorely lacking. While the results of his approach reinforce a culturally entrenched view of sound art based in high modernism, his method is worthy of closer scrutiny.

The book is divided into three sections, noise, water, and meat, which for the purposes of this paper I will call *nodes*, defined as attractors around which practice can be seen to converge. Kahn uses these nodes not only to demarcate areas of sound art practice, but also to connect these, in unexpected ways, to contemporaneous cultural changes. In the section 'Water' for example the node is used in a complex discussion of a shift in creative practice occurring in the early 1950s. A node, water, is then used to articulate a disciplinary dissolution that "would come to signal a greater saturated and fluid state within the late modernist arts" **[15]** (pp 244).

The second method of organizing data within the ImmApp reflects this approach as instigated by Kahn. Each artist and work has been cross-referenced with a number of 102 nodes. While some nodes are used reflectively within discourse (installation, music, laptop etc) other terms have not been directly addressed or are strangely absent as a focus of discourse. These, as yet, silenced nodes appear as potential sites of significance within the dataset. For example, the ImmApp has already picked up on the presence of 'queer', 'gender', 'race', as significant aspects of practice. That these aspects of sound art have received very little discussion in conventional coverage of sound art was made quickly apparent by the methodology embodied by the ImmApp project.

So for each entry in the database, there is an associated array of key terms. Statistical treatment of these arrays (i.e. which specific nodes are likely to appear together, or which are less likely to appear together) will provide the numerical basis for associating data in real space.

By this time, I hope to have demonstrated my intention to present sound art as a number of dynamic and interrelated elements, described in part by geographical and historical placement and further modified through a shifting array of nodes. Practice is to be mapped based on a direct investigation of materials, techniques, and the more slippery entities and relationships found within sound art that seem well suited to this method.

2.4 Dynamic Generation of Spatialised Datascapes from MySql Queries

In the current research I am interested in run-time generation of 3 dimensional spaces in response to a performative interaction with a database. The emergent properties of an environment generated in this way are of great creative interest, especially when

[1] Within the ImmApp project there is an unfortunate convergence of terminology. 'Node' is used in this discussion of artistic practice to refer what could alternatively be called a 'keyword' or 'tag'. 'Node' also has a specific, and different meaning in regards to X3D code where it is the equivalent of an XML 'element' i.e. a fundamental block from which X3D environments are written.

coupled with an 'open' dataset able to be updated and modified at any time. These run-time possibilities offer an approach very different from pre-rendered scenes that share much with the closed texts of the printed page.

While an immersant in a pre-rendered virtual world may have choices in the way that he/she may interact with the virtual world, the world itself is static, in a comparable way that architecture in the real world is static. A run-time environment is generated 'on the fly' and constructed according to the semantic search string. Due to this, the virtual architecture is fluid and dynamic, modeled on nothing found in the physical world.

A number of different technologies were considered to deliver upon this vision, some of the candidates included:

- Max/MSP **[20]**
- Macromedia Director **[21]**
- Pure Data **[22]**
- Processing **[23]**

These have been rejected for various reasons; at the time of writing, the technologies being explored are:

MySql **[13] ->**XML **[24] ->** X3D **[25] ->** audio engine[2] **[26]**

I will briefly discuss each of these in turn to provide an overview of the 'signal flow' within the ImmApp and I will describe how information inputted to the MySql database will create a generative sound field within a real world environment.

3 Technical Context: MySql, XML and X3D

"A machinic assemblage, through its diverse components, extracts its consistency by crossing ontological thresholds, non-linear thresholds of irreversibility, [...] phylogenetic thresholds [and] creative thresholds of heterogenesis and autopoiesis." Felix Guattari in **[27]**.

3.1 MySql vs. XML

In contradistinction to the linearity of language used in natural language, the structure of MySql operates 'relationally' as an array of interlinked and reconfigurable tables of information, each of which can be reorganized according to on the one hand processes and search mechanisms designed by the developer, and on the other hand, criteria provided by the user of the application. While hierarchies and linearities are sublimated in MySql structures, what is paramount is its support of relationships *between* entities (i.e. one-to-one, one-to-many, many-to-one and many-to-many).

This represents a drastically altered dynamic between *author*, *reader* and *text*, if indeed we can use these terms within the context of the ImmApp. The focus of the current research should not be understood as an unpicking of the semantics of these

[2] At the time of writing, a number of different options are being explored e.g. PureData, Max/MSP, Supercollider, LISP.

terms, but rather upon the specificities of sound art practice, the discourse surrounding this, and the potential of a dynamic immersive application to provide an alternative understanding of what such practice and discourse involves.

The search engine described above will allow the performer some choices in his/her search criteria in a manner modeled from advanced search engines as found on the web. For example:

```
SELECT * from work
     WHERE Materials = 'metal'
            EXCLUDE 'steel'
     AND year >= '1985'
     AND location = 'Europe'
```

or,

```
SELECT * from work
     WHERE node = 'acoustic ecology'
     AND YEAR > '1984'
     AND materials = 'multichannel'
               EXCLUDE 'tape'
     AND location = 'Canada'
```

It is also useful to compare the relational characteristics of MySql with the strict hierarchical structure of XML, the language into which the ImmApp queries results are transformed. It is too early to speculate upon the significance of this, but the comparison of MySql and XML being shaped by quasi-mathematical algorithmic processing with the strict linearity of natural language, used so far in analyses of sound art, is quite compelling.

3.2 XML and the Semantic Web

Web 2.0 is synonymous with what Tim-Berners-Lee has called *The Semantic Web* (**[28]**, **[29]**, **[30]**) a concept that outlines a vision of information becoming machine-readable. As HTML, the first language of the web, marks up text for *layout* upon web-pages, so XML, the language of Web 2.0 marks up the *meaning* of the elements laid out in electronic documents. For example, a simple piece of HTML:

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 //EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-frameset.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
  <head>
  <meta http-equiv="Content-Type" content="text/html;
  charset=iso-8859-1" />
  <title>Soundart01 - Surface</title>
  </head>
  <body><b>Luigi Russolo</b></body>
</html>
```

The HTML tags (generally in pairs and always contained within < >) in this example simply tell a web browser that the document is HTML and that it is of a particular specification of HTML. The <meta> tags provide information about the document to such machine agents as search engines, and provide an early indication of the direction of Web 2.0. The opening and closing tags simply tell the browser to make the text *Luigi Russolo* appear in bold.

This simple example illustrates HTML as a code hidden to general users that defines the appearance of web-pages, as well as providing limited information about the document to machines (typically the <meta> section of a html document contains a description of the page's content as well as a list of indexed keywords). The example above, all HTML, and all content held within its tag pairs, remains meaningless to a machine; it is from this starting point that Berners-Lee proposed the concept of the Semantic Web, where machines are given a limited means to interpret meaning within documents through an e**X**tensible **M**arkup **L**anguage (XML).

While HTML is used to 'mark up' the *appearance* of text, XML is used to describe its *meaning*. In this way, XML is a form of metadata (data about data), something that existed in a limited form in HTML <meta> tags. To illustrate this difference between HTML and XML, the example below extends the previous code fragment, and demonstrates the clear hierarchy of elements central to well-formed XML syntax[3].

```
<?xml version="1.0" encoding="UTF"?>
<Early_Originators>
        <Artist>
                <1stName>Luigi</1stName><2ndName>Russolo</2ndName>

        <Workname> L'arte dei Rumori </Workname>
                                        <Workdate> 1916 </Workdate>
        <Workname> Intonarumori</Workname>
                                        <Workdate> 1916 </Workdate>
        <Workname> Gran Concerto Futuristico </Workname>
                                        <Workdate> 1917 </Workdate>
                <Workname> Risveglio di una Cita </Workname>
                                         <Workdate> 1921 </Workdate>
        </Artist>
        <Artist> content </Artist>
        <Artist> content </Artist>
        <Artist> content </Artist>
        etc.
</Early_Originators>
```

XML is only the first level of the Semantic Web however. For meaning to be constructed it is clearly not enough to simply tag elements with metadata, it is also necessary to define these concepts and the relationships between them. In this way, this process within the current research can be viewed as the creation of a unique ontology of sound art. While based in natural language, contemporary philosophical concerns and the specific practices of sound artists, the project is equally informed by a practice-based approach located in the field of computer science. It is from this basis in Web 2.0 discourse about knowledge representation in artificial intelligence, that the ImmApp will present a model of sound art distinct from previous print-based approaches.

3.3 X3D

Since the first wave of internet hyperbole in the 1990s, visions of the web as an immersive space rather than a collection of 2 dimensional pages have occupied a

[3] HTML tags are specific and defined. In XML, the equivalent is called the 'element'. XML elements are e**X**tensible, which means they are open, and can be defined by the programmer.

peripheral fringe of popular consciousness. The technology that facilitated the early 'worlds', VRML (Virtual Reality Modeling Language) has been superseded by the XML-based X3D protocol **[31]**.

That X3D is based upon XML is demonstrated below where the underlying code forms a very simple X3D scene, and shows a clear relation to the XML code shown earlier. While the X3D is more complex, the similarities in structure and syntax are obvious.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE X3D PUBLIC "ISO//Web3D//DTD X3D 3.0//EN"
"http://www.web3d.org/specifications/x3d-3.0.dtd">
<X3D profile='Immersive' >
<Scene>
       <Transform DEF='dad_Luigi_Russolo' translation='-0 0 0'>
              <Shape DEF='Luigi_Russolo' containerField='children'>
                     <Text DEF='GeoText1' containerField='geometry'
                     string='"Luigi Russolo"'>
                     </Text>
              </Shape>
       </Transform>
</Scene>
</X3D>
```

When viewed in an X3D compatible browser, (of which there are several including BS-Contact VRML/X3D **[32]**, Flux Player **[33]**, Octaga Player **[34]**, the Java-based Xj3D **[35]**, FreeWRL **[36]**, Blaxxun **[37],** and Cortona **[38]**) we would experience something like the image shown in Figure 2.

Fig. 2. Screen Grab from FluxPlayer

This simple scene can be interacted with in virtual space. It is generated at run time by the simple example of X3D code shown above.

3.4 Audio in X3D

> "It's an interesting field, and one where major advances are now possible. X3D has progressed quite well in terms of graphics, but the interfacing, especially audio, has left something to be desired. " [4]
>
> John A. Stewart. Team Leader of the FreeWRL browser project

[4] From email correspondence 25th May 2007.

Before addressing the specific issues around audio in X3D we need to have a brief look at X3D nodes in a little more detail. The equivalent of XML *elements* (for example `<Artist> </Artist>` and `<1stname> </1stname>`) are, in X3D terminology, called *nodes*[5]. In XML, elements can be modified through the inclusion of *attributes*, and in a comparable way, the nodes contained in X3D documents can be modified by *fields*. In the X3D fragment above we see how the `<Transform>` node is modified by two fields `DEF` , and `translation`, containing the values `'dad_Luigi_Russolo',` and `translation='-0 0 0'` respectively.

More detailed coverage of the X3D specifications can be found online **[25]**, and in a growing body of literature **[39]**, **[40]**. Here all that needs stating is that an incrementally increasing number of X3D nodes are supported through a number of profile specifications which have been put in place to allow browser developers to target particular implementations.

In the X3D example above, the 'Immersive' profile is specified, which is aimed at multimedia content, other specifications include the 'Core Profile', 'Interchange Profile', 'CADInterchange Profile' (aimed at computer-aided design applications) and others. Each particular browser supports different levels of nodal functionality as defined by each specification. We should also note the e**X**tensibility of X3D; which, in practice, means the particular developers associated with particular browsers have extended their flavour of X3D in certain directions. Additionally, it is possible, and usual, for scripts to be run within X3D (with ECMAscript) and so X3D's functionalities can also be e**X**tended in this way.

Audio within X3D is dealt with by two nodes `<Sound>` and `<AudioClip>`, as specified in the Immersive X3D Profile. The `<Sound>` node deals with sound spatialisation whilst `<AudioClip>` deals with streaming and file playback.[6] In the words of Brutzman and Daly, "The Sound node enables sound-spatialisation capabilities by providing fields that define sound location, direction and relative intensity". (**[40]** pp 342).

However, the claims for sound spatialisation in X3D are based in a very primitive understanding of spatial audio, and it is, to me vital, to link the practices of real time 3D environments, such as X3D, with the much more developed explorations of sound in space as suggested by acousmatic music, and the explorations of the ambisonic, wavefield synthesis, and soundscape communities. It is also of great interest to expand the X3D community's understanding of sound through the application of the recent ideas of such important audio theorists and practitioners as Bregman **[42]**, Blesser **[43]** and Smalley **[44]** who not only have extensive technical capabilities, but also profound understanding of the use, or indeed, misuse, of spatialised audio.

In theory, X3D supports spatialisation, yet it remains dependant upon the specific browser chosen as to whether anything more than stereo attenuation is supported. Before providing a short overview of the browsers that are available, it must be noted

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[5] This is the area of potential confusion I touched on earlier in the paper, due to an unfortunate convergence of terminology.

[6] A more in-depth discussion of audio in X3D/VRML , although over 5 years old, can be found at 41. Pohja, M. *X3D and VRML Sound Components*. [cited 09.07.2007]; mikko.pohja@hut.fi:[Available from: http://www.tml.tkk.fi/Opinnot/Tik-111.590/2002s/Paperit/pohja_x3d_sound_OK.pdf.

that immersive audio within X3D is notoriously buggy, and has remained problematic throughout the current research. It is in the hope of improving this situation that I continue to explore this area.

There are a number of X3D browsers available, all with slightly different emphases; significant effort has gone into the exploration of these different technologies. Table 1 below summarises some relevant aspects of the most prevalent X3D browsers available today.

Table 1. X3D Browsers

	License	**OS**	**Audio**	**Notes**
Flux Player	Open-source	Win	Stereo	Direct X
Octaga	Commercial	Win / Linux / OS X	?	Supports panoramic video projection
BS Contact VRML/X3D	Commercial	Win	Up to 8 channel (Configured in SDK package)	Direct X OpenGL (industry standard browser)
FreeWRL	Open-source	Linux / OS X	Stereo	Rewire/ MIDI enabled
XJ3D	Open-source	Win /Linux /OS X /Solaris	?	Java Based (Java3d audio handling very buggy)
Cortona	Commercial	Win	Configured in SDK	Direct X OpenGL. VRML specifications, only a few X3D nodes supported
Blaxxun Contact	Commercial	Win	?	DirectX OpenGL Focus on multi-user collaboration. Java based. RealAudio.

As can be seen from Table 1, the attitude of the X3D development community towards audio is rather obscured. While the protocols of visual 3-dimensionality (DirectX, OpenGL) are made explicit by many of the groups and companies concerned, audio standards are clearly not a priority for (m)any of these groups. Information regarding auditory 3-dimensionality is hardly forthcoming, and development of sophisticated immersive audio with X3D is restricted to complex develop activity within the software development kits (SDKs) of the major commercial X3D applications.

3.5 The Helian Browser

The sole exception to this is the Helian browser **[45]** developed by Niall Moody as part of a recent PhD project at the Centre for Music Technology, University of Glasgow. The Helian X3D browser is cross-platform and designed specifically with audio in mind. This project is the only example approaching the requirements necessary for

the ImmApp. Particular aspects of Helian that distinguish it from the technologies discussed above are:

- Support for low latency audio (MME, ASIO, DirectX on Windows) (Jack, ALSA, OSS on Linux) (CoreAudio on OS X)
- B-format Ambisonic audio engine supporting sophisticated multi-channel speaker arrays.
- Open Sound Control support for all nodes.
- Multi-threaded audio engine allows processing of audio to be split into discrete threads and potentially processed by separate processors.

There would however be problems with using Helian as the browser of choice for the ImmApp.

- No http/ftp support (required for interaction with the MySql database).
- Helian is unable to dynamically load objects (required as response to MySql queries).
- OSC control is unidirectional (Helian receives OSC, and does not send it. This is the inverse of what is required for the ImmApp, where the location of spatialised nodes will be sent to the spatialisation engine).
- The Ambisonics implementation does not support camera movement (i.e. Soundfield rotation).

While it is clear that at the current time the Helian browser is unsuitable for the ImmApp project, the problems highlighted above are only problems from my own research perspective. Moody's work is a significant contribution to knowledge, on many levels, most explicitly through the innovative development of an X3D browser with a focus upon audio. An auditory focus, that is absolutely lacking in broader X3D discourse, as is illustrated in Table 1 above. The Helian browser has been developed for his particular research goals, and the limitations I have highlighted are simply not relevant to his aims.[7]

3.6 Technical Context: Summary and Conclusions

In this discussion of the technical context for the project I began by articulating the kind of discursive modality enabled by the relational dynamics of MySql, modulated by quasi-mathematical manipulation as facilitated by raw SQL coding.

I then moved on to an overview of the type of machine semantics envisaged by Berners-Lee in his conception of Web 2.0 and introduced XML, the primary language associated with this type of discourse, and the starting point for the development of machine ontologies in the context of the Semantic Web.

The next stage was to explain the relation between XML and X3D in order to clarify the modulation of cultural flows from dematerialized digital artifacts, through the shifting grids of a relational database, transformed and translated into a real world audio-visual-spatial synthetic environment.

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[7] I would like to extend my thanks to Niall for taking the time to correspond with me, and to answer the questions I had regarding his work.

The technical discussion ended highlighting the real research opportunity for developing an immersive, audio-aware, and audio-enabled X3D environment by demonstrating the current lack of such systems. I would like to end this paper by returning to the writing of Douglas Kahn and to give a simple example of how the ImmApp may provide an alternative narrative of sound art to a traditional text-based presentation.

4 The Water Face-Off: The ImmApp vs. Kahn InfoClash

For the sake of this discussion, I will focus upon the node 'water' selected by Kahn in his text 'Noise, Water, Meat'. I will give a short précis of his version of 'water' in relation to an art of sound, and open up a short discussion of water from an admittedly primitive early iteration of the ImmApp, which while in its current state has none of the sensory richness anticipated in more developed later versions, proves a certain value in this methodology.

4.1 Water from Kahn's Printed Page

The second section of Kahn's book attempts 'a short art history of water sound' and situates this with a retrospective view on the use of worldly water sounds in the earlier art musics of Eric Satie, Richard Wagner, and Henry Cowell, tape compositions by Hugh Le Caine and Toru Takemitsu and a more general watery inspiration found in works by Kurt Schwitters, André Breton, Raymond Roussel, Aldous Huxley, Marcel Duchamp and Salvador Dali. He then dedicates the majority of the section to a discussion of John Cage and Jackson Pollock and relates this to broader tendencies within the Fluxus movement and the work of Allan Kaprow and George Brecht.

In essence, this is the total extent of Kahn's exploration; a few passing remarks on Yoko Ono, Andy Warhol, Carolee Schneemann and Meiko Shiomi, ends his analysis. The last reference to a water based art-work being Annea Lockwood's 'A Sound Map of the Hudson River' (1982).

4.2 A Narrative of Water from the ImmApp

The ImmApp returns 18 works, only one of which, Brecht's Water Yam, is mentioned by Kahn. This in some ways is due to the semantic weakness of the existing search mechanism and once full-text indexing is implemented, a much richer response will occur.

However, even in its current primitive state it provides proof of several things. Firstly that the database has been populated with significant evidence of sound art. Of the 18 records returned, 15 different artists are represented from America, Australia, Austria, Canada, Germany and New Zealand.

An alternative reading focuses on the institutions associated with sound art, ranging from the important Austrian festival Kunst in der Stadt, the Otis Art Institute, Los Angeles, the Hirshhorn Museum and Sculpture Garden, Smithsonian Institute, Washington DC and The Centro Brasileiro Britânico, São Paulo amongst others. It also provides an insight into the diversity of practice with tape compositions, field recordings, instrument design, sound sculpture and site-specific installation all returned.

Finally, acknowledging Kahn's work, this exercise provides some vindication of his rather idiosyncratic method in approaching a history of sound in the arts. While his work connects creative practice to deeper cultural and philosophical debates occurring in modernity and pre-modernity, the ImmApp connects elements historically and geographically dispersed that conventional analysis has not related, fixated as they are upon a small number of possible variables.

5 Conclusion

This paper has attempted to introduce the ImmApp project, to provide some background to the area of study, to give a review of recent practice and to give a summary of my methodology within the context of contemporary technologies relevant to my research goals. I moved on to a discussion of the Semantic Web and the place of X3D within this discourse before summarizing the capabilities of the major X3D browsers before highlighting the poor support for audio functionality within such technologies. I ended the paper with a comparison of results obtained from a modernist, print-based methodology, as typified by Douglas Kahn's discussion of water, with an alternative reading of the same theme provided by the ImmApp. I hope to have proven by this the evident contribution that such a digital strategy can contribute.

In the brief comparative study presented above (The Water Face-Off: The ImmApp vs. Kahn InfoClash) Kahn's presentation of 'water' seems remarkably thin, and leaves the last 20 years of work wholly unaddressed. The stark difference in the material covered by him, and the artists and works returned by the ImmApp is highly pertinent. It not my intention in any way to belittle Kahn's work, but the demonstration above clearly highlights his fixation upon modernist art, and more specifically modernist art music. While Kahn explicitly acknowledges his agenda and his casting of modernism as a static, object-based practice compared to the fluidity and flow of a nascent post-modernism provides an essential background to sound art, his approach delimits and defines the diversity of sound art practice inappropriately.

Much contemporary sound art is produced by artists with little or no formal musical training, and music, or musicality is of reduced importance. In addition to this, critics and gallery presentation of sound work connect more closely to a discourse based in fine art than one of music. The works of such artists as Dan Senn, Steve Roden, Max Neuhaus and Janet Cardiff relate to a visual discourse and immersed listening practices within locational specificities that are intrinsic elements of the ImmApp, and these sensory resonances knit tightly with the design and development of a technical solution to a conceptual problematic.

The level of detail provided by the ImmApp, and the primary nature of the information, allows an understanding of practice to develop based in the specifics of practice of individual artists. Through this, and the diversity it represents, we may avoid totalizing overcodings of narrative as typified by Kahn.

The ImmApp project is then a practice-based project and one that attempts an articulation of sound art practice through the use of contemporary technologies. Such mappings of art practice are usually found within arts and humanities discourse; while I am aware of such discourse, the ImmApp project is essentially interdisciplinary, and alongside the exploration of sound art, is a detailed and in-depth investigation of an

area concretely within the domain of computer science. Research findings so far support claims that this is a fertile ground for continued investigation.

The particular strength of the project comes about through the ongoing shift in perspective and emphasis between the areas of art history, computer science and the goals of a practice-based creative project. The digital methodology opens an alternative interpretation of sound art history through the application of algorithm which is distributed throughout the ImmApp, and operates on many levels (ontologically, semantically, sensorially and spatially). Moving along the opposite vector, the critical theory associated with the study of an art history provides a critical philosophical framework with which to problematicise the creation of a sophisticated immersive digital application.

Finally, the ImmApp will involve sustained and focused interactions and manipulations of audio visual artifacts, facilitated by the later development of a robust audio engine. The choices made in performance, aimed at articulating one or more aspects of sound art, are of a very different order to those made by an author writing text for print media. While I refuse to speculate upon the final experience of this for performer and audience, I remain convinced that this performative presentation of sound art based upon a dynamic database will open a valuable space for a reinvigorated debate on sound art and the potentials of digital immersion.

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